# Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter X

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12190 | AII AR5 | 1 | | | | Dear authors, thank you for writing the first report. I have comments on selected text passages and sections which concern the interlinkages between mitigation and adaptation.<br>If the task of this IPCC report is to give an overview, synthesise and analyise the content of existing literature:<br>- the analysis on mitigation adaptation interlinkages lacks a systematic approach which is guided by clear analyitical question or a systamitized and explicit description and content analysis of available literature (either from a perspective of IPCC authors and their questions or from a perspective of the authors of the cited publications and their analytical questions<br>- the literature review and accordingly the used literature is not comprehensive, e.g. on adaptive capacity<br>- some text passages are based on the content of non refereed publications | Rejected. WG3 is tasked with analysing the science of climate change mitigation. Adaptation is primarily dealt with in Working Group 2. The synthesis report will focus on interlinkages. |
| 5754 | AII AR5 | 21 | 40 | 22 | 10 | Please include the IPCC RCP regions in the Glossary. They are used intensely in the text but not explained in each chapter. | Noted. The description of regions are provided in Annex II. |
| 4982 | All AR5 | | | | | Although there was something on Issue of gender in the social cobenefit subsection of chapter 7 & 9 ( Energy & buildings), the issue can also be adressed in chapter of FOLU in section of cobenefits | Accepted. We have introduced a consistent treatment of co-benefits and adverse side-effects throughout the report (3,4,5,6,7,8,9,10,11) in economic, |
| 13512 | All AR5 | | | | | Although there was something on Issue of gender in the social cobenefit subsection of chapter 7 & 9 ( Energy & buildings), the issue can also be adressed in chapter of FOLU in section of cobenefits | Accepted. We have introduced a consistent treatment of co-benefits and adverse side-effects throughout the report (3,4,5,6,7,8,9,10,11) in economic, |
| 17314 | All AR5 | | | | | Other recent publications that give an overview on gender and climate change are:<br>Skinner, Emmeline 2011. Gender and Climate Change. Overview Report. Brighton, United Kingdom: BRIDGE, Institute of Development Studies.<br>Dankelman, Irene 2010. Gender and Climate Change: An Introduction. London, United Kingdom: Earthscan. | Taken into consideration by author team. |
| 17315 | All AR5 | | | | | There is evidence for gender differences of indiviuals' carbon footprints, and on gender differences in food/meat consumption, see:<br>Carlsson-Kanyama, Annika & Räty, Riitta 2008. Kvinnor, män och energi; makt produktion och användning. Stockholm, Sweden: FOI.<br>Räty, Riitta & Carlsson-Kanyama, Annika 2009. Comparing energy use by gender, age and income in some European countries. Stockholm, Sweden: FOI.<br>Räty, Riitta & Carlsson-Kanyama, Annika 2010. Energy consumption by gender in some European countries. Energy Policy 38, 1, 646–649.<br>Max-Rubner Institut & Bundesforschungsinstitut fürErnährung und Lebensmittel 2008. Nationale Verzehrs-Studie II Ergebnisbericht. Teil 2. Karlsruhe, Germany: Max-Rubners Institut, Bundesforschungsinstitut für Ernährung und Lebensmittel.<br>Verkehrsclub Österreich (VCÖ) (2009) Gender Gap im Verkehrs- und Mobilitätsbereich, VCÖ, Wien | Taken into consideration by author team. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17316 | All AR5 | | | | | There is also evidence for gendered attitudes and preferences regarding climate change policies:<br>ARS research AB 2007. Genusperspektiv på allmänhetens kunskaper och attityder till klimatförändringen (tidigare växthusaffekten) (Gender aspects of the knowledge and attitudes to climate change). Stockholm, Sweden: ARS research AB.<br>European Commission (2007) Europeans and Nuclear Safety, Special Eurobarometer 271, Brussels<br>European Commission (2009a) Europeans' attitudes towards climate change. Special Eurobarometer 322, Brussels<br>European Commission and European Parliament (2009) Europeans' attitudes towards climate change. Special Eurobarometer 313, Brussels<br>Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Reihe Umweltpolitik (2006) Umweltbewusstsein in Deutschland 2006. Ergebnisse einer repräsentativen Bevölkerungsumfrage, Berlin<br>Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit, Reihe Umweltpolitik (2008) Umweltbewusstsein in Deutschland 2008. Ergebnisse einer repräsentativen Bevölkerungsumfrage, Berlin<br>Bord, R. J. and R.E. O'Connor (1997) 'The Gender Gap in Environmental Attitudes: The Case of Perceived Vulnerability to Risk', Social Science Quarterly 78(4): 830–840<br>Finucane, M.L., P. Slovic, C.K. Mertz, J. Flynn and T.A. Satterfield (2000) 'Gender, race, and perceived risk: the `white male' effect', Health, Risk & Society 2(2): 159–172<br>Kiljunen, P. (2008) 'Finnish Energy Attitudes 2008', in Research Report, No. 15, Finnish Energy Industries, Helsinki | Taken into consideration by author team. |
| 17317 | All AR5 | | | | | Moreover, there is evidence for gender differences in the response to policies, and gendered socio-economic impacts of policies and measures:<br>Carlsson-Kanyma, Annika & Lindén, A. L. 2007. Energy efficiency in residences - challenges for women and men in the North. Energy Policy 35, 2163–2172.<br>Johnsson-Latham, G 2007. A study on gender equality as a prerequisite for sustainable development: what we know about the extent to which women globally live in a more sustainable way than men, leave a smaller Ecological Footprint and cause less climate change. Stockholm, Sweden: The Environment Advisory Council, Ministry of the Environment.<br>LIFE e.V. forthcoming. Determinanten der Wechselbereitschaft von Frauen: Analyse der Hemmnisse und Motivationsstrategien des Wechsels zu Ökostrom. Berlin, Germany: LIFE e.V. available at http://www.genanet.de/fileadmin/downloads/Strom_Wechsel_Frauen/AbschlussberichtFKZ_0325108-nbf.pdf<br>an furthermore: | Taken into consideration by author team. |
| 17318 | All AR5 | | | | | Milieu Ltd. & LIFE e.V. 2011a. Gender analysis of the policy initiatives of the Member States in relation to climate change in the sectors of transport and energy. Analysis paper. | Taken into consideration by author team. |
| 17319 | All AR5 | | | | | Offenberger, Ursula & Nentwich, Julia 2009. Home heating and the co-construction of gender, technology and sustainability. In Gendering Climate Change. Women & Gender Research. Copenhagen, Denmark: Kristen Justesen. | Taken into consideration by author team. |
| 17320 | All AR5 | | | | | Offenberger, Ursula & Nentwich, Julia 2010. Intertwined practices of gender and technology: the case of sustainable home heating. St. Gallen, Switzerland: Universität St. Gallen. | Taken into consideration by author team. |
| 17321 | All AR5 | | | | | Oldrup, Helene & Romer Christensen, Hilda 2007. TRANSGEN. Gender mainstreaming European transport research and policies building the knowledge base and mapping good practices. Copenhagen, Denmark: Co-ordination for Gender Studies. University of Copenhagen. | Taken into consideration by author team. |
| 17322 | All AR5 | | | | | Schultz, Irmgard & Stiess, Immanuel 2009. Gender aspects of sustainable consumption strategies and instruments. Frankfurt/Main, Germany: Institute for Social-Ecological Research (ISOE). | Taken into consideration by author team. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17323 | All AR5 | | | | | Spitzner, Meike & Modlich, Regula 2006. Women at the crossroads with transportation, the environment and the economy - experiences and challenges in Germany. Women + environments international magazine. 70, 31. | Taken into consideration by author team. |
| 17324 | All AR5 | | | | | Lan, L., Z. Lian, W. Liu and Y. Liu (2008) 'Investigation of gender difference in thermal comfort for Chinese people', European Journal of Applied Physiology 102(4): 471–480 | Taken into consideration by author team. |
| 11194 | All AR5 | | | | | The report overall makes little reference to the importance of good governance, respect for human rights, and in the context of AFOLU, respect for the rights of indigenous peoples, in achieving successful mitigation activities. Respect for rights is not just essential to make mitigation measures effective (eg putting rights into REDD+ projects) but also an opportunity to put the brakes on major drivers of deforestation and land degradation (eg helping people and communities to resist destructive land grabs). | Rejected. The treatment of justice and ethical issues is covered in more depth than any previous assessment. |
| 11195 | All AR5 | | | | | The report includes dozens of references to the Clean Development Mechanism, but almost all references are positive, with hardly any information about the major problems with the CDM, both in terms of respecting the human rights of affected communities, and in terms of its inability to demonstrate additionality. Indeed, the CDM has been plagued with problems on these fronts, and its future is limited due to withdrawal by the European Trading System, and strong criticism by the US Government's Accounting Office. | Noted. We have made sure that the discussion on the CDM remains balanced. |
| 7395 | All AR5 | | | | | The report is largely missing any assessment of the spillovers related to mitigation, technology, and finance and their impacts on developing countries, which continues to be an important issue for developing countries and crital for future climate change agreements. | Accepted. We have strengthened the draft in chapter 6 and 14 on this issue. |
| 7396 | All AR5 | | | | | The draft provides very little very little attention to the issue of buren sharing and the prinicple of common but differentiated resposibilities in relation to mitigation (future pathways) and the sources and deployment of finance and technologies. | Accepted. We have continued to work on this issue in the context of chapter 6 as well as the summary documents. |
| 8441 | All AR5 | | | | | REVIEW OF AR5 CHAPTER 15 | No action needed. |
| 8442 | All AR5 | | | | | Ian Bailey | No action needed. |
| 8443 | All AR5 | | | | | My research collaborator Hugh Compston and I suggest that Chapter 15 could be made more useful for efforts to strengthen mitigation by incorporating more material on political opportunities for governments that want to take more effective action. Although the introduction to Ch. 15 briefly describes definitions and functions of institutions and governance, the excerpt on governance is restricted to pointing out that governance conceptualizes decision-making as a process involving multiple (governmental and non-governmental) actors. References are made to terms like political barriers and political acceptability at various points throughout the chapter but these are rarely specified and there is very limited discussion of their nature or strategic options available to manage political barriers. | Accepted. We have strenghtened the treatment of literature from political sciences on this issue. |
| 8444 | All AR5 | | | | | Political barriers at the national level have proven to be decisive obstructions to climate mitigation policy in most, if not all, states and have been particularly prominent in key states like the USA, Australia, India and China. Greater analysis is therefore needed within Chapter 15 of the nature of these barriers and how they might be overcome. The types of political barrier falling within this category include problems such as: | Taken into consideration, but limited space is highlighted. |
| 8445 | All AR5 | | | | | · Threats by major corporations to withdraw or delay investments from a country in response to a proposed emissions-reduction measure; the withholding or manipulation of emissions, financial, market or technical information by companies; and non-cooperation with the implementation of manipulation policies within the boundary of national law; | Noted. |
| 8446 | All AR5 | | | | | · Adverse public opinion towards an actual or proposed mitigation policy, as indicated by election results and opinion polls, due to factors such as the costs of mitigating actions. This may be aggravated by unfavourable media coverage and campaigns by opposition political parties; | Noted. |
| 8447 | All AR5 | | | | | · Partisan politics, as Section 15.5.4.1 notes in relation to emissions trading in Australia and which can also be observed in Canadian and US climate politics. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8448 | All AR5 | | | | | It is clear that these and other pressures have constrained national mitigation policies by increasing the risk that governing parties and individual politicians will either be unable to introduce stronger climate policies (policy blocks) or will suffer serious political damage if they do introduce new climate policies (policy penalties). Such pressures particularly affect democratic governments and acts as a strong disincentive for strong mitigation action, but may also be felt by those without representative democracy, through a loss of reputation and legitimacy among citizens and other major actors in society. Passey et al. (2012), for example, present systematic evidence that stakeholder pressure has, in many instances, blocked or weakened emissions trading schemes. | Political difficulty of enacting cap and trade programs noted in 15.5.3 |
| 8449 | All AR5 | | | | | Passey, R., Bailey, I., Twomey, P. and MacGill, I. (2012) The inevitability of 'flotilla policies' as complements or alternatives to flagship emissions trading schemes, Energy Policy, 48, 551-561, http://dx.doi.org/10.1016/j.enpol.2012.05.059. | Noted. |
| 8450 | All AR5 | | | | | These pressures apply in both one-party and multi-party systems, and across a multitude of governance scales. The purpose of including a systematic analysis of political obstacles would not be to advocate particular actions or to make any statements that could be seen as political, since this is beyond the remit of AR5, but simply to describe the nature of political obstacles to mitigation policies and provide an impartial and informative review of the political options available, much as has been done for the sectoral and instruments analyses in earlier chapters of AR5 WGIII. | Noted. Effort made to describe political obstacles and provide impartial and informative review as commenter notes. |
| 8451 | All AR5 | | | | | A wide literature exists on this topic. We recommend the following sources in particular: | Noted. |
| 8452 | All AR5 | | | | | Bailey, I and Compston, H. (eds) 2012 Feeling the Heat: the politics of climate policy in rapidly industrializing countries, Basingstoke: Palgrave Macmillan. | Taken into consideration by author team. |
| 8453 | All AR5 | | | | | Bailey, I. and Compston, H. 2010 Serendipity is still not a strategy: geography and the politics of climate policy, Geography Compass 4 (8), 1097-1114 | Noted. |
| 8454 | All AR5 | | | | | Bailey, I., MacGill, I., Passey, R. and Compston, H. (in press 2012) The demise of the Australian Carbon Pollution Reduction Scheme: a political strategy analysis, Environmental Politics, 31 (5): doi:10.1080/09644016.2012.705066. | Taken into consideration by author team. |
| 8455 | All AR5 | | | | | Bulkeley, H. and Newell, P. (2010) Governing climate change. Abingdon: Routledge. | Taken into consideration by author team. Similar references by author used e.g. in |
| 8456 | All AR5 | | | | | Carter, N. (2008) Combatting climate change in the UK: challenges and obstacles, Political Quarterly, 79, 194–205. | Taken into consideration by author team. |
| 8457 | All AR5 | | | | | Compston, H. and Bailey, I. (eds) 2008 Turning down the heat: the politics of climate policy in affluent democracies, Basingstoke: Palgrave Macmillan. | Noted. |
| 8458 | All AR5 | | | | | Compston, H. and Bailey, I. 2012 Climate Clever: how governments can reduce emissions and still win elections, Abingdon: Routledge. | Noted. |
| 8459 | All AR5 | | | | | Giddens, A. (2011) The politics of climate change (second edition), Cambridge: Polity Press. | Noted. |
| 8460 | All AR5 | | | | | Pralle, S. (2009) Agenda-setting and climate change. Environmental Politics, 18, 781–799. | Noted. |
| 8461 | All AR5 | | | | | Stadelmann-Steffen, I. (2011) Citizens as veto players: climate change policy and the constraints of direct democracy, Environmental Politics, 20 (4): 485-507. | Noted. |
| 8462 | All AR5 | | | | | Compston and Bailey (2012) and Bailey and Compston (2012) provide especially detailed theoretical and empirical investigations of political options. These options include: | Noted. |
| 8463 | All AR5 | | | | | · Unilateral action, for example taking small steps on many fronts, and introducing contentious policies early in a term of office to allow opposition to subside and benefits to become clearer before the next election; | Noted. |
| 8464 | All AR5 | | | | | · Using communications to change other actors' policy preferences not only by providing accurate information on climate change and possible policy responses but also through stressing the co-benefits of climate policy for other, such as energy security, employment and regional development, and using metaphors and analogies to make ideas more accessible and appealing to target audiences; | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8465 | All AR5 | | | | | · Trading policy amendments for support, either amendments that relate to the climate policy under discussion, such as by providing transitional assistance, or amendments to other types of policies, such as business regulation; | Noted. |
| 8466 | All AR5 | | | | | · Improving the bargaining position of advocates of strong policies by means such as integrating climate and energy ministries, and seeking cross-party consensus on climate change. | Noted. |
| 8467 | All AR5 | | | | | Assuming no change in the structure of the chapter, the most appropriate place to insert material on political barriers and opportunities would appear to be 15.9 Barriers to Mitigation. This is currently focused on developing countries. Among other things a more comprehensive approach would replace Table 15.3 with a table showing constraints for countries whose actions can make a bigger contribution to reducing greenhouse-gas emissions, such as China and/or India (because of their status as major BRICs), Brazil (to illustrate constraints on reducing tropical deforestation); the USA (a major highly fossil-fuel dependent developed nation facing severe constraints on mitigation policy); and Germany or the UK (to illustrate European perspectives where stronger action has been taken). Useful summaries covering all the countries named are included in: | Partially accepted. A summary of mitigation action is included in 15.2, which notes increases in different areas of the world. |
| 8468 | All AR5 | | | | | Bailey, I and Compston, H. (eds) 2012 Feeling the Heat: the politics of climate policy in rapidly industrializing countries, Basingstoke: Palgrave Macmillan. | Taken into consideration by author team. |
| 8469 | All AR5 | | | | | Compston, H. and Bailey, I. (eds) 2008 Turning down the heat: the politics of climate policy in affluent democracies, Basingstoke: Palgrave Macmillan. | Noted. |
| 15264 | All AR5 | | | | | Conflict resolution strategies are essential to resolving international, inter-organisational and cross geopolitical ideological differences. However, current strategies (apparently) follow normative, reductionist paradigms eschewing the human dimension in favour of the sublimely 'objective' allusion. It is time to embrace post-positivist, 'humanistic' methodologies as the subject matter so implores: passion, compassion, empathy - the full gamut of the human (and other creatures and associated systems') condition(s). Isolationary perspectives in terms of obervable phenomena are failing us all. Humanistic complexity perspectives may create a more complete picture of life for planet Earth in the Twenty First Century. Without this viewpoint we are all guilty of delusion of the severist degree. | Noted. |
| 12611 | All AR5 | | | | | The messages from AR5 are very similar to AR4 and all other Ars before. I am concerned that this exercise is not having the desired effect on the international direction of climate change negotiations. In my view this stems from the inability or reluctance to properly consider the costs of climate change adaptation and impacts. As it stands each WG seems to be considering their issue in isolation which avoids the key balance of: Climate Change Mitigation vs. Climate Change Adaptation + Climate Change Impacts. Without trying to understand and if possible quantify this balance I feel AR6 will likely be telling the same story only with less time and more dire consequences at stake. | Rejected. AR5 provides a wealth of new insights in WG3. The structure of the IPCC assessment is that first each WG assesses a well-defined part of the literature. In the synthesis report - all knowledge is brought together. The issue of balancing costs and benefits of |
| 12654 | All AR5 | | | | | The messages from AR5 are very similar to AR4 and all other Ars before. I am concerned that this exercise is not having the desired effect on the international direction of climate change negotiations. In my view this stems from the inability or reluctance to properly consider the costs of climate change adaptation and impacts. As it stands each WG seems to be considering their issue in isolation which avoids the key balance of: Climate Change Mitigation vs. Climate Change Adaptation + Climate Change Impacts. Without trying to understand and if possible quantify this balance I feel AR6 will likely be telling the same story only with less time and more dire consequences at stake. | Rejected. AR5 provides a wealth of new insights in WG3. The structure of the IPCC assessment is that first each WG assesses a well-defined part of the literature. In the synthesis report - all knowledge is brought together. The issue of balancing costs and benefits of |
| 11188 | All AR5 | | | | | Congratulations for the quality of the job. I From my expert viewpoint , I have no comment. | Noted. |
| 14327 | All AR5 | | | | | on Geoengineering: The scientific background to geoengineering concepts is also addressed in WG1 - chapters 6.5 and 7.5. There seems to be at least some repetition, possible redundancy and inconsistencies with the texts on geoengineering in WG3, e.g. in chapter 6.9. | Accepted. We have worked and will continue to work on this - in direct contact with the respective Working |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 14328 | All AR5 | | | | | on Geoengineering: In contrast to the description of the geoengineering science in the FOD of WG1, the FOD of WG3 only contains little text that is scattered over various chapters, e.g. in sections 1.2.1, 1.4.2; 1.4.5, 6.1; page 27; section 9.5.2; and 13.4.2. I I suggest that these various parts on geoengineering in WG3 should be brought together and concentrated under one specific subheading in one of the chapters, e.g. ch.6, with references to this subheading in the other chapters. | Accepted. We continue to deal with different aspects of geoengineering in different chapters of the report, but we moved towards synthesizing our knowledge more and more i chapter 6. |
| 14329 | All AR5 | | | | | on Geoengineering: while the FOD addresses governance and policy questions on a number of other topics, there is virtually no analysis of the literature on the unresolved policy and governance implications of geoengineering, e.g. implications for climate mitigation policies or for the climate negotiations. A number of relevant pieces of literature have been published that have gone through legal peer review and are thus fit for use as IPCC source material. I have submitted some of them as attachments to the e-mail address comments@ipcc-wg3.de, in accordance with the instructions to reviewers. Recent literature that should be included includes:<br>- Bodle, R., with Homan, G., Schiele, S., and E. Tedsen (2012). Regulatory Framework for Climate-Related Geoengineering Relevant to the Convention on Biological Diversity. Part II of: Geoengineering in Relation to the Convention on Biological Diversity: Technical and Regulatory Matters. Secretariat of the Convention on Biological Diversity. Montreal, Technical Series No. 66;<br>- Bodle, Ralph, “Climate and Geoengineering”, in: Hollo, Erkki, Kati Kulovesi and Michael Mehling (eds.), Climate Change and the Law: A Global Perspective, Berlin: Springer, forthcoming 2012 (submitted May 2012);<br>- Bodle, Ralph, Geoengineering and International Law: The search for common legal ground, Tulsa Law Review. Geoengineering Symposium issue, 46 Tulsa Law Review 2 (2010) 305-322;<br>- Bodle, Ralph, “International governance of geoengineering: Rationale, functions and forum”, in: William C.G. Burns and A. Strauss, (eds.), Climate Change Geoengineering: Legal, Political and Philosophical Perspectives, Cambridge: Cambridge University Press (submitted February 2011; in press);<br>- Lin A.C., International Legal Regimes & Principles Relevant to Geoengineering (in press). In: W.C.G. Burns and A. Strauss, (eds.), Climate Change Geoengineering: Legal, Political and Philosophical Perspectives. Cambridge: Cambridge University Press, Cambridge (submitted 2011, in press);<br>- Rickels, W.; Klepper, G.; Dovern, J.; Betz, G.; Brachatzek, N.; Cacean, S.; G ssow, K.; Heintzenberg J.; Hiller, S.; Hoose, C.; Leisner, T.; Oschlies, A.; Platt, U.; Proelß, A.; Renn, O.; Sch fer,S.; Z rn M. (2011): Large-Scale Intentional Interventions into the Climate System? Assessing the Climate Engineering Debate. Scoping report conducted on behalf of the German Federal Ministry of Education and Research (BMBF), Kiel Earth Institute, Kiel, available at http://www.fona.de/mediathek/pdf/Climate_Engineering_engl.pdf; | Taken into consideration. |
| 13018 | All AR5 | | | | | This comment is in regard to Annex I - Glossary. Annex I Option in drop down list under the Chapter heading is not available. The term "carbon dioxide capture and storage (CCS)" is defined (page 7, line 3) and the term "sequestration" is defined (page 31, line 32). Under the "sequestration" definition, it refers the reader to the "carbon capture and storage"(page 31, line 38). definition it is recommended that this should be revised to "carbon dioxide capture and storage" to reflect the the formal definition in the Glossary. | Accepted. |
| 13019 | All AR5 | | | | | This comment is in regard to Annex I - Glossary. Annex I Option in drop down list under the Chapter heading is not available. The term "carbon dioxide capture and storage (CCS)" is defined (page 7, line 3) and the term "sequestration" is defined (page 31, line 32). Under the "sequestration" definition, it refers the reader to the CCS definition elsewhere in the Glossary (page 31, line 38). However, under the CCS definition, it does not refer the reader to "sequestration." Since these terms are used interchangebly throughout the document, it is recommended that, under the CCS definition, there should be a reference to the term "sequestration" that redirects the reader. | Accepted. |

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|---|---|---|---|---|---|---|---|
| 13020 | All AR5 | | | | | This comment is in regard to Annex I - Glossary. Annex I Option in drop down list under the Chapter heading is not available. The term "carbon dioxide capture and storage (CCS)" is defined (page 7, line 3). However, throughout the document, the technology is more commonly referred to as "carbon capture and storage." It is recommended that there should be clarification of the various ways CCS can be referred to under the CCS definition in the Glossary (e.g., also referred to as Carbon Capture and Storage and/or Carbon Capture and Sequestration." | Accepted. |
| 13022 | All AR5 | | | | | This comment is in regard to Annex I - Glossary. Annex I Option in drop down list under the Chapter heading is not available. The term "geologic storage" or "geologic sequestration" is absent in the Glossary but identified in areas in the document (Ch 7, page 5, line 49) and alongside "carbon capture" (Ch 13, page 13, line 8) as a stand alone term. It is recommended that the term be included in the Glossary. In the absence of a proper definition, it is reccommended that the reader should be redirected to the terms "carbon dioxide capture and storage (CCS)" (page 7, line 3) and "sequestration" (page 31, line 32) in the Glossary, respectively. | Accepted. |
| 15718 | All AR5 | | | | | None of the chapters make mention of a feature of global urbanization that may have the most far-reaching impact on the climate debate: An urban planet also means more large cities. UN DESA data show that more than a thousand cities now have populations in excess of half a million. These are places large enough to have technical and financial capacity to introduce change by means of planning, design, and local regulation. | Noted. We cover this aspect, but will work to make it more explicit. |
| 15719 | All AR5 | | | | | The discussion in opening and concluding chapters completely misses the potential actions that are now and could be more often taken by subnational governments. Chapters One and Fifteen focus on national and international actors as though they were the sole and most promising agents to effectuate mitigation and adaption. Yet this model since Kyoto has proven elusive and faulty. Copenhagen, Durban and Rio showed a striking inability to get to grips with solutions. At the same time, Chapter Twelve (especially Section 12.4, 12.5, 12.6, and 12.7 contain extensive discussion about mechanisms and incentives which have achieved some progress in specific cities and classes of places, for example, cities in association with one another, suggesting that more could be done at the subnational level. Not a single reference is made to these discussions in Chapter One. | Rejected. This particular aspect does not need to be captured in chapter 1. But it is a point that is made in the report. |
| 15720 | All AR5 | | | | | A further point along these lines is that also deserving of mention is that recent evidence suggests that cities in the 500,000 range are engaged in extensive and effective transfer of knowledge, on the order of thousands to tens of thousands of visits annually, and this horizontal exchange mechanism exhibits the earmarks of risk management by city officials who for reasons of short terms of office have little or no incentive to act on global goods. Identifying and adapting good practice reduces the risk for mayors. Coupled with proper national and international incentives, this subnational mechanism might be able to advance good and better practice where national fiat has failed. | Noted. |
| 13057 | All AR5 | | | | | From Line 3 to 7 of this file I have reproduced the same comment related to the Costs&Potentials X-Cut issues of the chapters, to propose to put them in perspective with market realisation and policy issues | Noted. |
| 12214 | All AR5 | | | | | General comment: Fluorinated greenhouse gases are not very well covered in the report. In particular, an extensive coverage of these relatively important GHGs and their alternatives under mitigation option should be covered in chapters 7 Energy systems (SF6 in high voltage appliances), 8 Transport (mobile air-conditioning), 9 Buildings (air-conditioning, heat pumps) and 10 Industry (commercial refrigeration etc.). The IPCC/TEAP special report "Safeguarding the Ozone Layer and the Global Climate System - Issues Related to Hydrofluorcarbons and Perfluorcarbons", as well as more recent publications, might serve as a basis for this coverage. | Noted. We have continued to work on this aspect. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4513 | All AR5 | | | | | It is very important that it be made clear when giving the list of expert reviewers that participation in the review process does not indicate agreement with the methodology or conclusions of the Report. This is such a wide-ranging document, with so many topics and arguments fraught with unresolved conflicts and disagreements, that readers of the Report not have the impression that it is somehow a "consensus" document. | Rejected. The IPCC has never implied that reviewers agree with the findings of the report. They are helping to make it better as in any review process. Responsibilities lies with authors and Co- |
| 4514 | All AR5 | | | | | In particular, my comments and suggestions are by no means complete or comprehensive. Other time commitments preclude my reviewing the entire Report in detail. | Noted. |
| 2215 | All AR5 | | | | | Optimally, use consistent quotation for the following report. Recommended: "McKinsey & Company, Pathways to a low-carbon economy - Version 2 of the Global Greenhouse Abatement Cost Curve, January 2009" (McKinsey, 2009), also seen in FOD as "Nauclér and Enkvist" | Noted. |
| 2348 | All AR5 | | | | | Cost definitions and descriptions: 1) Use one consistent cost metric across entire AR5 to compare mitigation options between different sectors and measures (most likely $/tCO2e) 2) for the sectors where other, more sector specific metrics are helpful and possibly better suited, COMPLEMENT this first metric with a second one (e.g. in power/energy $/kWh) | Rejected. This issue has been discussed, but authors agreed that this is not the best away of synthesizing the literature adequately. |
| 2349 | All AR5 | | | | | Explain clearly what types of cost are included, and split those up as far as possible. For example, use "technical project cost (incl. Capex and opex incl. Fuel cost)" and "transaction=program=implementation cost" (not technical, just people capacity) | Noted. We continued to work on transparency. |
| 2350 | All AR5 | | | | | Include cost development over time (e.g. abatement cost) and/or investment development over time, especially for technologies with high expected technological learning (e.g. solar PV (EUR/kW, EUR/kWh), 2nd gen LC ethanol) | Accepted. We have done so in places where appropriate. |
| 2351 | All AR5 | | | | | Include investment needs over time for the measures - upfront financing is a key issue. This way you can also link up the financing needs with the Global Climate Fund of UNFCCC | Accepted. We provide an analysis of investment needs in chapter 16. |
| 2354 | All AR5 | | | | | Currently often the essence/excutive summary of each chapter is in the FAQs at the end, which makes it hard to read Suggestion to have or each chapter two intro paragraphs: 1) Purpose of this chapter (1-3 sentences) 2) Key takeaways (5 bullets) - both should be as much as possible standardized across the sector chapters (energy, transport. etc) | Rejected. We have seriously considered this option, but opted against this. It is not suitable format given the particular remit of IPCC. |
| 2355 | All AR5 | | | | | At least across the sector chapters, standardize the way how information is presented as much as possible. Same thing: Use SAME units for SAME information across chapters: e.g. CO2e (GWP100) rather than CO2e, C, etc. This helps the reader to get easy access to the content. Table formats, graphics. See for example "McKinsey & Company: Pathways to a low-carbon economy" as sample how standardization could look like. This needs to come from the TSU. | Accepted. We worked on these consistency issues. |
| 2366 | All AR5 | | | | | All sector chapters should include a forecast of sectoral emissions, to have a baseline to which abatement potentials are relative to. Absolute abatement potentials without a baseline are unfortunately pretty useless. | Accepted. We have included or are still in the process of collecting such |
| 6809 | All AR5 | | | | | There is a generally complacent tone about conditions, targets and measures in the inroduction and the chapters. It needs to be stated far more clearly that short of aiming at full displacement of fossil fuel combustion with efficiency, sufficiency and renewable generation there is no hope to mitigate climate change effectively. http://pubs.giss.nasa.gov/abs/ha00410c.html | Rejected. This is not consistent with our assessment of the literature. Models show that fossil fuels can still be used, if the CO2 is captured and stored. But the |
| 6818 | All AR5 | | | | | It is clear that the chapter was written by different people with different agenda. There too much political smoothing of hard scientific facts - too much reluctance to name a spade a spade, too much and obvious pandering to the nuclear lobby. | Rejected. IPCC assessment have the merit that they do not reflect the view points of individuals, but of larger, well |

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| 15550 | All AR5 | | | | | In general, this draft does not, unfortunately, currently adequately address (or even frame) the undeniable starkness of the mitigation challenge that policy makers currently face, internationally, nationally, ot locally. In particular, the disconnect between the scientific basis established by AR's 1-4 (presumably to be even further re-enforced by AR-5 WG's 1&2) is not sufficiently contrasted with the potential mitigation benefits, co-benefits and opportunities described in previous AR's and again here. Too often, language and syntax deployed in this draft tends to frame the mitigation challenge as assessed potential deviation from fossil-fuelled BAU--without addressing the basic fact that BAU is no longer possible if < 2 oC is to be achieved. (See, for instance Box 13.7 in AR-4 WG-3). Additionally (and relatedly) I could not easily locate in this report any further work on, or development of, the vital topic of policy inertia, as previously so tellingly highlighted in the TAR, and referenced again in AR-4. These comments particularly apply to the introduction (since that is the one chapter that will probably be widely read by non-experts), but also apply more deeply and systemically to an undrecurrent throughout the report. | Rejected. The reports makes it very clear that BAU has to be avoided asap to maintain a good chance of staying below 2°C. We are in the process of building in new literature trying to understand how delay in international cooperation and technology constraints make this more challenging. But literature is still coming through. We deal with the iddues of balancing mitigation, adadptation and residual imapcts in the synthesis report. |
| 5753 | All AR5 | | | | | The correct reference is "GBEP. (2011). The Global Bioenergy Partnership Sustainability Indicators for Bioenergy. FAO/GBEP, Rome, Italy." (The word Sustainability is missing in more than one place through the document) | Noted. |
| 10725 | All AR5 | | | | | It is important to ensure consistency across the WG reports. This applies for estimates of current emissions, scenarios, description and and quantification of effects of various components, calculated contributions to climate change, and metrics for comparing effects of emissions. GWP and CO2 equivalents are used throughout the report but often without much explanation. The metric values used should later be made consistent with those given in the report from WGI. | Rejected. We use metric values from SAR consistent with the data available in most global databases. We will work with WG1 colleagues on consistency issues. |
| 10726 | All AR5 | | | | | The authors of the sector chapters could see whether there is useful information in section 8.7.2.4 Metrics and Impacts by Sector in AR5 WGI | Noted. |
| 10727 | All AR5 | | | | | GWP for a 100 year time horizon is often used without any indication that the GWP has been subject to evaluation and critisism in the scientific literature. It could be noted that there are other time horizons than 100 years and that several implicit choices have been made in the application of GWP100 (see WGI Chapter 8 and WGIII chapter 3). It could also be noted that the contributions calulated would look different if a different time horizon was used or if a different metric was used; see figure 8.31 in WGI. Some attention to choice of time horizon could be given - which is a value-based choice that can not be based on science alone. | Accepted. We have included a metric discussion in chapter 3. This is part of the framing of the report and will also be highlighted in the summary documents. |
| 10728 | All AR5 | | | | | Since Life Cycle Assessment is used in several chapters I have a general comment for the whole report on this: When various emissions are aggregated and converted to "CO2 equivalents" the GWP-100 is usually applied. But as several studies over the last 5-10 years have shown, there are limitations related to this metric, and some alternatives have been presented. The use of 100 years time horizon is not an obvious choice and the effect of using different horizons could be given some attention. For example, using a GWP for methane of 25 (from AR4) will give much emphasis to some emissions and sectors relative to using the Global Temperature change Potential (GTP) which has a value of ca 4 for the same time horizon. I think it is important that the authors make the readers aware of this issue, and the potentially significant impact on the results. | Accepted. We have included a metric discussion in chapter 3. This is part of the framing of the report and will also be highlighted in the summary documents. |
| 10729 | All AR5 | | | | | Somewhere in WGIII the various alternatives for design of multi-gas policies (as embedded in the UNFCCC) should be discussed; i.e. whether a gas-by-gas approach, a basket approach (like in the Kyoto Protocol) or a multi-basket approach is chosen. There are some recent papers in the literature on this; e.g.: 1) Smith et al., in Nature Climate Change. 2) Daniel et al. Climatic Change 111 (2): pp. 241-248. (See also brief disussion of this - and references - in section 8.7.1.5 of WGI). | Accepted. We deal with this in chapter 6 and have improved the text. |

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| 12999 | All AR5 | | | | | Much of the report seems to concentrate on, and sometimes simply assume, a rather narrow ethical framing cashed out in terms of contemporary CBA. This perspective is admirably pursued at great length and depth. However, it is (as the first half of chapter 3 and the beginning of chapter 4 suggest) only one of a number of ethical perspectives discussed and canvassed in the peer reviewed literature. It also has its own problems, most of which are either not mentioned at all or else pointed out only very quickly. If the aim of the report is to advise policy makers (and the general public), I respectfully suggest that greater balance would be desirable. | Rejected. The report draws little from CBA. Most of the scenarios, for example, are based on CEA. There are multiple framings and approaches used, which are introduced in chapters 2,3 and 4. |
| 13010 | All AR5 | | | | | Arguments about the relevance of past emissions crop up in a number of places. Other concerns, such as responsibilities to future generations and nonhuman nature, are treated very briefly. Some adjustment would be helpful. | Accepted. We have further elaborated on this in chapter 3. |
| 13012 | All AR5 | | | | | As is perhaps inevitable in a multi-authored first draft, the current treatment remains somewhat uneven and disjointed. For example, different normative approaches are emphasized in chapters 2-4, and chapter 4 seems to assume that a robust analysis of the discounting issue has occured in chapter 3 when in fact it is treated very briefly there. I also doubt the repeated claims that the normative foundations described in the first part of chapter 3 really do underpin the preceeding and subsequent discussions. Some evidence for these claims should be provided. | Accepted. We have worked and continue to work on the linkage between framing chapters (2-4) and the subsequent analysis. This is a challenging task, which takes time. |
| 9781 | All AR5 | | | | | Even if the focus of the report is climate change, some statements could be relativated by addressing climate change as one important environmental issue. In some parts of the report this is well elaborated whereas in other parts, especially when conclusions are drawn, it could be added as the reader might not read the full report. | Noted. |
| 11991 | All AR5 | | | | | I have a comment to Annex I i.e. The Glossary, which for some reason I could not select in this excel sheet's column B: Please add a definition of Cryosphere. | Noted. This is part of our definition of climate system. It is not a central term in WG3, which is used frequently across |
| 4271 | All AR5 | | | | | There does not seem to be a systematic approach to searching for and assessing the quality and validity of specific articles. I think it will be important to have a transparent and defensible approach to deciding which papers to reference and why. Ideally search strategies for relevant articles should be publically available and quality criteria should be published, not necessarily in the main report but somewhere on the IPCC website. | Rejected. The IPCC has a very sophisticated and resource intensive author selection process. They are experts in the area and in the best |
| 14991 | All AR5 | | | | | The decision to exclude discussion of adaptation from the WGIII report is problematic. Although at a theoretical level, it is often convenient to treat mitigation and adaptation as distinct policy responses to climate change, at the level of implementation, these distinctions tend to vanish in certain cases. For example, land-use planning and management, including management of agricultural and forest lands, must consider both mitigation concerns (maintenance of forest stocks, low-carbon agricultural practices) and adaptation concerns (adapting crop selection and agricultural productivity to future climate regimes, siting agricultural lands in the face of future water availability, effect of future climate regimes on forest composition and forest health). To the land manager, many of these concerns must be dealt with together. Indeed, as many countries and local areas go further down the path of grappling with climate change, a key consideration is how best to integrate mitigation and adaptation imperatives within very real budget constraints. Separating adaptation and mitigation policy responses in two distinct volumes written by different working groups leaves little to no opportunity for treatment of this timely and important issue facing policy makers and public managers, and risks the possibility that the AR5 will be largely silent on this topic. | Accepted. Note that adaptation is not excluded, but the main discussion takes place in IPCC WG2. WG3 has worked and will continue to work on strengthening relevant aspects of adaptation recognising the division of labour across WGs. |
| 14992 | All AR5 | | | | | This issue could be addressed in chapter 14 of the WGIII volume, or in a separate chapter or cross-cut section. | It is unclear what the reviewer is referring to. |

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| 14993 | All AR5 | | | | | The decision to exclude discussion of adaptation from the WGIII report is problematic. Although at a theoretical level, it is often convenient to treat mitigation and adaptation as distinct policy responses to climate change, at the level of implementation, these distinctions tend to vanish in certain cases. For example, land-use planning and management, including management of agricultural and forest lands, must consider both mitigation concerns (maintenance of forest stocks, low-carbon agricultural practices) and adaptation concerns (adapting crop selection and agricultural productivity to future climate regimes, siting agricultural lands in the face of future water availability, effect of future climate regimes on forest composition and forest health). To the land manager, many of these concerns must be dealt with together. Indeed, as many countries and local areas go further down the path of grappling with climate change, a key consideration is how best to integrate mitigation and adaptation imperatives within very real budget constraints. Separating adaptation and mitigation policy responses in two distinct volumes written by different working groups leaves little to no opportunity for treatment of this timely and important issue facing policy makers and public managers, and risks the possibility that the AR5 will be largely silent on this topic.<br>This issue could be addressed in chapter 14 of the WGIII volume, or in a separate chapter or cross-cut section. | Accepted. Note that adaptation is not excluded, but the main discussion takes place in IPCC WG2. WG3 has worked and will continue to work on strengthening relevant aspects of adaptation recognising the division of labour across WGs. |
| 12556 | All AR5 | | | | | There is clearly a concerted effort to insert promotional material on geoengineering throughout the draft. This remains a conjectural mitigation strategy or set of measures, in contrast to all other mitigation measures examined throughout the report which have some experiential basis. It seems appropriate to include a generalized discussion of the concepts and approaches that have received serious discussion, e.g. in section 6.9. However, many references are sprinkled throughout the text and the wording leaves the impression that geoengineering is a measure and policy tool available today. For example, Ch. 1, p. 24, line 15, or Ch 6. p. 22, line 35, or Ch. 6, p. 81, line 23 ("SRM role in climate policy is shaped by the fact that it acts quickly" when in fact "it" does not currently exist). These standalone references and many others do not indicate the contingent nature of this strategy nor the very serious ethical and governance questions it raises, questions which are addressed to a at least some degree in section 6.9. | Rejected. The IPCC does an assessment of the literature. There is relevant literature on geoengieering. The IPCC is not promoting any technology. |
| 7606 | All AR5 | | | | | It would be desirable to add the following works of bibliography in the chapter listed:<br>Cap 12.<br>-Olcina, J., 2010: Spatial planning processes, territorial planning law and flood risk in the region of Valencia (Spain), in Risks Challenging. Publics, scientists and governments. [Menoni, S. ed. ] Taylor and Francis Group, 191-204.<br>-Olcina, J., Hernández, M., Rico, A.M., Martínez, E., 2010: Increased risk of flooding on the coast of Alicante (Region of Valencia, Spain), Natural Hazards, 10, nº 11, 2229-2234.<br>-Olcina, J., 2008: Droughts and their economic and territorial effects on the Iberian peninsula, Environmental Economics [Burny, Ph.; Petrescu, D. C. (editors)], Les Presses Agronomiques de Gembloux, ASBL, 173-192.<br>-Sauri, D. Serra, A. Olcina, J., Vera, J.F., 2011: Climate change and Europe's regions: Key findings. Case study Spanish Mediterranean coast. ESPON Climate. Climate Change and Territorial Effects on Regions and Local Economies / Stefan Greiving (Coordinator) / ESPON (European Observation Network for Territorial Development and Cohesion), 30-39.<br>-Rico, A.M., Olcina, J. and Sauri,D. 2009: Tourist land use patterns and water demand: Evidence from the Western Mediterranean, Land Use Policy, 26, nº 2, 493-501. ANNEX I-GLOSARY<br>-Olcina, J., 2007:<br>Research into climate risk in Spain: challenges for the future, in Spanish Climatology. Past, present and future [Cuadrat, J.M. and Martín Vide, J. (coords.)], Prensas Universitarias de Zaragoza, 421-449. | Taken into consideration. |

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| 7608 | All AR5 | | | | | There are details to be made in the treatment of the concept of risk from the geographical point of view. The natural –climate- risk must be understood as an expression of territorial actions carried out by humans in the territory who have not taken into account the natural functioning of the environment where they occur. So if the man does not respect the dynamics of the physical land, infrastructure, economic activities, housing to develop man are deemed to be vulnerable to the development of a climatic event of extraordinary range (Olcina, 2007). | Noted. We deal with concepts of risk extensively in chapter 2. |
| 3058 | All AR5 | | | | | There is an air of unreality about this entire report. Since 1990 IPCC has been discussing and urging reductions in GHG emissions. Despite all the detailed discussions of scenarios, paths, etc., GHG emissions have continued to increase, and (aside from fluctuating with the world economy) there is no indication that even this increase in the rate of GHG emission will slow. The threats of dire consequences may, or may not, be realistic, but the world is not paying attention. | Rejected. IPCC reports have never urged for emission reductions, but assessed the relevant literature on mitigation. |
| 3059 | All AR5 | | | | | China continues to build one major coal-burning power plant a week, making all the talk of reductions of emissions in the US or EU or OECD irrelevant. The various simulations and scenarios have nothing to do with what the world is actually doing. They aren't wrong, in the technical sense, but are only academic exercises: If emissions follow a certain path, then GHG forcing will vary in a certain way, and people and institutions respond in a certain way to incentives and penalties...but on the basis of the last 22 years of experience, it is clear that there will not be (whatever their merit) incentives and penalties sufficient to modify a continuation of the present rate of increase in GHG emissions. | Noted. We are very clear that we try to identify the economic, technological and institutional requirements of alternative stabilization pathways. This is policy-relevant, but non-prescriptive input for policymakers. |
| 3060 | All AR5 | | | | | Why bother? | Authors do not understand this |
| 3065 | All AR5 | | | | | Geoengineering is conspicuous by its near absence from this report. There are two brief mentions in Chapter 1, and two pages in Chapter 6, in comparison to more than 1000 pages on emission reductions. Yet history shows that there is little prospect of reductions in emissions (or even in their rate of growth), while a persuasive case has been made that geoengineering can, at modest cost, reduce the net forcing function to its pre-industrial value, should that be desired. | Accepted. We have worked on the coverage of geoengineering and will continue to do so. It is covered at different places in the report, but material will be focussed in chapter 6. |
| 3068 | All AR5 | | | | | Running through the entire report is the tacit assumption that warming and climate change will be, if not “mitigated” (although that is not standard English usage; the authors mean “reduced”) harmful or even disastrous for humanity. This is an appropriate subject for scientific inquiry, but the question is entirely ignored, and a pessimistic assumption made without examination or inquiry. In order to convince governments and publics to engage in expensive reductions of emissions, they must first be persuaded of their necessity. WGIII ignores this entirely. | Rejected. We identify the economic, technological and institutional requirements of alternative stabilization pathways in Working Group 3. Working Group 2 deals with the consequences of different levels of warming. This is not |
| 3069 | All AR5 | | | | | In many places a 5% annual discount rate is applied to future costs. This has the effect of making future expenditures almost free (the present value of a 2030 $, at this discount rate, is $0.42; a 2050 $ is $0.16; a 2100 $ Is $0.014) at this discount rate. This makes it possible for the authors to propose drastic emission reductions in the distant future, at only slight costs. Unfortunately, 5% is unrealistic. Real per capita wealth grows at About 1—2%, and that is the proper discount rate to use. This gives credibility to such fantasies as 80% emission reductions in 2050; in effect, it postpones any serious cost to the remote future, rather like the alcoholic who promises to stop drinking in some indefinite tomorrow. | Rejected. Discount rates are chosen by each modeling team individually and in some cases are endogenous (e.g. following the Keynes-Ramsey rule in growth models). A 5% discount rate for the calculation of net present value mitigation costs was used ex post to establish comparability between |
| 3074 | All AR5 | | | | | In summary, this extraordinarily detailed report has two gaping omissions: Its detailed scenarios are entirely unlike the actual path the world has taken in IPCC's 22 years, which has been to make a few gestures in the direction of emission reduction, but to continue rapidly increasing emissions, and it never addresses (much less answers) the crucial question of whether warming and climate change are scientific phenomena for us to observe, or problems we must mitigate. The latter is tacitly assumed, without justification. | Rejected. We clearly highlight that current emissions increase despite mitigation policies. Scenarios assess future mitigation pathways with different levels of ambition ranging from likely 2°C |

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| 18036 | All AR5 | | | | | The terms "low carbon" and "zero carbon" energy technologies must be defined. This is absolutely essential to ensure that statements in the text is precise. Otherwise conclusions and statements will continue to be ambigious and very unclear in many places. In Chapter 7 alone, the term is used more than 50 times, without any attempt to define it. Most would agree that, when it comes to energy sources, renewables are low carbon and nuclear is low carbon. But where is the cut off? at CCS? gas? It must bet the task of the IPCC to provide a reasonable definition of low-carbon energy technologies to avoid that text is wide open to interpretation | Noted. |
| 5938 | All AR5 | | | | | Colour coding of charts, in particular gradations on a particular shade, make them difficult to read | Accepted. We have worked on this, but will need to continuously improve on this. |
| 5259 | All AR5 | | | | | See additional sheet | Noted. |
| 16678 | All AR5 | | | | | There are many references to sustainability or sustainable energy as part of the solution or requirement for effective mitigation. However, "sustainability" is not a well defined field of study or discipline, nor is there a great deal of agreement as to what the terms mean. If the problem is climate, the reports should focus on climate and lowering CO2/GHG emissions. If you ask climate policy to address all the world's problems it is unlikely to succeed on many fronts. (In fact a well crafted climate policy helps address other issues, but if it is shaped specifically to do these, it will likely be suboptimal in addressing anything). Many references assume sustainable energy means renewable energy, but as the terms lacks agreed definition, this may or may not be true. | Accepted. We tried to avoid misleading jargon. |
| 16679 | All AR5 | | | | | At several points in the report, there is the apparent assumption that the best mitigation choice is renewable (or "sustainable") energy, without reference to the economic cost. Relying solely on renewable energy is a much more costly mitigation path -- this is covered in chapter 7, section 7.12.5, lines 16-26 -- this should be highlighted throughout report as countries consider their mitigation strategies and pathways. A "renewables only" policy framing is possible but much more costly -- countries may choose this, but to promote this without discussing costs impacts vs. a policy that includes all mitigation technologies is not helpful to policymakers. Claims that renewables are less costly are not supported by sound analysis. | Rejected. This is clearly not the case. For exampe, chapter 6 highlights the importance of CCS and BECCS. You will find this clearly written down in the first version of the summary documents. |
| 16680 | All AR5 | | | | | Would be helpful if report included more context re the differences in costs of mitigation associated with various technologies and sectors. Not all mitigation options cost the same, nor do they cost the same even w/in same technology -- there is generally an upward sloping supply curve for all -- example, some wind energy installations will be less costly/more productive than others. Help reader understand that some mitigation options will likely deploy before others, and some may not deploy until some decades in the future. Policymakers interested in not wasting resources would do well to understand that not everything should occur in the first decade. They should also understand that a policy that fails to deliver the most costly options in the first decade is not a failure -- rather the policy may simply be driving less costly options first, which should be seen as desirable policy attribute/success. | Noted. We are still working with our authors on finding the best way to represent cost information. The literature is very heterogenous and the task therefore challenging. |
| 16681 | All AR5 | | | | | Market or price based policies have been demonstrated on many occasions to be the least costly approach to controlling pollution -- they incorporate an externality into investment and consumption decisions. This is only touched upon in a few spots within the report. All sections re different sectors (buildings, energy, transport and so on) should demonstrate or explain how such an approach would apply within these sectors. Just describing the possible reduction options or technologies without providing context regarding their relative costs nor how they would likely deploy in a price based regime does not help policymakers understand the primary policy architecture under discussion. If this does not happen, the report is much less useful than it should be. | Noted. We do not necessarily agree that this only touched upon in a few places. It is a fundamental insight of the report. We have tried to make this clear, whilst at the same time recongnizing the plethora of evidence on regulation that has come forward. |

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| 16682 | All AR5 | | | | | This comment DOES NOT apply to the general discussion of chapter 3. However, there are references to "market failures" within the document (chapters 5, Energy efficiency discussion in Chap 10, in the context of "this technology is not deploying as fast as it should and this is evidence of a market failure." This may or may not be true, however, in most cases the fact a preferred action is not happening (even with a CO2 price) does not mean the market is failing -- even if an analysis indicates this is a low cost option. What is more likely is that the analysis fails to include other costs which are all too real to either the consumer or industry that is failing to "be rational" from the point of view of the analyst, or the analyst has failed to incorporate the risks involved in the investment decision, thereby raising the required returns and preventing investment. | Noted. This is part of on-going discussions we are having on issues such as "negative costs" or "co-benefits" |
| 16684 | All AR5 | | | | | When discussing the cost impacts of a climate policy, the frame typically used is lost GDP or lost consumer welfare by a particular date in the future. As the future continues (barring the end of the world) and models almost always show growth continues, it might be more helpful for policymakers to understand how much additional time must pass to achieve the same level of GDP or the same level of consumer welfare in the policy case vs. the non-policy case. This helps place in context the fact that economies continue to grow despite the policy "costs," and helps reinforce the fact this occurs even in developing countries. | Noted. We are having this discussion right now, most importantly in chapter 6. But so far, we concluded not to express consumption or GDP losses in this way. |
| 17635 | All AR5 | | | | | Figures should be systematically reviewed to be sure that : (1) they can be understood effectively when printed in black & white, (2) captions from the original/source graphic are not inappropriate included, (3) acronyms and abbreviations are defined in captions, legends or notes, and (4) captions provide enough guidance that a non-specialist reader can understand the figure without reading the text. ( I suspect many, if not most, readers will read chapters in the IPCC report as PDF documents, i.e., without benefit of color display or reproduction.) | Accepted. We are reviewing figures continuously and will continue to do so until the final version of the report. We have already improved, but will require substantial future progress. All figures in their final version will be reproduced by a |
| 2576 | All AR5 | | | | | What are the levels of fossil fuel subsidies globally? | Accepted. We have included a discussion fo this in chapter 14. |
| 15445 | All AR5 | | | | | There should be more cognizance of the4/ CMP.7 decision by which policy-makers will undertake a review of metrics starting by 2015. Policy-relevant aspects of the discussion on metrics could be brought out more clearly, and this would greatly help policy-makers when they approach their review. | Accepted. We have strengthened the discussion of metrics - particularly in chapter 3. |
| 15714 | All AR5 | | | | | I wonder whether the WG III AR5 makes comparisons between the investments and costs of mitigation, avoided damage and avoided costs of adaptation, The Stern review ( 2006) did a first attempt but I assume there are much better publicationsis today . It is a crosscutting issue but I believe it deserves a prominent place in the WG III report | Noted. IPCC WG3 will not do this as this is a job for the synthesis report, which combines insights from all three WGs. Chapter 3 contains a general |

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| 15737 | All AR5 | | | | | An extremely general comment on IPCC:<br>At some time, IPCC should be re-named to something like IPCW (W=Watch) or IPAW (A=Atmosphere). Humanity has now discovered that it can influence, and thus has responsibility for, general climate or atmospheric conditions. This will endure until eternity, even after the current GHG and warming problems have been solved. Moreover, “IPAW” will at some time have to be accompanied by an “IPOW” (O=Oceans plus polar glacier regions and their animals and plants) and an “IPLW” (L=Land including rivers, lakes and groundwater, plants and animals). Reason is that, as human activities become more and more effective and the mass of activities increasing (due to rising population and per capita income), its impact on all parts of the geosphere must be watched by permanent UN-based scientific organizations like IPCC making comprehensive five-years science-based reports with a well-organized review process.<br>I am of course aware that these topics are none to be decided by the authors of AR5.<br><br>Another general comment on AR4 and AR5:<br>I have only access to the AR5 GIII draft. In order to understand the context apart from GIII, I have read several parts from AR4. In the SYR I was missing a table of contents and a complete list of abbreviation or glossary, explaining such basic terms as IPCC, SPM, WG I x.y, Annex I nations… These elements should be included in the Synthesis Report of AR5. | Noted |

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| 15738 | All AR5 | | | | | Missing chapter in WGIII: What are the exact motives for mitigating actions?<br>I am dearly missing an assessment of the motives for mitigating GHG emissions.<br>There seems to be unanimity (WG I) that climate conditions are governed by the greenhouse effect (taking sun conditions as given) and in particular that, if humanity can affect climate conditions at all, then by affecting the greenhouse effect. Based on this, there are two largely independent motives for mitigating GHG emissions:<br>Motive 1: If it is believed that there is long-term and persisting global warming and that this poses problems (WG I and II), then GHG emissions have to be reduced. Note that this reasoning is completely independent of the cause of warming. Even if global warming has increased solely due to some sun activity, the only measure to react on it is reduction of anthropogenic GHG emissions (and possibly going further and reduce natural net GHG emissions). In my view, the issue whether global warming has been caused by anthropogenic GHG is given too much emphasis in AR4 WGI and throughout (also in the introduction of AR5 WGIII).<br>Of course, one should always try to find out the cause. But given the uncertainty about the cause and, on the other hand, the certainty about the cure (reducing CO2), it is of secondary importance.<br>One may argue that, if the cause is anthropogenic, then this serves as an indicator that the problem can be solved at all. I.e. the dimension of the problem should then not be too large. Again, this is a second line argument. It is of limited value if, as is often said, the anthropogenic cause can trigger much more powerful chain reactions. Once such a trigger has been pulled, shall we then ignore the warming problem? I think we will then realize that we have to work even harder on GHG emissions.<br>Motive 2 is a precautionary motive: We should mitigate GHG emissions, since these might change climate conditions in the long run. Note that this motive is (not completely but) quite independent of climate forecasts - only if we would witness a prolonged global cooling would this motive be weakened.<br>In contrast to the first motive, this second motive is underscored by an observed and strong anthropogenic effect on GHG concentrations in the atmosphere. Maybe it would be a bit weak without this observation. But with it, it is quite strong: We should stop messing with the greenhouse machine, since this can be expected to change climate conditions in the long run.<br>The two motives are complementary, that is, they add probabilities implying that mitigating GHG emissions is a good idea. This can be expressed as follows: Let p1 be the probability that global warming is already going on, and 1-p1 that climate is still stable (but might change in the future). Let p2 be the independent probability that GHG concentrations are already increasing due to human activities, and 1-p2 the sum of probabilities that GHG concentrations are not yet increasing or that they are increasing, but so far independently of human activities (but this might change in the future). Then mitigating GHG emissions is a good policy goal with probability p1 (first motive) + (1-p1)p2 (second motive) = p2 + (1-p2)p1 = 1- (1-p1)(1-p2).<br>Of course, the reason for political action is strongest if both reasons are given. But this is only the case with probability p1p2, where it holds p1p2 < 1- (1-p1)(1-p2).<br><br>A reasoning like the above is important, but I don't find it in the WGIII AR5 Draft or anywhere in AR4. It should be carried out (more elaborated and refined than I did here) in WGIII and taken up in the Synthesis Report. Instead, Chapter 2 of WGIII repeats textbook stuff on decisions under uncertainty at length without even discussing the uncertainty structure of the climate change problem (see my critical remarks on Chapter 2). I am aware that at | Noted. |

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| 15739 | All AR5 | | | | | Missing chapter in WGIII: What are the general economic strategies for mitigating GHG emissions?<br><br>The general economic principle stipulates that abatements should be made efficiently: Either by minimizing the total cost of achieving a given amount of mitigation, or by maximizing the total mitigating effect for a given total cost.<br>In practice, the efficiency principle leads to basically two types of political strategies:<br>Strategy A, the least marginal cost rule: Mitigation measures should ranked by their effectiveness (in CO2equiv reductions) per dollar spent, and those measures with the highest rank carried out first. This principle is taken up, for example, in WGIII AR5 Draft, Chapter 7 (Energy), p.54, line 28 by reference to the marginal abatement cost (MAC). Or in Chapter 6 (Overview), section 6.3.5.1, where the additional costs due to unjustified exclusion of some sectors are highlighted.<br>Strategy B, push-through strategies in selected sectors: Where complementarities prevail (including economies of scale in production, network effects and so on), the marginal cost approach is probably misleading (i.e. not leading to the least cost solution). In that case the optimal policy might entail an orchestrated push-through in order to change the whole setup of the chosen sector.<br>To repeat: the MAC rule is wrong as a general prescription when there are economies of scale or other complementarities (because the second-order condition for a maximum is then not necessarily satisfied).<br>Note also: If a specific sector is (rightly) selected as a push-through target, this implies that other sectors are rightly given less focus and funds to realize abatements. This puts into perspective the view put forth in the above-mentioned Chapter 6 (Overview), section 6.3.5.1.<br>An example of a push-through policy is the endeavor of some countries, like Germany, to change their power generation sectors profoundly. In power generation, complementarities arise from the facts (i) that there are potentially large economies of scale in the production of renewable energy (RE) facilities and (ii) that infrastructure investments are needed to enable a large-scale buildup of RE (compare Chapter 7, section 7.6).<br>Another important economic principle, which stems from the considerable uncertainties associated with mitigation pathways, is the future option value of a current decision. Since both climate conditions and technologies are subject to uncertainties, flexibility of policy paths has value. This may favor some decisions compared to others. For example, investments in science and R & D leave a lot of flexibility in contrast to the implementation of particular abatement measures. Among sectors, it appears that power generation is a multi-purpose sector that might affect other sectors (like transport) in the future by opening up more opportunities. This calls for the power generation sector as a suitable starting point for action. On the other hand, electro-mobility in transport may be complementary to a push-through in power generation, since electric cars might provide the required energy storage.<br>While option value is an important category, the danger of stranded investments is another (and opposed) important determinant of policy choices. For example, in Germany the stock of inherited power generation plants gets old and needs to be replaced by new facilities on a large scale anyways. Thus, it is just time to think about future technology, and it would be great economic risk to choose CO2-intensive technologies that might have to be replaced in the near future, incurring great losses to companies and society.<br>The related issue of co-benefits is very important for any economic analysis and strategy, since co-benefits can | Noted. |
| 15381 | All AR5 | | | | | For general comments on policy chapters 13-16, see "wdavidmontgomery - general comments on policy chapters 13-16.doc" sent separately | Noted. |
| 15416 | All AR5 | | | | | Need a more consistent application of the most common evaluation criteria – cost-effectiveness, predictability of emission reductions, administrative cost, institutional support required – some ignore these completely (14 and 16). No consistent discussion of role of government in large-scale demonstration and commercialization or effects of policy uncertainty on investment | Accepted. We have worked on this aspect for the Second Order Draft and will continue to do so towards the final draft. |
| 17421 | All AR5 | | | | | Recommended reference: Angelsen A. 2010. Policies for reduced deforestation and their impact on agricultural production. Proceedings of the National Academies of Science 107(46): 19639–19644. | Taken into consideration by author team. |
| 17422 | All AR5 | | | | | Recommended reference: Foley JA et al. 2011. Solutions for a cultivated planet. Nature 478: 337–342. | Taken into consideration by author team. |

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| 17423 | All AR5 | | | | | Recommended reference: Foresight. 2011. The future of food and farming. Final project report. Futures. London: Government Office for Science. | Taken into consideration by author team. |
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| 17428 | All AR5 | | | | | Recommended reference: Vermeulen SJ, Aggarwal PK, Ainslie A, Angelone C, Campbell BM, Challinor AJ, Hansen JW, Ingram JSI, Jarvis A, Kristjanson P, Lau C, Nelson GC, Thornton PK, Wollenberg E. 2012. Options for support to agriculture and food security under climate change. Environmental Science and Policy 15: 136–144. | Taken into consideration by author team. |
| 10776 | All AR5 | | | | | Use of nuanced collors in graphics is confusing. For instance, lilac blends with red, dark brown with black etc. Please, choose stark collors or graphic dots, lines. | Noted. All figures in their final version will be reproduced by a graphic designer |
| 10777 | All AR5 | | | | | Biased criticism and unfair reporting by newspaper, TVs, pundits are pervading and spoiling public opinion and decision makers. Please add a critical review of the media coverage and advise readers on how to interpret them. | Rejected. This is beyond what IPCC can and should do. But IPCC can assess studies on the influence of media |
| 10778 | All AR5 | | | | | Language tone: sentences in the whole report were written as if for scientists and technical readers only and the often appears as academic style. Indexes display unassuming neutral titles "coal emissions", while it could convincingly say "coal emits most of CO2 to the atmosphere". The best would be to write in simple but scientifically correct English, accessible to decision makers, journalists, and politicians. Here are some senior science/ technical writers that may advise on how to bring AR5 closer to the general reader: Brian Green, Edmond Weiss, the UK´s Plain English Campaign, Elizabeth Kolbert (The New Yorker, climate change). | Noted. Above all, IPCC reports summarize the available science and should do so using the best possible language. |
| 10780 | All AR5 | | | | | the terms "high agreement", "low confidence" "more than probable" etc may be rigorous in science writing, but are confusing and misleading to journalists, politicians, scholars in humanities, pundits, and the general public. They mean totally different things to laypeople. They should be replaced by other terms. Please see my comment on language tone, above. | Rejected. This is IPCC uncertainty language, which is critical for transparent reporting. |
| 10781 | All AR5 | | | | | Worldmapper is a collection of world maps, where countries and territories are re-sized on each map according to the subject of interest, such as population, income, CO2 emissions, or women illiteracy; there are nearly 700 maps. In an outstanding way, they could show climate change issues- energy, beef consumption, emissions, pollution impacts etc. Please contact: http://www.worldmapper.org | Noted. But these may not always be the scientifically best way of transmitting information. |
| 10783 | All AR5 | | | | | if the AR5 text had hyperlinks to definitions of technical words and acronyms, reading will be much easier for decision makers, leaders, non-specialists and so on. The glossary and a list of acronyms will suffice. | Noted. |
| 7854 | All AR5 | | | | | Generally, we see a dominance of the philosophical paradigm of weighed and discounted utilitarianism as well as efficiency oriented CBA in combination with rational choice approaches. This dominance seems to be even stronger than it was in the former ARs. The plurality of of the philosophical, economic and political debate about climate change is not well-represented throughout chapters 1,2 and 3. These chapters do not represent a balanced review of literature (matters seem to be differnt in chapters 4 and 6 though). If the paradigms of discounted utilitarianism, CBA and rational choice are seen as the most plausible/reasonable, criticism of these paradigms must be discussed. This is not the case, rather, the approaches are laregly taken for granted. See comments for deatils and literature. | Accepted. We have worked on a more balanced treatment. |

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| 7855 | All AR5 | | | | | The combination of the key messages of chapter 1 (almost infeasibility assumption regarding 2° goal and affirmation of root cause of climate change - GDP growth; see comments) and these pardigms (see comment 1) implies a remarkable shift from prioritizing mitigation to a portfolio approach entailing mitigation adaptation and climate engineering. | Rejected. IPCC should not be judging feasibility, which is not a purely scientific exercise. We have worked throughout the report to discuss requirements of different levels of mitigation rather than feasibility. But even as the report stands it does not judge on the priority of mitigation and should not do so. Only from the synthesis report, which combines information from all three |
| 7939 | All AR5 | | | | | References: | Taken into consideration by author team. |
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| 10169 | All AR5 | | | | | I lack specificity about whether sustainable CCS methods are available and in use today, and what they are, or whether they are non existent hypothetical technology or technology under development. | Accepted. We have added to the CCS discussions throughout the report, but |
| 10170 | All AR5 | | | | | Table and figure texts are generally poor in information, and may be difficult to interpret without reading the main text thoroughly | Accepted. We have worked a lot on the figures for the SOD and will continue to |
| 10175 | All AR5 | | | | | Figures and tables should be given more space and higher resolution and quality | Accepted. Once the design of all figures is finalized they will be re-produced by a |
| 10195 | All AR5 | | | | | The use of acronyms and/or abbreviations: although this will reduce the legnth of the text, the readablility of the text has to be taken inte account as well. At the moment the number and extent of acronyms used limits the potential to remember their meaning/definition and thereby understanding the text. The readability and ability to understand the text is especially reduced if the meaning/definition of the acronym is not given the first time it is used within a chapter (e.g. chapter 9, p. 4, l. 25 ICT, p. 6, l. 27 CR, p. 6, l. 32 ESCO, EPC, MEP etc but also true for the other chapters). Either limit the use of acronyms (i.e. use them in figures and tables, with accompanied explanations, but to a much lesser degree in the main text) and/or including a list of acronyms/abbreviations for each chapter would be useful (if not necessary). | Accepted. We have reviewed this issue and tried to imrove the balance between brevity and ease of understanding. |
| 10197 | All AR5 | | | | | It is often difficult to understand from the text which mitigation measures are actually available, implemented and working today, and which are under development or only hypothetical/utopical | Noted. We highlight this in most cases clearly, but have continued to be as |
| 10200 | All AR5 | | | | | "Waste" and "Service sector" might merit their own separate chapters | Accepted. We have included a new section on waste at the end of chapter |
| 10201 | All AR5 | | | | | To reduce the length of text: 1. use standard reference style in the text, i.e. use only surnames and one (for one author or three or more authors) or two names (for two authors), e.g. Borg 1997, Borg & Pedersen 2012, Borg et al. 2003; 2. word economy, e.g. more concrete, less verbal models, more specificity and models that can be tested | Noted. |
| 10210 | All AR5 | | | | | When references to empirical and theoretical studies are both given in the same paragraph it becomes more difficutl to entangle what is what unless (in each paragraph)one is dealt with first (e.g. theoretical) and the other thereafter (e.g. empirical) | Rejected. We do this structurally in the report. Chapters 2-4 provide the (theoretical) framing, whilst the later chapters are more dealing with the empirical material. This is more treu so |
| 10911 | All AR5 | | | | | Please make the use of "Life Cycle Assessment" and "Life Cycle Analysis" consistent. | Noted |
| 10913 | All AR5 | | | | | Many chapters seem to give their own summary of GHG emissions and there drivers. Of course, each chapter puts its own spin on it, but I think overall it would be better of GHG emissions and their drivers were discussed in one chapter. In addition, none of the chapters seem to cross reference the similar work in the other chapters. | Rejected. We do both. Chapter 5 is devoted to this question. The subsequent chapters only cover the most relevant aspects for a particular sector at the beginning. We have made |
| 10948 | All AR5 | | | | | The WGIII report is quite different in structure to how the WGI report works. The WGI chapters are very disciplinary. If I am an expert on radiative forcing, there is only really one chapter to read. Someone interested in mitigation, is really interested in the entire WGIII report. I for example, wanted to read about 10 chapters, but only had the time to skim read a few chapters! Even through this, I noticed large areas of overlap. On the one hand, this is hard to avoid is each chapter needs some specific framing of the drivers of GHG emissions, for example. On the other hand, the overlaps makes the report very long and in some cases repetitive. As one example, many chapters discuss GHG emissions, GHG emission drivers, IPAT/Kaya type thinking, etc. As far as possible, it would be good to see some effort in reducing overlap and providing much greater linkage between sections with overlap. This makes it easy for a mitigation person to read more of the report! | Accepted. We have worked hard and will continue to work hard on reducing overlap. This is most challenging. As the reviewer correctly points out, the material from WG1 and 3 is very different. To be useful to policymakers it needs to be structured very differently. |

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| 10949 | All AR5 | | | | | A constant theme in the report is the weighting of GHG emissions. For perhaps obvious reasons, authors fall back to the Global Warming Potential with a 100 year time horizon, even though this has had a strong critique since its inception. The FAR even refers to it as an illustrative approach to demonstrate the difficultuies in comparing GHG! The CLAs and LAs should really be aware of the issues with using a GWP100. A read of the relevant part of Ch8 WGI is important. Using a Global Temperature Potential will greatly change the importance of food for example. It is worth point CLAs and LAs to the paper by Shine on the issue, Shine was a CLA for the IPCC FAR which introduced the GWP and his perspectives on why it is used should be read by anyone just assuming a GWP100 is ok. Shine, K.P., 2009. The global warming potential - the need for an interdisciplinary retrial. Climatic Change 96, 467-472. | Accepted. We have added to the discussions on metrics in different parts of the report - but most prominently in chapter 3. |
| 17274 | All AR5 | | | | | I'd like to put attention that if we use more clean technologies cuting the aerosole emmision the anthropogenic warming increases because of a reduction of aerosole-related cooling. This is clear and quate significant effect. However, I have not found the obvious discussion of this issue (perhaps as a result of lack of time to read carefully all chapters). | Noted. The scenarios presented in chapter 6 almost all tend to account of this issue. Itis therefore well-addressed even though more implicitly. |
| 7827 | All AR5 | | | | | Some language is too prescriptive. The IPCC must not prejudge decisions from policy makers/policy level. Concrete examples are given below. | Noted. We continue to review the language carefully to be policy-relevant, |
| 7828 | All AR5 | | | | | It is suggested that finally all text is reviewed/edited by a native English speaker of high langauge skills in order to improve readability and clarity. E.g. chapters 9 and 10 offer already a very good flow of language. | Noted. There are native English speaker in each chapter. We will carefully check |
| 7841 | All AR5 | | | | | Executive summary need to build on the assessments in the underlying subchapters. Therefore every paragraphs should include references to the underlying subchapters in order to allow the reader to check the original literature that informed any finding. | Accepted. We will make sure that this is the case ultimately. |
| 7842 | All AR5 | | | | | It is noted that many statements in executive summaries do not include qualifications of the level of evidence for specific findings. It is of great importance for the weight of any finding to provide information on the level of uncertainty of each finding using the calibrated IPCC language. The authors should be prepared to explain any such judgements in a transparent manner. | Accepted. We will make sure that this is the case ultimately - unless we are dealing with "statement of facts". |
| 10261 | All AR5 | | | | | In general : Lots of errors in reference names and in references list. | Accepted. We have already reviewed this issue and will continue to do so unitl |

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| 15071 | All AR5 | | | | | The distinction between 'direct' and 'indirect' policy instruments is an important one and thus made effectively (pp. 33 and 36 of Chapter 3). Indeed, it has often been the 'indirect' policy that has had most consequence (e.g, single largest climate change initiative in Canada was a coal-fired power station closedown, motivated by local air pollution concerns and local economic development aspirations) – see Rowlands (2007, below). This distinction between these two types of policies should be 'maintained' throughout, but they are subsequently 'mixed together'. For example, in Chapter 10 (p. 51), consideration of 'energy management systems' seems to be presented as a 'GHG mitigation policy', but it is the case that such systems are introduced for non-climate reasons; impacts upon net greenhouse emission levels are of secondary importance. Indeed, reference to 'indirect policies' are relatively rare (e.g., p. 21 of Chapter 16), even though – I would argue – much of the discussion is actually about 'indirect policy'. (And at other times, e.g., p. 34 of Chapter 16, line 9, they are bunched together completely – in this case, mention of 'energy and climate change goals').<br>I would have thought, particularly if attention was going to be given to 'indirect policies', more attention would have been given to sub-national approaches, and the 'policy successes' therein. Yes, Chapter 15 (p. 65) and Chapter 16 (p. 34) have some, but more might have been useful. Three sources of mine that might be useful for such a review are listed below:<br>Ian H. Rowlands, 'Encouraging Renewable Electricity to Promote Climate Change Mitigation', in Barry G. Rabe (ed), Greenhouse Governance: Addressing Climate Change in America (Washington, DC: Brookings Institute Press, 2010), pp. 181-203.<br>Ian H. Rowlands, 'Renewable Electricity: The Prospects for Innovation and Integration in Provincial Policies', in Debora L. VanNijnatten and Robert Boardman (eds), Canadian Environmental Policy and Politics: Prospects for Leadership and Innovation, Third Edition (Toronto, ON: Oxford University Press, 2009), pp. 167-82.<br>Ian H. Rowlands, 'The Development of Renewable Electricity Policy in the Province of Ontario: The Influence of Ideas and Timing', Review of Policy Research (Vol. 24, No. 3, 2007), pp. 185-207. | Accepted. We deal with this issue now more comprehensively in the context of the issue of "co-benefits". |
| 8505 | All AR5 | | | | | It would be better to use the term "climate engineering" instead of "geo-engineering" (or "geoengineering") | Rejected. This is a decision that has already been taken across WGs. |
| 17074 | All AR5 | | | | | The comments are made with reference to CHAPTER on EQUITY AND SUSTAINABLE DEVELOPMENT and consequential changes will be needed in the text. A key concern is the use of the term "development path", which implies the reference is to developing countries, and the more neutral term "growth path" should be used as the term applies to both developed and developing countries – for example, we say 'green growth' and not 'green development'. In this context, what is the 'legacy of development'? This is not a commonly used term (title of paragraph 4.3.6); do you mean 'eradication of poverty"? | Noted. |
| 3034 | All AR5 | | | | | This review is limited to the specific topics of energy efficiency and rebound effects. | Rejected. We are dealing with a plethora of issues throughout the report. |
| 3035 | All AR5 | | | | | While it is deeply gratifying to finally see rebound effects addressed in this latest IPCC report, they do not appear to be very well integrated with the model results throughout the report. Rebound effects increase the climate change stakes enormously, because if they are not properly accounted for it means we have less time than we think--less time than our forecasts commonly predict--to devise climate change mitigation (or adaptation) solutions. | Noted. We have continued to work on this aspect in multiple chapters. |
| 11157 | All AR5 | | | | | Overall, the Chapters and Sections layout and sequencing is good. The idea of the FAQs at the end of each Chapter is brilliant. One suggestion on the FAQs sections: Could the FAQs be topical/current with the different chapters rather than FAQs that have been aoound for sometime? Examples of FAQs could include: Chapter 1: WHERE IS THE WORLD AT WITH RESPECT OT CLIMATE CHANGE MITIGATION?; Chapter 7: WHAT IS THE STATE OF THE ART TECHNOLOGIES IN ENENRGY WRT CLIMATE CHANGE MITIGATION? WHO IS EMMITTING THE MOOSTAND THEREFORE WHO IS THE MOST CALPABLE?WHO IS THE VILLAIN? | Noted. |

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| 11545 | All AR5 | | | | | Obviously a lot of hard work has already gone into this draft, and the result is already impressive. However, CLAs will need to spend more time to streamline the chapters and to cross-reference to the right places, otherwise there will be too much shallow repetition, and not enough deep substance where it is due. | Accepted. We have continued to do so throughout the report and will continue streamlining towards the final draft. This is one of the most challenging tasks in |
| 11547 | All AR5 | | | | | To the steering group: it may be worth reiterating to the authors of all chapters the difference between the style of an assessment and a journal article, and to remind them that their target audience are not their scientific peers. | Noted. |
| 10415 | All AR5 | | | | | I suggest to include some works from developing countries, although these works may not be published in Eglish, they could have a great value for the whole assement work. | Noted. Authors are encouraged to do so, if appropriate. This is fully in line with |
| 15443 | All AR5 | | | | | These comments on the FOD of WGIII's contribution to AR5 were drafted by Kathy Jo Wetter, Ph.D., ETC Group, Programme Manager and Pat Mooney, ETC Group, Executive Director. Both Kathy Jo and Pat are registered as Expert Reviewers for IPCC WGIII AR5, FOD. Kathy Jo uploaded the comments. | Noted. |
| 12970 | All AR5 | | | | | Thank you for letting me participate as an expert reviewer for the 5th IPCC draft. Please accept this statement as my position on the document. I do not support the work of the IPCC for the misuse of science including omissions of complex earth system dynamics and for the political insubordination of the free market and personal sovereignty. Hard science is a beautiful craft that reveals both our understandings of our world and the world of learning, critical thought and further understandings of life. Intellectual rigor in our thinking is as valuable as clean water or forests. Our impact on the planet is irrefutable. As is our thinking of our place in it. We are meant to be taking care of the world. Creating a system of centralized control of resources by a few people makes the everyday man, state and nation impotent in thought and action. You strip away mans ability to think, learn, grow and create something other than children, you do get a population problem. It is the only sense of personal control he has left. And then you get a resource problem. Instead, we need open vibrant minds who challenge the status quo. We need diversity in our life strategies that embraces and values talent of the individual and gives them permission to believe in themselves. To take care of themselves and not be dependant on the state to do it for him. A dignified world values the ability of self mastery of the person and their craft. An environmentally healthy world would embrace a science that supports that dignity. A freer political state would enable intellectual competitiveness and leadership. My biggest question is how -if - and when would we ever know these ideas to work unless we try. | Rejected. We appreciate the position, but do not agree with the implication the reviewers draws concerning the report. The IPCC does not advocate a particular way of dealing with the climate externality. It simply summarizes the state of the scientific literature in a policy-relevant, but non-prescriptive way. |
| 8850 | All AR5 | | | | | General comments on the whole report:<br>In general, chapters shall be shortened and sections shall be made more coherent within the chapter. All authors shall try to state facts (findings) and their limitations as well as applications. Besides drawing clear conclusions that are often applicable to certain circumstances/regions/countries, it's very important for authors to acknowledge and state information/knowledge gaps in a consistent way, and to clearly state and enlist recommendations that are appropriate for future work in each chapter that addresses specific sectors/areas/programs. The authors shall strive to minimize ambiguity througout the sections. | Noted. Some chapters are of appropriate length, while others will have to be shorted. We are continuously working on clarifying the language to the degree possible. |
| 4692 | All AR5 | | | | | Annex I definitions can access the Boykoff and Okereke glossary assembled here: http://www.theboulderstand.org/climate-change-glossary/ The full glossary is in 'The Politics of Climate Change: A Survey', Boykoff, M. (ed) (2009) Routledge/Europa. | Noted. |
| 8903 | All AR5 | 0 | | | | There is more interaction needed between chapter teams to unify some (theoretical) positions and avoid repetitions | Accepted.We have worked on this for SOD and will continue this work towards |

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| 8780 | All AR5 | 0 | | | | Unthinking use of the term 'interests' which implies a utilitarian ethical assumption and framing to questions of mitigation of climate change, similar issues with the unthinking use of the terms 'cost and benefits', 'optimum', 'preferences', 'prosperity' and in places 'consequences' (cf. consequential/utilitarian/economistic ethics). This language is normative and policy prescriptive not neutral. | Working Group 3 has to deal with both facts and values. In fact, they cannot be easily seperated. We aim to provide alternatives and make their ethical implications transparent. For this reasons we have devoted three chapters |
| 8544 | All AR5 | 0 | | | | HAD PROBLEMS WITH THIS CELL. PLEASE START AT #2. Thank you. | Authors do not understand this |
| 16910 | All AR5 | 0 | | | | Based on experience of previous IPCC Assessments, my sense is that AR5 is in relatively good shape for this stage of the process, albeit with some obvious exceptions that it is essentilal to address. Congratulations to the authors who have clearly put in a vast amount work already. However, it still lacks much intellectual integration across the different chapters and at present it is not at all clear what the "big new insights" may be. Nor is there a consistent intellectual structure to help the reader navigate the numerous short (/satisficing), medium (/optimising) and long term (/transformation) issues, even though the decision and economic processes at different timescales involved are quite distinct.<br>There are some issues of intellectual integration across the “framing” chapters (1-6), but the bigger challenge is demonstrating consistency between the more top-down / theoretical structures of these, and the sector-specific insights in the sectoral chapters. My sense is that the “meso-scale” analyses represented in some of Part III – most notably chapters 12 and 14 – might help a lot here to make some of the connections; the interactions between these chapters and the framing chapters deserves particular attention, as I imagine it is otherwise easily lost.<br>As I skimmed the report I was looking for “iconic” figures to summarise really core points that may not be familiar to a governmental audience. There may be several – perhaps the Secretariat could come to the next LA meeting with some suggestions. One “structure” of presentation in particular that caught my eye is Figure 14-12, of per-capita emissions vs per-capita wealth. Being grounded in real data this could have particular impact. However in its current form of aggregation it doesn’t do the job (and the different ways of interpreting it need to be better mapped out). I offer comments in Chapter 5 and 14 on this though it is also relevant to others eg Ch.4.<br>Finally, in presenting data on the implications I think it important that IPCC considers the lessons on the importance of presentation and framing effects. Once they have established “baselines”, the modelling community almost entirely thinks in terms of changes from these baselines. Normal people think in terms of absolute changes. See for example my very brief comments on presentation in Chapter 6.<br>Clearly there is a potential length problem, but reading across ther report there are significant possibilities simply by removing redunancies and getting authors to cross-refer to other chapters that address similar issues. | We accept most of the remarks. In fact, it is one of the key challenges to reconcile sectoral and cross-sectoral evidence. We have made some progress for the SOD, but we need to continue along this road. |

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| 16911 | All AR5 | 0 | | | | The basic intellectual structure that starts to emerge in Chapter 2 (where it refers to System 1 and System 2 processes) could be usefully broadened, extended, and applied as an organising framework across many chapters in AR5. (a) Broadened, so that it is not purely about the psychology of individual decision-making, but about the wider characteristics of decision-making processes at different temporal and institutional scales. (b) Extended to recognise a third level of decision-making in the realm of strategy, security, decision-making under deep uncertainty, innovation and infrastructure, which also speak to the longer-term evolution of systems: broadly these go beyond the realms in which quantified cost-benefit approaches are practiced, or indeed practicable. There are thus three 'domains' of decisionmaking, not two. And (c) these three domains could be applied as a framework to help organise corresponding observations in many chapters of the report. For example, a lot of the material in the Buildings chapter is really grounded in characteristics of the first domain. A lot of transport discussion, with emphasis on infrastructure and innovation, is more about third domain processes. The norms of mainstream energy sector investments tend to be strongly about second domain chacteristics, which corresponds most closely to classical economic assumptions. For sectors and issues dominated by first and third domain processes, however, there is no intrinsic reason to assume that 'business as usual' corresponds at all to optimising behaviour or 'least cost'. At present, too many of the chapters seem to present information which jumbles up these different processes, and leaves the reader somewhat confused about the actual implcations for costs and policy responses. This may also help to provide an classificaiton framework for policy instruments, since the kinds of policy instruments appropriate to the different domains are very different, and have specific roles in relation to the characteristics of those domains. I will submit to the Secretariat the chapter from my book which is focused on defining these 'three domains' and tries to give some sense of their relative significance in relation to energy and CO2 issues. | Noted. |
| 16912 | All AR5 | 0 | | | | It would help enormously if chapters could be more systematic in including an up-front summary of the state of knowledge represented in preivous IPCC reports. In addition, the SPM or Technical Summary should be able to compile estimates of mitigation potentials and costs, in ways analogous to AR4, and to draw any comparison with AR4 in this realm. It is not at all obvious that the chapters yet provide any solid basis for such an effort. | Taken into account. We have encouraged all chapter teams to highlight what has changed since AR4. |
| 9407 | All AR5 | 0 | | | | Especially in Chapter 7, 9, and 10, when it comes to discussing amounts of mitigation potentials by sector (for example, reporting as XX MtCO2 mitigation potentials), it needs to be carefully clarified whether effects of electricity savings in the demand side are included in the demand side or such electricity saving potentials in the demand side are counted in the Power sector. Depending on its definition, results of mitigation potentials by sector will be different. This point was sometimes confusing in the IPCC AR4, thus it should be clearly mentioned or keep it consistent across chapters in the AR5. | Noted. We do not adopt the concept of mitigation potentials as AR4 did. But whenever it is used we should aim to be as transparent about methodology as possible. |
| 14259 | All AR5 | 0 | | | | I would be happy to provide additional comments if I had time (so, please let me know if the deadline is extended or if one can provide comments later/to later revisions). | Rejected. We cannot extend the deadline. |
| 9106 | All AR5 | 0 | | | | I think that two topics would deserve inclusion to the publication, namely agglomeration economies and rebound effect. Cities are shown (as mentioned in the draft) to lead the global economy creating wealth and attracting both affluent consumers and businesses. This leads to cities being consumption centers as well where lifestyles may be much more GHG intensive than in less dense urban/human settlements. This may be a strong opposite effect for GHG mitigation through more dense structures. Related to this is rebound effect. If GHG mititgation leads to monetary savings the savings will be at least partly spent and will cause additional emission. E.g. Turner has demonstrated how the rebound effect may lead to even an overall increase in the emissions (Turner, K. (2009): Negative rebound and disinvestment effects in response to an improvement in energy efficiency in the UK economy, Energy Economics, 31, 648–666.) | Accepted. We have for the first time a chapter on human settlements and infrastructure to better understand the role of spatial structure and urban planning. We have further improved the coverage of the rebound effect in various chapters of the report. |

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| 9125 | All AR5 | 0 | | | | As a suggestion to reduce the amount of pages in the report, to my opinion the sections 12.5-12.8 should be heavily reduced. The level of detail is not in balance with the earlier sections especially consedering the descriptive nature of the sections in general. | Rejected. |
| 13237 | All AR5 | 0 | | | | More integration between chapter 8 (dealing with behavioural aspect of transport) and chapter 12 (dealing with spatial planning) could lead to interesting debate : work by Schaefer or Laterrasse acknowledge that to combine behavioural measures (e.g. energy tax) and planning measures (e.g. densify city centers) can theoretically have greater impact on energy use for transportation. | Accepted. This is an important issue we have worked upon and will continue to work on towards the final draft. |
| 13247 | All AR5 | 0 | | | | More integration between chapters 8 and 12 could potentially reduce in length both chapters. | Generally accepted, but not sure about |
| 4045 | All AR5 | 0 | | | | The issue of whether 2 degrees C can or cannot be achieved by the end of this century needs to be assessed and discussed transparently and robustly. As a member of the U.S. National Climate Assessment Development and Advisory Committee, we were also faced with the same question and have to deal with this head-on. It is clear from all modeling that the kind of policies and actions needed to achieve 2 degrees C would be impossible. What are the options and more realistic scenarios which the world can achieve? | Rejected. We cannot easily make a scientific judgement of feasibility. In fact, since AR4 there is more scenario evidence than ever consistent with a likely 2°C world. Working Group 3 puts an emphasis on discussing the technological, economic and institutional requirements of such a transition |
| 4314 | All AR5 | 0 | | 0 | | My main comment is that, almost without exception, the chapter avoids discussing evidence that casts doubt on the main thesis–that renewable energy can make a large difference to carbon dioxide emissions. This is not unbiased science as I know it. I would also comment that it is extremely wordy and much of what is quoted adds little to the argument. I think it would be easy to reduce the length by 50% and, as a result, the important points would be easier to determine from the mountain of often irrelevant detail. My understanding is that this chapter takes as a given that greenhouse gases cause dangerous global warming and it is all about how to reduce the concentration of greenhouse gases. Therefore, the numerous references to 2° warming and various statements about the dangers of global warming should not be in this chapter. If they're all deleted–as they should be–then the chapter will be more objective and shorter. | Rejected. The report, in fact, stresses the importance of CCS and bioenergy for staying within 2°C. This is highlighted by the latest science trying to understand how difficult individual technologies can be replaced in a mitigation technology portfolio. |

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| 18576 | All AR5 | 0 | | | | General comments<br><br>Going through the material I was struck by three points:<br><br>There is no obvious narrative or storyline, just an enormous amount of material.<br><br>The overiding conclusions are unclear.<br><br>How does the material relate to WG I and WG II material?<br><br>Buildning on the three points I think it is really important to try answer three rather general questions.<br><br>Why is the material produced?<br><br>The material is said to be policy relevant but not policy prescriptive, but relevant to whom? To politicians? To policymakers? To scholars and experts?<br><br>The extensiveness and comprehensiveness rule out a majority of politicians and policymakers. The lack of clear conclusions and reader-friendly summaries strengthen the effect.<br><br>It is hard to read out any sort of general message or storyline. What is the intention? What is the consequence? Based on the material as it is presented you can easily draw and underpin very different stories and there is a clear risk that the material is partly “hijacked” by persons wanting to drive their own theses.<br><br>A part of the problem is that the material is more of a mitigation encyclopedia (though not fully developed) but pretending to be a report. There is a choice to be made.<br><br>The bottom-up approach also adds a lot of confusion since the same themes come up again and again in different chapter but partly building on defferent material and often pointing in different directions.<br><br>What is the material trying to cover?<br><br>From what I can read out the intention is to give an overview of existing knowledge form a scientific perspective and thereby give advice to policymakers. Scientific and knowledge is interpreted as peer reviewed material but I would argue that policymaking, even if built on existing knowledge and experiences made, goes far beyond what can said to be proven based on scientific methods.<br>Sometimes I get the impression that the material tries to prove that going a direction has given consequences or try to prove the true consequences of a policy which I am convinced is fundamentally wrong. There is no such thing as correct or false choices purely based on science. Remember, policy relevant but not policy prescriptive | Noted. First drafts of the summary documents are provided with the SOD. They may provide a more concrete idea of the main findings of the report. The report is aimed at an array of policymakers, but the key outlet of IPCC reports are the international climate change negotiations. |
| 11657 | All AR5 | 0 | | | | The issues of HCFCs and CFCs are written in Chapter 1, 5 and 10, however, the banks of HCFCs and CFCs contained in existing equipment, foams and other products are not described. This is very important issue as these emissions from the bank with high GWP are not regulated neither by the Montreal protocol nor the Kyoto Protocol. The IPCC/TEAP special report in 2005 can be referred to present a significance of the reduction and the potential CO2-equivalent emissions when released to the atmosphere. | Noted. |
| 10822 | All AR5 | 0 | | | | In relation to emissions "embodied" in trade, the terms "embedded" and "embodied" are used. I suggest to consistently use "embodied" | Accepted. We have worked and will continue to work on consistency issues. |
| 11322 | All AR5 | 0 | | | | Comments above refer - the chapters are not linked even though the content is. Chapters reviewed (5 and 12) could benefit from reflecting observations in Chapter 13, and vice versa. | Accepted. We have worked and will continue to work on cross-linkage of contents across chapters, but this is |

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| 12840 | All AR5 | 0 | | | | There are co-benefits but also conflicting items when it comes to measures and solutions. An example of this is the food-feed-fuel-fibre-forest topic as it comes to increasing biofuel and energy crops. As this differs between world regions like Europe with scarcity of land and other continents without scarcity, I propose to discuss this in some detail in Chapter 14. Actually I mean a solution for choice of land use valid for South America is not necessarily valid for Europe when it comes to biofuel production. | Accepted. We have added an bioenergy appendix to chapter 11. The body of the chapter also deals with the issue of land competition. We have added tables on co-benefits and adverse side-effects of |
| 8936 | All AR5 | 0 | | | | I miss in this report an overview of the literature that looks into the implications of different development pathways with respect to urbanization, income distribution or population structure for baseline emissions. This field has made major progress since the last Assessment Report. This literature includes, for instance, the literature that focuses on the future relations between urbanization and emissions, such as B. C. O'Neill et al., Global demographic trends and future carbon emissions. PNAS 107 (2010); V. Krey et al., Urban and rural energy use and carbon dioxide emissions in Asia. Energy Economics in press, (2012) and B. O'Neill, X. Ren, L. Jiang, M. Dalton, The effect of urbanization on energy use in India and China in the iPETS model. Energy Economics, (in press). Also, the relation between income distribution, energy access and baseline emissions is not discussed, as would be available in, for instance, B. J. van Ruijven et al., Model projections for household energy use in India. Energy Policy 39, 7747 (2011). I would expect a discussion of this literature in either Chapter 4 (4.3 or 4.4) or in Chapter 9 (9.2.3 or 9.3.8), or at another place that I might be overlooking | Noted. We discuss this material in chapter 12 and in various other places. |
| 8939 | All AR5 | 0 | | | | Access to electricity is discussed in multiple sections (4.3, 7.9, 9.2, 9.4, 14.2) and with different numbers for current access and using different future projections. Current access is probably best estimated by the IEA or the Global Energy Assessment. There have been multiple future projection produced over the past years (again IEA, GEA, or B. J. van Ruijven, J. Schers, D. P. van Vuuren, Model-based scenarios for rural electrification in developing countries. Energy 38, 386 (2012)), which could be used as a range for future projections of access to electricity, the impact of full-access on emissions and the potential for renewable energy to increase access to electricity | Taken into account. |
| 3273 | All AR5 | 0 | | | | Further coordination across chapters may be needed to reduce overall volume. For example, 2.4.4.3 and 3.11.1.1 make similar argument in some parts, referring to Attari et al. (2010) and Allcott (2011). Most of chapters include behavioural aspects, barriers and opportunities of mitigation. In general, they consist of two parts; common elements to all sectors and sector specific information. Common elements can be described under a chapter of "Framing Issues", such as chapter 3. and other chapter should focus on sector specific information. | Accepted. We have worked on the issue of overlap and will continue to do so. Some chapters have been shortened, but we may not reduce the overall length of the report significantly due to the breadth of literature and issues. |
| 9948 | All AR5 | 0 | | | | Any abbreviation appeared first time in each chapter should be followed by the complete spelling. | Accepted. We have worked and will continue to work on such editorial issues. But this is best done once the |
| 7379 | All AR5 | 0 | 0 | 0 | 0 | Use of calibrated uncertainty language is almost completely absent in many chapters and sections. This is a major failing of the FOD that requires urgent and consistent attention for the next draft. | Accepted. |

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| 7380 | All AR5 | 0 | 0 | 0 | 0 | The treatment of GHG metrics (GWPs etc) is still very patchy in the FOD and does not do justice to the available literature or the policy-relevance of this issue. Metrics are discussed in 3.10.3, but none of the sectoral chapters seem to be aware of this or make any attempt to show how their emissions profile or mitigation potential could change under alternative metrics. This would be crucial for AFOLU, but also industry and transport. Lots of literature on the latter, and it could easily be done. Chapter 5 shows emissions trends only for GWPs, even though this would be a great place to demonstrate how different choices of metric would change the perceived contributions from different sectors. Chapter 6 makes brief reference to the role of metrics in transformation pathways in one small sub-section, even though different metrics could have far more pervasive effects. This is not to say that metrics are crucially important: in contrast, the FOD is missing an opportunity to demonstrate that the closer the policy framework is to a first-best world, the less metrics matter; but the more patchy the policy framework, the more significant could be the regional and sectoral implications of alternative metric choices. | Accepted. We have worked on the metrics section in chapter 3 and chapter 6. |
| 6854 | All AR5 | 0 | 0 | | | These WGI TSU and Co-Chair review comments have been prepared by Thomas Stocker, Gian-Kasper Plattner, Alexander Nauels and Yu Xia. | Noted. |
| 6855 | All AR5 | 0 | 0 | | | The WGI TSU and Co-Chair review comments cover issues identified in the WGIII FOD related to the WGI contribution to the AR5 with regard to consistency, missing references, and sometimes reassessments of WGI-material. We do not attempt to propose alternative text etc. but simply flag the issues. In many cases we feel that providing the physical science basis context by referring to the WGI AR5 rather than doing a separate assessment would already help substantially in avoiding duplication of assessments and ensuring consistency between WGIII and WGI. | Noted. |
| 6856 | All AR5 | 0 | 0 | | | Referencing to IPCC WGI reports (to AR4 and/or AR5 FOD) currently is weak and in the rare cases it's done it's often too unspecific, i.e., lacking information of which Chapter of a specific report is being referred to. Often the entire report, or the SPM-only, is referred to as a whole. We suggest to be as specific as possible and to refer to the Chapters in the underlying report supporting the statements made whenever possible and feasible. | Accepted. |
| 6857 | All AR5 | 0 | 0 | | | As a general comment, we strongly encourage the WGIII authors to avoid reassessing topics concerning the physical science basis in order to reduce redundancies and, more importantly, inconsistencies between the WGIII and WGI contributions to AR5. In case specific mention of physical climate science assessments is needed, please refer to the WGI AR5 and carefully ensure consistency with the assessment provided by the WGI AR5 Chapters. One topic for which this seems particularly relevant is Geoengineering. Geoengineering is mentioned in several of the WGIII FOD Chapters with several instances where a reassessment of the physical science basis of individual Geoengineering Technologies is provided. This clearly needs to be avoided (see also the related Chapter-specific comments ). | Accepted. We have worked hard on the section on geoengineering and will continue to work with WG1 colleagues to ensure consistency. |
| 6858 | All AR5 | 0 | 0 | | | FAQs: We suggest that the FAQs within the WGIII contribution to AR5 carefully stay within the remit of WGIII, i.e., when the Physical Science Basis is mentioned, this should merely serve as a starting point but then the FAQ should focus on mitigation etc.. It is crucially important that the WGI-relevant starting points provided in these WGIII FAQs are consistent with the assessment in WGI. | Noted. |
| 6859 | All AR5 | 0 | 0 | | | FAQs: We note that in contrast to the WGI approach to FAQs, in the WGIII FOD FAQs are mostly short and do thus not allow for detailed answers. This approach, in our view, bears the risk to produce non precise language or gloss over caveats and subtleties. In order to help the reader, we strongly suggest that cross-references for "futher reading" or "detailed information" are provided as an integral part of the short FAQs, and that information on associated uncertainties be added. | Noted. |
| 5421 | All AR5 | 0 | 0 | | | Overall, this report made an excellent summary for the key literature. I just add a few more comments to this report before it can be released. | Noted. |

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| 5422 | All AR5 | 0 | 0 | | | This report mentions the “green growth”, but a definition of “green growth” is missing in the document. What is the essential relationship of “sustainability” and “green growth”. Does the “green growth” belong to the “sustainability” category. | Accepted. We will try to avoid using too many broad concepts like SD and green growth. |
| 5423 | All AR5 | 0 | 0 | | | Many of the citied references are a little bit old. The literature published in recent three years (>2009) was limited citied in this report. In addition, some important policy papers were still missing. | Accepted. We continue to add to the reference lists. Reviewer suggestions are |
| 5424 | All AR5 | 0 | 0 | | | Climate action plans were an emerging new issue since last report. This report did address this important trend. However, the strengths and weaknesses of the current climate action plans were not fully identified. The current climate change action plans well addressed the energy efficiency in building, transportation and built environment; however, they did not appropriate consider other components (such as natural resources, agricultural lands, etc). | Noted. We have strengthened this discussion in chapter 12. |
| 17727 | All AR5 | 1 | | 1555 | | referencing should be correct and uniform across all chapters; such as Sims et al. , rather than R Sims et al. Correct references such as "D Arent and Tol, Forthcoming" | Accepted. We are continuously working on such consistency issues. |
| 7306 | All AR5 | 1 | | | | Comments will be limited to "waste" management strategies, waste sector emissions, and mitigation costs & potentials. | AA: This is not a comment but rather a note |
| 7317 | All AR5 | 1 | | | | This is a long comment related to how emissions & mitigation potential associated with waste management activities were quantified in the AR5.WGIII report to date. Even through "Waste and Wastewater" had the smallest sectoral emissions in the AR4, this sector is, nevertheless, an IPCC reporting sector and, for completeness, it seems that this sector should have been explicitly included as a "sectoral chapter"in the AR5 (as was done for the AR4.WGIII.Chapter 10) or alternatively as a unified discussion in another sectoral chapter (?industry, as was generally the case prior to the AR4). Moreover, there are no clear guidelines for the definition of waste in the various sections of the AR5 draft where is it mentioned (municipal post-consumer waste, agricultural or forestry waste, mining & other industrial processing wastes, wastewater, etc.) Generally, in the current draft for the AR5, there are bits and pieces of discussion pertaining to waste management in several chapters ( esp. 1,5,7,12) with sometimes contradictory numbers and erroneous citations (see other detailed comments). Importantly, in Chapter 1 for the WGIII AR5 FOD, the waste sector is generally missing from figures giving comparative sectoral estimates (Figs.1.4, 1.5 as mentioned above). Chapter 4 mentions waste in the context of sustainable development and consumption "accounting" practices (see 4.4.5.1). Chapter 5 (5.7 esp.) includes figures (FIgs. 5.7.1 through 5.7.5) detailing emissions from waste citing one major reference (Gerlagh and Van der Zwaan, 2012) which has to be erroneous because that reference does not discuss waste (instead, it discusses economic modeling of long-term CO2 leakage from CCS projects). The actual numbers given are similar to AR4.WGIII.Chapter 10 numbers, so perhaps that is the source with respect to the references cited therein? Chapter 7 (Annex) briefly discusses bioenergy from organic waste & residues--see 7.A.3.2. Most discussion of "waste" occurs in Chapter 12 in the context of "urban settlements, infrastructure, and spatial planning." Although one might argue that "urban" waste GENERATION is indeed an important aspect of the urban infrastructure, many activities related to urban waste MANAGEMENT occur at urban fringes or at remote sites far removed from urban/suburban development. Also (as mentioned above with respect to "waste" definitions), it is unclear how emissions from agricultural waste, forestry residues, and industrial waste/byproducts are being considered and quantified (or not being considered) in this report. Clarifications would be welcomed. | AA: Accepted - The main discussion on waste section will be discussed in chapter 10. Coordination with other chapters 5, 7, 11, and 12 will be done to ensure consistency.<br>Also, reference used in chapter 5 figures will not be used and EDGAR data will be used instead. Agricultural waste and forestry residues are discussed in the bioenergy section. MYR (as per Estela's email): a new figure has been done for chapter 5 that shows global emission trends for the<br>four categories in the Waste sector, and their relationships with GDP and population trends normalized at 1970 based on the updated EDGAR database. The figure was made thinking in avoiding any overlap with Chapter 10. |

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| 7321 | All AR5 | 1 | | | | This is a second long comment related to quantification of waste, GHG emissions from waste, and mitigation of GHG emissions from waste. As discussed in the AR4.WGIII report (Chap 10), annual numbers for waste generation from various countries can have high uncertainties and could greatly benefit from improved standardization of terminology and accounting at the national level. Especially, for many developing countries, the role of the "informal sector" for collecting, processing, and recycling waste is largely unquantified. I would highly recommend a 2007 World Bank book by Martin Medina titled "The World's Scavengers: Scavenging for Sustainable Consumption and Production". Although the overall numbers from various cities are not summarized in a table for readers, his specific case studies detailing jobs/livelihoods gained from informal waste recycling, as well as the economic value of those jobs and the materials recycled provides important quantification of the impact of this sector for selected global cities and regions. The challenge is to improve the living conditions for these waste workers and their children. However, recognition of the magnitude of the informal recycling and its economic value is an important point to make in the AR5. | AA: Taken into account - This issue will be included in the co-benefits discussion. |
| 7322 | All AR5 | 1 | | | | This is a third long comment related to quantification of GHG emissions from waste. It's important to get the numbers right, esp. as many studies are beginning to focus on regional and local (urban-scale) emissions to better understand smaller-scale CH4 emissions using innovative tower-based, tracer, and aircraft-based methodologies for specific sources. Historically, the largest % of GHG emissions from waste has been from landfill CH4 (about half/see AR4.WGIII Chapter 10). Also, the IPCC National Inventory Guidelines for Waste (2006) have historically based landfill CH4 emissions on a first order kinetic model (termed FOD, "First Order Decay") which estimates the mass of CH4 produced over decades from waste landfilled in a given year in a given location. However, the existing methodology does not take into consideration the climate and soil microclimate conditions which limit those emissions, specifically: (1) the thickness and physical properties of site-specific cover materials, including seasonal soil moisture changes which limit gaseous transport in the cover materials; (2) the effect of engineered gas recovery on reducing soil gas CH4 concentrations at the base of the cover and thus limiting diffusive transport of CH4 to the atmosphere, and (3) seasonal CH4 oxidation (by methanotrophic microorganisms) in site-specific cover materials which is highly dependent on temporal variations in soil moisture and temperature. [For (3), current methodology allows either zero or 10% CH4 oxidation, the latter based on one of the first studies in the literature, Czepiel et al., 1996, JGR). In recent years, we have developed a freely available site-specific modeling tool which has been field-validated for 5 sites in California and is currently undergoing global validation. This model takes (1) - (3) into consideration through linkages with globally-validated U.S. Dept of Agriculture climate and soil microclimate models, scaling of oxidation to temperature and moisture via extensive supporting laboratory studies, and modeling of a typical annual cycle at 2.5 cm depth increments and 10 min time increments for user-specified site-specific daily, intermediate, and final cover materials (including both soil covers and engineered materials). The model was originally developed and validated for the state of California (and is called CALMIM, for CAlifornia Landfill Methane Inventory Model). The pertinent references are as follows (NB: ref. 1 gives additional background information on field and laboratory research by many groups over the last decade which facilitated the development of CALMIM): (1) Spokas, K., Bogner J., and Chanton, J., A Process-Based Inventory Model for Landfill CH4 Emissions Inclusive of Soil Microclimate and Seasonal Methane Oxidation, J. Geophysical Research-Biogeosciences, 116: paper G04017, 19 p. (2011); (2) Bogner, J., Spokas, K., and Chanton, J., Seasonal Greenhouse Gas Emissions (methane, carbon dioxide, nitrous oxide) from Engineered Landfills: Daily, Intermediate, and Final California Landfill Cover Soils, J. Environ. Quality 40:1010-1020 (2011). (3) Spokas, K., and Bogner, J., Limits and dynamics of methane oxidation in landfill cover soils, Waste Management 31:823-832 (2011). These 3 references have been emailed to the TSU as "authors, year". | AA: Taken into account. The text will address the limitation in emission estimation methodology. |

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| 7323 | All AR5 | 1 | | | | This is a 4th and final long comment related to quantification of GHG emissions from waste. There are a large number of existing CDM (Clean Development Mechanism) projects related to the recovery & utilization of landfill CH4, as well as CDM projects which rely on the "avoidance of landfill CH4 generation" through composting, combustion, or anaerobic digestion. Again, it is important to get the numbers right. The majority of landfill gas CDM projects are under-producing relative to the modeled (FOD model) CH4 generation and recovery predicted in their Project Design Document (PDD). In many cases, the waste composition was poorly known (including the impact of informal recyclers and on-site waste burning to recover metals), overly-optimistic modeling by sometimes-inexperienced developers, and uncertainties regarding the extent (volume) of waste in place. For landfill CH4 projects, however, the PDD projections do not matter so much since the credited CERs are quantified directly and solely on the CH4 collected and destroyed by combustion. However, for the "avoided landfill CH4 generation" projects, the CERs are credited on the modeled (presumed) CH4 that would have been generated, IF the organic waste had been deposited in a local landfill site. Given the variability in landfill CH4 generation at specific sites (as landfills are inefficient anaerobic digesters in the ground), the multiplicity of site management factors which direct affect CH4 generation & recovery, and lack of inputs regarding the factors which actually limit emissions (discussed in previous comment), one might argue that the "avoided CH4" projects' CERs are not always real, quantifiable, and additional. This issue should be re-examined with respect to continuing Kyoto, bilateral, or other mechanisms. | AA: Taken into account. The text will address the limitation in emission estimation methodology and the possible impact on offset estimation which are used as a mechanism to help reach mtigation targets. |
| 2238 | All AR5 | 1 | | | | This whole Report is based on the assumption that emissions of greenhouse gases have a harmful effect on the climate. There is no evidence for this assumption, so the entire Report is unnecessary..This assumption is based on personal opinions of the value of the absurd model of the climate sponsored by the IPCC. These opinions are made by people paid to make them, so the conflict of interest means that they are worthless. | Rejected. We are assessing the science of climate change mitigation in the WG3 contribution. Potentially harmful climate impacts and the physical science foundations are discussed by WGs 1 |
| 2239 | All AR5 | 1 | | | | Annex 1 Should have definitions for CONVECTION and LATENT HEAT which are the most important methods of heat transfer in atmosphere | Noted. |
| 16665 | All AR5 | 1 | | | | I mainly reviewed chapters 3 and 4. There is a lot of both overlap and inconsistency between them, and a great deal of self-reference on the part of some of the authors. This compromises the claim that this report is supposed to provide a snapshot of the state of the art in this field. Some references should be deleted as not central to the climate ethics discussion (or at least multiple references to the same piece), and others added. I feel awkward about the fact that many of the references that I suggest adding are to my work. On the other hand it seems strange that after 24 years of contributing to this field there is no mention of my work in the 24 pages of chapter 3 references. A further point: I have a lingering concern that both chapters are too prescriptive for an IPCC report. | Noted. We have worked on the overlap between chapters 3 and 4 and will continue to do so. We continuously update the references during the drafting process. |
| 6220 | All AR5 | 1 | | 1555 | | Throughout the report the graphs are much too complicated and need considerable simplification and careful consideration needs to be given to the colours used. Complicated graphs impede understanding of the message. | Accepted. The work on figure material has been a key focus during the revisions and will received continued priority. Note once the figure material is |
| 12908 | All AR5 | 1 | | | | The FOD seems to have still value judgements in which should be avoided. | Rejected. Value judgements cannot be avoided, but need to be made transparent. For this very reason, WG3 has provided an array of three framing |
| 15051 | All AR5 | 1 | 1 | 36 | 41 | Annex I - The definition of value capture, walkability, complete streets, automotive dependence, automobility were not considered in the glossary. | Noted. |
| 15052 | All AR5 | 1 | 1 | 36 | 41 | Annex I - The definition black carbon sould be improved to fit Chapter 8. | Noted. |
| 15053 | All AR5 | 1 | 1 | 36 | 41 | The following a anacronysm that are importatn for Chapter 8 were not considered: TOD, BRT, LRT, PRT, HRT, LDV, ICE, CH4, EV, BEV, PHEV, NGV, FCV, V2G, ITS, VKT | Noted. |

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| 7050 | All AR5 | 1 | 1 | 1 | 1 | Did not use this row because "Comment" field does not wrap. | Noted. |
| 7075 | All AR5 | 1 | 1 | 1 | 1 | this line not used because the cell does not wrap the text | Noted. |
| 4689 | All AR5 | 14 | | | | throughout the FOD, particularly noted in Chapter 1 (p. 14), Chapter 6 (p. 15) and Chapter 8 (p. 52) the loose references to 2 degrees Celsius temperature targets detract from the effectiveness of the work. In the 2010 paper by Boykoff, Frame and Randalls ''Discursive stability meets climate instability: A critical exploration of the concept of 'climate stabilization' in contemporary climate policy', Global Environmental Change, 20(1), 53-64, they state the following: An important framing of climate science and policy today revolves around the concept of 'climate stabilization'. While many factors contributed to the rise of this concept in the 1980s, this article reasons that this 'stabilization' discourse is problematic. Drawing upon emerging climate science, the article suggests that the heavy focus on monotonically increasing concentration pathways, stabilization and climate sensitivity have led to insufficient policy inferences relating to the range of uncertainties, the weak relevance of equilibrium for today's policy and the idea that there is a magical threshold of 'dangerous anthropogenic interference'. However, this article argues that the stabilization-based discourse became attractive because stabilization and its ancillary concepts developed from the connected arenas of climate science, environmental economics and energy concerns. That this discourse is tethered to these ways of thinking is unsurprising; but that it has remained relatively free of critical scrutiny can be associated with fears of unsettling often-tenuous political processes taking place at multiple scales. Nonetheless, with this historical trajectory in mind and on the cusp of an agreement in Copenhagen to succeed the Kyoto Protocol, we argue that the time has come to re-assess the concept of stabilization and to explicitly move to more productive ways of framing action to address anthropogenic climate change. The implications of this historical analysis is that stabilization is a problematic way of conceptualizing climate policy and that new approaches need to be found that focus on short- to medium-term decarbonization goals. This needs to be considered when making these claims, and/or parroting comments from UN negotiations between parties. | Noted. |
| 4345 | All AR5 | 4 | 16 | 4 | 22 | "production-side option" and "demand-side potion" are new categories. Detail explanation is necessary in the first place of this section. Figure or table may be helpful for understand. I can see the word of "supply-side" in the text. Is this same as "production side"? | Noted. |
| 4346 | All AR5 | 4 | 1 | 5 | 26 | The authors seem to avoid duplicative discussion in AR4, but important massages to political decision makers should be incooporated. It would be better to address clearly on several options relating to forestry. | Accepted. We continue to focus on "what's new", but restate AR4 finding if |
| 16052 | All AR5 | 5 | | | | The message of AR5 could be more assertive on the remaining possibility or not of sufficient mitigation to attain international goals limiting climate change, either at the technical or political levels. Yes or no is it still possible? If no consensus is here, could the report at least be blunt about the lack of consensus? | Rejected. Feasibility of goals cannot be easily assessed by science. We outline the economic, technological andinstitutional requirements and as such provide a basis for policymakers to |
| 2160 | All AR5 | All | | | | Although the Contribution's recommendations are directed at policy makers, it lacks specific "sectoral" policy recommendations that could drive transformation of engineering practices through regulatory and standard changes. Without setting such policies directed at engineering practices, engineers might be slow to adapt their practices that are necessary prerequisites to any adaptation of the built environment/infrastructure to climate change. It seems to me that the Contribution has the objective of recommending policy changes at sectoral/high level, and does not go to specificity levels that are appropriate for engineers to take hold of something as a basis to transform engineering practices. It might be necessary to have an additional effort by another group to take these policies in the Contribution and establish policy interpretations to bring them to engineering-specific changes in standards and practices. | Rejected. We have a whole serious of sector chapters, which make important conclusions, which are also relevant to engineering. |
| 8358 | All AR5 | all | | | | CO2, Co2, CH4, SO2, N2O and etc. should be revised according to their mocular formula. | Noted. |

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| 3485 | All AR5 | all | | | | Throughout the entire report, chemical symbols are written incorrectly, without subscripts and superscripts. For example, the correct symbol for CO2 has the 2 as a subscript [this form does not allow me to format it correctly]. Sometimes you have it right, but in many places it is wrong. This needs to be cleaned up for all chemical symbols throughout the report. | Accepted. We have been revieweing this and will continue to do so. |
| 7653 | All AR5 | Annex I, 7 | | | | Could add 'carbon footprint' to the Glossary, e.g. from; Wiedmann, T. and Minx, J. (2008) A Definition of 'Carbon Footprint'. In: C. C. Pertsova, Ecological Economics Research Trends, 1: Chapter 1, pp. 1-11, Nova Science Publishers, Hauppauge NY, USA. https://www.novapublishers.com/catalog/product_info.php?products_id=5999 | Noted. |
| 9098 | 1 | | | | | Totally appropriate concept | Noted |
| 17119 | 1 | | | | | This chapter does not have any acknowledgement of the global climate advocacy efforts of local governments that has focused through Local Government Climate Roadmap in 2007. A major outcome of the process was the Global Cities Covenant on Climate - the Mexico City Pact which has an international secretariat and regularly monitors progress of signatories. carbonn Cities Climate Registry in an important effort of local governments for measurable, reportable, verifiable climate action, which captures information of more than 170 cities worldwide as of July 2012. Recognition of local governments as governmental stakeholders in para.7 of Cancun Decisions is also important reflection of all these efforts in to UNFCCC processes.This is partciularly important because many of these efforts have been realized or intensified since the relase of AR4. I believe the chapter should also have a bit more reference of theissue of urvanizatuon and global GHG emissions since there are significant number of pages in the whole WGIII Report. | Accepted - Added sentence, "A large array of mitigation actions have also been planned and orchestrated by local governemnts, including cities that are working in concert on climate change issues through parternships such as the C40, and there is some evidence that these efforts are intensifying. " [cite para 7 of Cancun decisions on local action/cities; add cross-reference to chapter 15] |
| 17739 | 1 | | | | | Overall, this chapter should be checked by the authors once again when other chapters have been finalised. At the end, there should be a paragraph on identifying each chapter and what these are about. | Noted |
| 5460 | 1 | | | | | This chapter attempts to summarize changes in emissions, changes in how emissions are viewed (multiple perspectives here) and emissions in a broader context of a paradigm shift in how climate change is considered- here in a much broader context of sustainable development. While the authors present a range of figures- the grouping of figures in 1.7 seems both too complex and too simplistic. (b) in this figure dramatically shows the importance of world trade - this deserves a clearer emphasis and additional discussion- perhaps best to put this in a seperate section. The discussion of sustainable development and the interaction with climate change is critical and is an important part of the chapter- but some type of figure to illustrate what is potential with this interaction would be very helpful for the reader | Rejected, it is not practical to address sustainable development coherently in a figure, and there are lots of ways to organize the material here. |
| 4138 | 1 | | | | | It would be helpful it you could develop section 1.5 and maybe merge it with section 1.4 because it seems that the latter already contains some material on key issues focused on by subsequent chapters. | Taken into account - we will streamline at final |
| 4139 | 1 | | | | | Please review section 1.3 in light of chapter 5 discussions. If you feel that this section contains redundant and/or inconsistent duplications of chapter 5 discussions, please revise your sections. | Accepted - we have redrafted and streamlined |
| 4140 | 1 | | | | | It would be useful if your Introduction to the report also said something about its underlying assessment philosophy and related key issues in the science-policy interface. This discussion should be related to the AR5 roadmap (section 1.5) because one key purpose of the framing chapters is to establish transparency over normative assumptions that are implicit in the concepts and methods used by later chapters to assess transformation pathways. The need to do this arises from our assessment philosophy. Please liaise with the Co-Chairs and chapter 2 authors (section 2.4.5.3) to discuss how to introduce the AR5 assessment philosophy. | Taken into account - we will streamline at final |
| 8910 | 1 | | | | | Please make sure that all abbreviations are explained in the text and that legends to figures include the abbreviations used in a figure. | Editorial – copyedit to be completed prior to publication |
| 4469 | 1 | | | | | In general, the Figures are hard to read, even on a high-resolution computer screen. This will be a problem for those accessing the Report online. | Figures will be re-designed for print and on-screen display for final draft. |
| 2347 | 1 | | | | | <no comment here as cells could not be enlarged to fit the text> | no comment text submitted to database |

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| 2353 | 1 | | | | | Exclude findings/results from the introduction. Those should go to the "technical summary" and the SPM. I recommend to focus the introduction to "what did we do and how did we do it" in AR5 WGIII. | no action needed--we will have figures and tables in chapter 1 |
| 9782 | 1 | | | | | Environmental impact categories beside Global Warming Potential and trade-offs between them, should be stressed throughout the report | Noted - we already discuss interactions between impacts. No further action |
| 9777 | 1 | | | | | (a)and (b) is not good only to give "change in emissions", suggest to give us as "emission in 1900,1990 and 2008" | Rejected, exactly that information is presented elsewhere in the chapter and |
| 16200 | 1 | | | | | Needs a legend for the abbreviations of the regions | Taken into account - figures will be re-designed for print and on-screen for final |
| 18013 | 1 | | | | | It is general position of the developing world that the principle and provisions of the UNFCCC should not be changed. The current negotiation under the Durban platform does not have the mandate to modify or replace the UNFCCC. So it is important that this section dose not send wrong signals to the UN process. | Noted. |
| 17480 | 1 | | | | | Resolution of 1.7a is so poor as to prevent reading or review | Taken into account - Figures will be re-designed for print and on-screen display |
| 17481 | 1 | | | | | Captioning is quite inadequate. For panel a, there should be some guidance as to interpretation, i.e., helping reader to "read" the graph. Axis labels and legends are so small as to be unreadable even when viewed on screen at 100% size. | Taken into account - Figures will be re-designed for print and on-screen display for final draft. |
| 17795 | 1 | | | | | General: It would be useful to explain in the first pages also - why little focsu has been given to other sectors then energy which had however as of AR4 a significant mitigation potential - e.g. households. I find it interesting that the authors rely a lot on the recent big energy reports e.g. GEA, WEO, IPCC etc - rather then having a slightly less global reports biased approach. If it is really so that in the other areas | Rejected. No action needed. |
| 17796 | 1 | | | | | contl little progress has been done - then there should be a call for more research or analysis. | Noted |
| 17798 | 1 | | | | | contl would explain why these initiatives or not others have been selected | Noted |
| 17799 | 1 | | | | | The reference to the Fukushima accident and the implication for energy choices, e.g. a divided europe - might be elaboated in a way that it includes " the concern for population health of the Fukushima accident - has lead to a diferential approach between and within countries - also time will show how long the fears will prevail | Noted, no action needed. |
| 17802 | 1 | | | | | The style of the chapter in general could be improved - it has initial important developments - but does not outline for example the particular choices done in additional or more in depths analysis in the remaining chapters - it further does not shine - for referrences, and in some parts it appears to be a bit biased and narrow minded. A bit more relying on AR4 - and clearly evolve from some of the key messages - reported from wg 3 in the synthesis report could be important | Taken into account - we will streamline at final |
| 17803 | 1 | | | | | General: It would be useful to explain in the first pages also - why little focsu has been given to other sectors then energy which had however as of AR4 a significant mitigation potential - e.g. households. I find it interesting that the authors rely a l | Taken into account - we will streamline at final |
| 17801 | 1 | | | | | In paticular Figure b - could be better worked out - and with the raw data - of the 1,b,c,d - could not linkages created??? | Rejected, these are already quite complicated; adding more linkages is |
| 15265 | 1 | | | | | I consider the approach of Chapter 1 is very pragmatic, and it is crucial for the real challenge to the global worming. Especially, regarding with the current situation of the world, the realistic description on the hardness to stop warming at +2oC (P22L19), and on climate problem location as one of the wider array of urgent priorities that governments face (P22L44) are plausible. | Noted |
| 17399 | 1 | | | | | In general, I recommend caution with portraying the climate change mitigation challenge as exclusively linked to energy to the exclusion of agriculture, forestry and other land uses. See Ch 1 pp 15-16 for quantitative basis for giving adequate attention to AFOLU. Also, Fig 1.5 illustrates the significance of AFOLU in many regions. Further, changes in land use offer mitigation responses that can both reduce GHG emissions and also sequester atmospheric C. | Accepted - added discussion of land use. |

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| 15455 | 1 | | | | | While the report as a whole deals with gender issues quite substantially, the Introduction does not refer to women specific issues, or problems of gender. Since there is now substantial literature on gender and climate change issues, as well as a vast literature pertaining to feminization of agriculture and pastoral economies, and feminization of poverty - both tangentially and directly implicated with climate change related vulnerability and adaptation - the Introductory chapter MUST introduce the problem of gender, and the need to have a women focus on adaptation strategies. | Noted - no action needed; there is no literature to engage nor other chapters to engage |
| 18124 | 1 | | | | | c) Figures a and b may be a bit too small - I had to blow it up to 300% to see the details. | Figures will be re-designed for print and on-screen for final draft. |
| 5313 | 1 | | | | | is written very well and well balanced, also highlighting the trade-off between investment in green house gas mitigation and other important issues such as poverty reduction and so on. | Noted |
| 5314 | 1 | | | | | Chapter 1 is written very well and well balanced, also highlighting the trade-off between investment in green house gas mitigation and other important issues such as poverty reduction and so on. | Noted |
| 3048 | 1 | | | | | The following comments apply only to the rebound and energy efficiency aspects of the models listed in Table 1.8. Accompanying this submission is a Word document, "Rebound Comparison of Models Listed in Figure 1.8.docx" containing a table comparing all the models across the dimension of rebound-relevant features. These seven features are:<br>- Production function form<br>- Factor substitutability<br>- Factor prices<br>- Efficiency technology method<br>- Multi-factor technology gains considered?<br>- Productive ("embedded") vs End-use energy consumption distinction?<br>- Consumer re-spending effects considered? | Rejected - relevant for another chapter; chapter 1 draws on chapter 6, where the models are discussed in greater detail. |
| 3049 | 1 | | | | | While many of these models are extremely rich in detail, fundamental determinants of energy efficiency rebound, and thus of energy use itself, are perhaps underdeveloped by comparison to other model features. No model considers all the rebound-relevant characteristics listed above. | Rejected - This is not a EMF model intercomparison document. It just reviews what is out there. |
| 3050 | 1 | | | | | A number of the models use some version of a CES production function, sometimes with nestings of Cobb-Douglas or Leontief. It is known that CES functions are fairly "rebound-flexible," but have the disadvantage that energy use in response to price and rebound effects of efficiency gains are determined overwhelmingly by the energy elasticity of substitution. Therefore, these models' energy results are largely determined by modelers' choice of this elasticity's numeric value. This points to modelers needing to be careful in selecting the parametric value and clear in reporting it so comparisons can be made. Ideally, this value will be econometrically measured, not simply assumed. Merely assuming a value is tantamount to pre-determining the results. The simplicity of the CES function also suggests that models would benefit from a less arbitrary choice of production function, more general and more flexible. A rigorous comparison of production functions for uses such as these is given in [H.D. Saunders, "Fuel conserving (and using) production functions," Energy Economics 30 (2008) 2184 2235.]. The importance of the core substitution elasticity in CES production functions is shown there and in [H. Saunders, "The Khazzoom-Brookes postulate and neoclassical growth," The Energy Journal 13(4) (1992) 131 148].<br>There is also the thorny question of how to nest these various production functions, as the nesting scheme matters to the results. Turner and her colleagues [karen.turner@stir.ac.uk] have expended considerable effort looking at this question. | Rejected - relevant for another chapter; chapter 1 draws on chapter 6, where the models are discussed in greater detail. |
| 3051 | 1 | | | | | Models using some form of the Kaya identity face all the problems listed above related to the energy intensity term. | Noted |
| 3052 | 1 | | | | | Since factor substitutability is such a key driver on the production side, the more explicit the model in depicting this, the more credible the result. | Rejected - relevant for another chapter; chapter 1 draws on chapter 6, where the |

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| 3053 | 1 | | | | | For those models using a production function approach, the manner in which energy efficiency gains are introduced is important. Arguably, a factor-augmenting approach is best, as it fits most closely with engineering concepts and can be econometrically measured. The AEEI concept creates some issues when introduced in the traditional way to a CES function. That is, when translated into an equivalent factor-augmenting expression, the functional form is difficult to interpret in anything resembling a commonsense engineering depiction of the efficiency technology being implemented.<br>The article cited previously shows how factor-augmenting technology terms can be measured econometrically [ref: H.D. Saunders, "Historical evidence for rebound in 30 US sectors, and a toolkit for rebound analysts," (2011, under review) available at http://works.bepress.com/harry_saunders/9/] and another reference shows how such terms can be assessed consistent with engineering principles [for detail on obtaining engineering assessments of energy-augmenting technical change see also H. D. Saunders. "Specifying technology for analyzing rebound" in: Energy efficiency and Sustainable Consumption: Dealing with the rebound effect. Ed. H. Herring and S.Sorrell. Palgrave Macmillan, 2009. link available at: http://works.bepress.com/harry_saunders/12/]. | Rejected - relevant for another chapter; chapter 1 draws on chapter 6, where the models are discussed in greater detail. |
| 3054 | 1 | | | | | No models explicitly incorporate consideration for technology gains that apply to other factors of production, with the exception of WITCH, which introduces a neutral technology gain parameter (TFP), and the possible exception of MESSAGE, if it considers technology gains for other factors via its annual "recalibration" approach. Technology gains for other factors have a huge impact on energy consumption [H. Saunders, "The Khazzoom-Brookes postulate and neoclassical growth," The Energy Journal 13(4) (1992) 131 148] and [H.D. Saunders, "Historical evidence for rebound in 30 US sectors, and a toolkit for rebound analysts," (2011, under review) available at http://works.bepress.com/harry_saunders/9/]. Research is needed to evaluate this effect on energy use more explicitly to improve forecasting. | Rejected - relevant for another chapter; chapter 1 draws on chapter 6, where the models are discussed in greater detail. |
| 3055 | 1 | | | | | None of these models apparently incorporates the ability to partition energy efficiency gains as between productive and end use sectors. Some use a traditional Residential/Commercial/Industrial/Transportation partitioning, but none distinguish efficiency gains in households and for personal transportation (where utility maximization is the driver) from energy efficiency gains in the productive part of the economy (where profit-maximazation is the driver). The productive side of the energy economy (including commercial/industrial/commercial transportation sectors) is where energy becomes "embedded" in the goods and services provided. Efficiency gains are likely to have very different effects in these two components of the energy economy. | Rejected - relevant for another chapter; chapter 1 draws on chapter 6, where the models are discussed in greater detail. |
| 3056 | 1 | | | | | None of these models seems to take advantage of new research on end-use consumer "indirect" or "re-spending" effects. Several researchers have found fairly significant rebounds owing to these effects [Druckman, A., Chitnis, M., Sorrell, S. and Jackson, T., 2011 Missing carbon reductions? Exploring rebound and backfire effects in UK households. Energy Policy, 39, 3572-3581.] and [Thomas, B. A., Azevedo, I. under review, 2012 Direct and Indirect Rebound Effects for the U.S. Household Using a Partial Equilibrium Model. Working paper available at: http://www.andrew.cmu.edu/user/ilimade/Ines_Azevedo/Home.html] and [H.D. Saunders, "An Income-based Analysis of Historical US Energy Consumption" Available at: http://works.bepress.com/harry_saunders/27 (2012, under review)]. Any discussion of rebound should acknowledge direct and indirect effects on both the end use side and the production side of the energy economy. These effects may be strongly additive. | Rejected - relevant for another chapter; chapter 1 draws on chapter 6, where the models are discussed in greater detail. |
| 4368 | 1 | | | | | A general comment on chapter 1: I find it difficult to appreciate the cost of implementing mitigation and adaptation measures. May be it would help to compare estimation of this cost against other expenses such as the cost of the recent economic crisis, the cost of military conflicts around the world, etc | Noted |
| 10460 | 1 | | | | | A good chapter and mostly well written. Need to avoid personal pronouns though throughout. | Taken into account - we will streamline |

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| 10676 | 1 | | | | | Show 2100 chart from Unger as well, to demonstrate how importance of emissions depends on time horizon? Although this is shown in Figure 8.2.1, I'm not sure that readers of the current draft would go to the transport chapter to find it. | Rejected - figure has been replaced |
| 10374 | 1 | | | | | We suggest to adopt more models from developing countries, so that to convince developing countries taking part in mitigation. Our model also produce the BAU emissin, in which emission in 2100 and 2050 is about 70 GTC and 48GTC respectively. So we may suggest to include some other models from developing countries, especially the IAM which is different with the ones AR5 has selected. | Rejected - relevant for another chapter; chapter 1 draws on chapter 6, where the models are discussed in greater detail. |
| 9923 | 1 | | | | | Resolution is too low to read the data and legend clearly. | Taken into account - figures will be re-designed for print and on-screen for final |
| 9924 | 1 | | | | | Resolution is too low to read. | Taken into account - will be done as part |
| 9925 | 1 | | | | | Assumptions for economic growth, technological change and population growth etc. vary in different models. So BAU emissions from different models are non-comparable only if all the model assumupations are also list as complements. | Rejected - relevant for another chapter; chapter 1 draws on chapter 6, where the models are discussed in greater detail. |
| 18420 | 1 | | | | | main messages and changes since AR4 | No action needed |
| 9928 | 1 | | | | | It's very helpful to highlight issues learned after AR4, but as a response to those issues should be reflected in the following chapters. So that we can see the progress IPCC made after AR4. | Noted |
| 17003 | 1 | | | | | The lack of any discussion on hydro is a glaring omissions. Both large-scale and the potential for micro-hydro, especially in non-grid-connected areas. | Rejected, hydro's potential in mitigation is comparatively limited. |
| 18425 | 1 | | | | | Energy supply<br>Again, the tone is rather optimistic, because it emphasizes the growth of alternative sources of energy (which is true) but does not acknowledge completely the trends in coal, and oil, especially horrible sources like tar sands. Regarding shale gas, the report does not fully recognize the potential problems with this source, in terms of delaying investment in cleaner energy technologies. □ | Accepted - added a declarative statement about coal and more discussion on drivers of emissions |
| 18426 | 1 | | | | | International organizations and agreements<br>It is interesting that the report recognizes the growing of different forms of institutional structures in dealing with climate change, such as G-20 and g-8. But, no surprise here, it fails to acknowledge that the failure of UNFCCC in 2009 is due to structural problems of that kind of negotiating platform.<br>The review of the research agenda of RI and climate change is excessively concentrated in liberal-institutionalism agenda, and does not acknowledge constructivist and especially global governance approaches. □ | Accepted, will add some mention of constructivist work, but if you look at the reference to Hafner-Burton et al (2012) you will see that work cited heavily |
| 3310 | 1 | | | | | I find this section and its graph nearly inscrutible. | Noted - all figures completely redone |
| 10675 | 1 | | | | | Short-lived forcings (especially methane, ozone and black carbon) are a hot policy topic given the recent UNEP report and the formation of the Climate & Clean Air Coalition. I am not sure that this section - plus the reference to a slightly obscure section of the transport chapter - contains sufficient detail and perspective given its policy relevance. For instance, it does not cite Shindell et a. (2012) "Simultaneously Mitigating Near-Term Climate Change and Improving<br>Human Health and Food Security", published in Science, which underpins the UNEP report and is highly relevant. I think at least two points are missing from this discussion. First, these emissions are not limited to the transport sector: they are relevant to biomass burning for energy and larger fossil fuel plants. Second, action on short-lived forcings are not a substitute for mitigation of CO2: peak temperature limits such as 2 degrees can only be met by bringing CO2 emissions to near zero; emission rates of short-lived forcings then add some additional warming to that peak. But the reverse is not true: bringing short-lived emissions to zero cannot limit peak warming under conditions of non-zero CO2 emission rates (this could be demonstrated by reproducing Shindell et al. Figure 1, but critically extending it to beyond the point at which temperature peaks in the 'CO2 measures' scenario, if the data are available). I would like to see these points discussed, perhaps in a more appropriate section of the report such as chapter 5 or section 1.4. | Accepted - cites to Shindell, UNEP on "black carbon", and Victor, Kennel, and Ramanathan (2012) in Foreign Affairs added in section on short-lived climate pollutants |

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| 18427 | 1 | | | | | Emission trajectory<br>I think this part could be more assertive regarding the path of emission rate, putting numbers and showing how far we are from a stabilization path. | Taken into account - text was rewritten and plans to update the figure showing the gap |
| 12514 | 1 | | | | | Generally, the discussion in Chapter 1 and specifically in this section does not treat energy efficiency and demand side measures generally with the fortitude that they deserve. As important as supply side measures are, this imbalance should be addressed. Numerous studies since the early 1970s have documented the benefits of energy efficiency and indeed its crucial role in mitigation. The draft documents this extensively in later sections. There is no doubt that energy efficiency at scale is an essential strategic approach to reducing emissions and climate risk, and additional discussion to that effect is in order. | Noted, we can add two more sentences on efficiency |
| 10833 | 1 | | | | | I understand what you are trying to do here, to show different perspectives at lookin at emissions, but since you only cover four, you are opening yourself to a critique for what you have missed… The main point is not to miss the most obvious ones. For example, what about annual emissions (the current approach), what about historic emissions (as often debated), etc. I am surprised that these two are not included. Then there are others, such as ability to pay... | Taken into account - we will be adding cumulative emissions |
| 18129 | 1 | | | | | a) Overall it would be good to elaborate if the discussion on perspectives refers to all GHGs or only CO2. For figures 1.7a and b, it is clear that the former refers to all GHGs whilst the latter only to CO2. However for figures 1.7 c and d, elaboration on this is required as ranking and persepctives may vary depending on the GHGs considered and the data sources used (especially for more uncertain sectors like forestry). Transparency here is therefore important.<br>b) The axis marking for the y-axis for 1.7a is very difficult to read - CO2? | Noted - all figures completely redone; rest of text is pretty clear about which ghgs are covered |
| 4472 | 1 | | | | | This section is unduly pessimistic. It should be expanded to include the results of as Stern (2009) and other estimates that place the global effort that would be required to de-carbonize the global economy by 2100 at around 1 to 2 percent of global GDP. This is surely a very large effort, but it is possible. The models are not the same as reality; projections of what is feasible or not over a 100-year horizon need to be much more heavily qualified than they are in this section. | Rejected, section on achievable targets totally rewritten to make conditions clearer |
| 18133 | 1 | | | | | Geoengineering is mentioned several times in this section. What is entails should be briefly described. | Rejected, term will be explained in |
| 12193 | 1 | | | | | General comment for the chapter: Chapter 1 is an introductory chapter. Reading chapter 1.4.5 it is not quite clear to me, what the task/function of the chapter is. Is it to structure the following research on related topics in the report? Is it to provide an overview on past research results in this field since AR4? As it is organized now, it is very general and not comprehensive/balanced, reflecting the literature or possible questions of this topic. The text includes only one reference. What about the related body of literature on “collective action”, for example? | Noted. This wil be clearer when we add a roadmap to other chapters and when the SPM figures out its key messages |
| 4142 | 1 | | | | | You might want to consider additional questions for the FAQs, e.g. "What is new in the AR5?" or "Why and how does the AR5 assess recent findings on climate change mitigation?". | Rejected, a topic like "what is new" is too broad. No action needed |
| 10266 | 1 | 0 | | | | Highly balanced descriptions have been done in this chapter. Excellent. | Noted |

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| 9093 | 1 | 0 | | | | The analysis not only must be focused in the total rise of the emissions of the greenhouse gases (GHG), but also starting from the real bases of the very high emissions originated in developed countries, and those emissions issued in the developing countries which are in comparison very little.<br><br>The developed countries are responsible for the base emission of GHG that has led to the climate change now threatening humanity due to their historical and systematic policies of excessive consumption of good and the irrational appropriation and exploitation of the countries` natural resources and also the natural wealth of the developing countries.<br>That is the reason, why in the analysis of the mitigation, it is essential to include transparent considerations that lead to the change these policies from developed countries. | Noted. This will be clearer when we add a perspective on cumulative emissions. |
| 13357 | 1 | 0 | | | | This chapter is very fine in many ways. It is well structured, throughly researched, and its overall argument is clearly put. Given this, please forgive the fact that, for brevity's sake, I'll offer corrective comments and criticisms which may make the tone of my response seem unduly negative. | Noted |
| 2151 | 1 | 0 | | | | <no comment here as cells could not be enlarged to fit the text> | no comment text submitted to database |
| 2152 | 1 | 0 | | | | The key messages of the executive summary do not yet come across in a clear manner. Currently the executive summary is to a large extent a (apologies!) collection of key elements of AR5. In my view it needs to be organized around the set of 5-10 key messages which are the essential ones. Those are the ones which you want to bring to policy makers, businesses, and other decision makers. (Former consultant cannot avoid the advice: Take 1 single piece of paper and write down what those 5-10 messages are) | Noted |
| 2153 | 1 | 0 | | | | I recognize that the discussions needed in AR5 on mitigation are broader than in AR4. The main audience of this report are policy makers and businesses who should be motivated to action, as well as the broader public who want to understand what climate change means to the world. Their main questions are still "What can we do to limit global warming? Can we stabilize at 2°C warming? Which measures would need to be pursued and how much reduction contribution do they have? And what will mitigation cost?" Now, the executive summary does not really answer this central set of questions, which should be amended substantially. | Noted. Some of those questions are answered. Executive Summary will be developed further along with chapter. |
| 16913 | 1 | 0 | | | | A well written and professional chapter; however its exact role in relation to the full report and depth of connection to its contents is unclear, and it does have some specific problems. Focusing on the “six arguments” feels a bit unusual for an introductory chapter – but it’s a lot better than anodyne summary so I would incline to keep it. | Noted - No action needed. Our inclination is to keep the 6 arguments as well, but we need to see what comes from the SPM. |
| 16914 | 1 | 0 | | | | The overall “tone” emerging in chapter 1 is pessimistic. This would reflect reasonable judgement – particularly viewed from a North American or ‘current global trends’ perspective - but I think should be more cautious (see some of specific comments below); history is marked by discontinuities. It looks like the language on 2 deg.C has already been quite carefully crafted (“the current trajectory is inconsistent..”), but it is important that the overall message on 2 deg.C is anchored in Chapter 6, and presented with care and consensus. | Taken into account - tone adjusted slightly but message remains the same |
| 4829 | 1 | 0 | | | | With my background in environmental psychology I am happy to see that the WG III report takes findings produced by social science much more into account than previous reports. However, the introduction does not reflect this scope properly as it is strongly dominated by behavioural economy. I would like to see more references to later chapters in the introduction already since this will be read by more people than the whole report. | Noted. |

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| 4315 | 1 | 0 | | 0 | | This figure only goes back to 2000. It therefore gives a misleading impression that recent prices are exceptional. It also uses actual prices rather than correcting them for inflation. This exacerbates the misleading impression. http://inflationdata.com/Inflation/Inflation_Rate/Historical_Oil_Prices_Chart.asp gives a much more accurate message. | Rejected. Quoting nominal prices is fine. Our point is not a long discussion of oil prices but some context. |
| 18401 | 1 | 0 | | | | 1. It would have been very nice to have right here some information in advance (what can be done, what have been not done) about the economic potential for mitigation. | Noted - some of this will be addressed through our discussion of what is achievable and the updating of the EMF |
| 18402 | 1 | 0 | | | | 2. The chapter is not well balanced within countries and groups of countries. Nothing to say also in an elegant way about performance or results of Annex 1 countries with regard to commitments of the Kyoto Protocol. BRICK´s seems to be the bad guys. Remember that the lowering on emissions after 1990 was due to emissions of so called economies in transition due to economic crisis. This is well documented and IPCC cannot ignore it. | Noted. We have four (soon five) different persepctives on mititgation Some make the BRiCs look good; others bad. |
| 18403 | 1 | 0 | | | | 3. Executive Summary | no action needed |
| 18577 | 1 | 0 | | | | As a reader I expect to find an overview of the report, what it itends to do and also of main learnings. | Noted - this will be addressed when we add a roadmap to the report and also the |
| 18578 | 1 | 0 | | | | Ideally the introduction should help the reader to navigate through the extensive material. | Noted - this will be addressed when we add a roadmap to the report and also the |
| 18579 | 1 | 0 | | | | The chapter is at least readable but some sort of declared ambition is lacking. | Noted - some of this will be addressed through our discussion of what is achievable and the updating of the EMF |
| 18580 | 1 | 0 | | | | Addressing CC an important component of SD. Hardly a lesson as such but an important insight/ wider perspective | Noted. |
| 18581 | 1 | 0 | | | | Financial crisis/macroeconomic situation. Figures/date referring to 2009 and 2010. Will be pretty old and partly outdated when published. The interesting (and most sustainable?) part/conclusions:<br>Globl economic growth is shifting to the BRICS<br>Sharp rise in “embedded” emissions<br>Lower turnover in capital stocks in historically industrialized countries. Slow down in practical impact of policies | Noted - we have addressed all these points already in the text; however, financial performance figures might need updating |
| 8989 | 1 | 0 | | | | A fundamental framing issue that Chapter 1 must contend with is whether the assessment report will deal only with flow of current emissions or analyze this in the context of stock of emissions. Ignoring the role of the stock of gases in the framing chapter will make the whole assessment disconnected from reality and risks the presentation of an irrelevant report. | Taken into account - added chart on stock |
| 8990 | 1 | 0 | | | | It is important for the chapter to recognize the macroeconomic and development contrasts between developing and developed countries. The issue of lifestyles and consumption constrasts between developing and developed countries is not analyzed. The contrasting level of industrialization and urbanization is also ignored. It would be useful to discuss the distinction between luxury emissions in the developed countries, part of which is made possible by the exports from develoing countries produced with high emission and the survival emission in developing countries where the majority of populations still do not have access to modern sources of energy. | Noted - Most of these points need to be addressed in later chapters; some of the macro differences are addressed. |

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| 8991 | 1 | 0 | | | | The chapter highlights the global financial crisis but misinterprets its impact and its meaning. The discussion suggests that developing countries growth are decoupled from developed countries, and does not refer to analytical literature that the decoupling is mostly a myth. (For example, see Akyüz, Yilmaz. (2012). "The Staggering Rise of the South?" Research paper no. 44. The South Centre. Geneva and Izquierdo, A., Romero, R., Talvi, E. (2007), "Booms and Busts in Latin America: The Role of External Factors", Working Paper 631, IADB Research Department.) That the developing experienced deep economic downturns at the onset of the crisis in fact demonstrates that the "decoupling" hypothesis does not apply. The recovery in developing countries follows from the economic stimulus measures undertaken in response to the crisis – monetary easing and investment – which also helped in the quick recovery in commodity prices. The chapter mischaracterizes the growth of the BRICS during the crisis, but even in August 2012 the growth rate of all the BRICS has declined, mainly as a result of the slow growth and threatened recurrence of recession in the developed countries. | Taken into account - removed disucssion of causal reasons for the crisis |
| 8992 | 1 | 0 | | | | By emphasizing the recent and future trends emissions, the chapter inaccurately characterizes the climate change issue, shifting the blame to developing countries. This approach de-emphasizes the role of developed countries for the the long-lasting stock of CO2 which conflicts with the global climate change regime which recognizes the responsibility and leadership of developed countries to take action and address the problem. As a matter of accurancy, it is necessary for this chapter to have a comprehensive treatment of the role of the stock of emissions and historical responsibility. | Noted - we will consider expanding point on emissions |
| 8993 | 1 | 0 | | | | The chapter should put the use of the Kaya identity in its proper place. It is a well-known principle in social science that identities by themselves do not generate policy implications. An identity helps to categorize quantitative elemets of a total but ignores the relationship between the parts. For example, many of the arguments in the right side of the identity can be interdependent. The Kaya identity is particularly inaccurate when it is applied on country categories, ignoring levels of per capita income and emissions and irrespective of level of development and economic structure. For example, developed countries already have a larger proportion of GDP in highly technology and in services which have lower emissions. Developing countries still have a large proportion of their economies and their people in low skill, low productivity jobs and will require greater manufacturing activities which are more highly polluting than services industries. | Accepted - Added p.17., line 18: "Within broad groupings of countries—industrialized, and emerging and other developing—patterns are broadly similar, except for the energy intensity per unit of GDP due to shifts in time caused by different stages of industrialisation and subsequent shifts towards a more service-based economy, with related higher and lower levels of emission intensities." And modify p. 17 |
| 7856 | 1 | 0 | | | | Despite the claim to the contrary, the chapter is writtten in a value-laden language and contains many implicit value judgments. These should be made explicit and debated in chapter three. | Noted |
| 10829 | 1 | 0 | | | | Particularly in section 1.3, there is the use of "Annex I", "Annex II", and "Annex B". The first two relate to the UNFCCC and second to the KP, and "Annex I" is different to "Annex B". This is confusing for all but those deeply in the process. I suggest a box/FAQ define what "Annex I", "Annex II", and "Annex B" are and if they refer to the UNFCCC or KP. Following this, make sure the usage in section 1.3 is correct. | Accepted. Annex definitions will be part of the Glossary |
| 18390 | 1 | 0 | | | | This chapter is an overview of this IPCC Report but must contain some general points like: (a) Greenhouse gases are a stock pollutant as opposed to flow.<br>(b) The cause is anthropogenic. (c) Mainly due to industrialization of the advanced countries. | Noted |
| 18391 | 1 | 0 | | | | Mitigation can be over time. Who should bear the responsibility? Cannot be the rich nations alone but also developing countries but the latter must be compensated since they did not create the problem—transfer of technology, carbon permits etc. | No action needed |
| 18392 | 1 | 0 | | | | There is very weak evidence for macroeconomic decoupling, so it should not be<br>taken as an article of faith. Citibank says a one percent decline in US activity lowers the rest of the world's activities by 0.3 per cent or more. | Noted. Text adjusted, evidence is mixed. |
| 18393 | 1 | 0 | | | | So with a global slowdown, industrial activity gets lowered worldwide—good for the environment—but R & D etc also take a hit. | No action needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18394 | 1 | 0 | | | | Some more discussion on uncertainty, fat tails, especially in general equilibrium. | Noted, we have adjusted the text, issues will be discussed in Chapter 2 |
| 18395 | 1 | 0 | | | | Emphasize the point made about linking emissions to consumption rather than production. With international trade not all of China's emissions are for consumption in China. | Accepted - we have made this point and will embellish it with discussions of |
| 5425 | 1 | 0 | | | | I find the text rather biased. Intermittency is flagged as a problem for renewables, but it is not mentioned that there are proven solutions to most such problems. In contract, neither accidents, waste storage or profilation issues are noted for nuclear energy, and the Fukushima accident is mentioned as if it were a public relations issue. | Accepted, need to verify that discussion is balanced with advantages and flaws of all major technologies mentioned/illustrated. |
| 12907 | 1 | 0 | | | | Chapter 15 argues that the subnational governance level is important and that innovation is not just about technology but about situated sociotechnical systems. For example on Chap 15 p64 it is stated that 'Cities have become a critical site for the mobilisation of climate mitigation policy' and that 'new logics and practices for urban development' can realise climate change objectives 'achieving widespread 'transitions' to low carbon urban development' These are extremely important points yet the introductory chapter conspicuously fails to acknowledge them. If Chap 1 is intended to give an overview then it needs to address these issues much more directly and explicitly. | Noted. |
| 18416 | 1 | 0 | | | | There is a sort of tension in this chapter: on one hand, the intention to show that the current GHG emission path, climate modeling, and lack of profound mitigation measures are leading humanity towards a dangerous climate change scenario. On the other, there is some kind of optimism in relation to international arrangements (considering the failures of UNFCCC as temporary setbacks and highlighting actions taken by g-8, g-20 and BRICS) and national actions regarding climate mitigation. For instance, in the same page (22) the 2C target is both considered almost impossible (when talking about climate modeling) and then uncertain (when talking about global political responses).<br>However the tension, I think that the predominant vision in the chapter is the second one, which tries to highlight positive trends in low carbon political economy. Those positive trends exist, but they are by far overpassed by the scientific evidence regarding the degree of the climate problem. In this way, the scenario built in the chapter is inaccurate.<br>There is an unsurprising problem regarding the use of non-scientific UN vocabulary, such as developed and developing world. In my opinion it should be used the much realistic and accurate classification of the World Bank in four groups: High-income countries, Upper- middle-income countrie, Low-middle income countries and Low-income countries.<br>The acknowledgement of growing emissions in the emerging world is always treated with delicacy and moderation, as if the path of emission growth in these countries was not that threatening to climate stability. | Noted - this tension is unavoidable and part of the central tension in the socioeconomic literature, so if the chapter has a tension that is good. But our writing team needs to check if we have the right tension and also if we should shift usage in terminology. |
| 10372 | 1 | 0 | | | | Learn from the financial crisis in 2008, the security of nuclear energy should be reconsidered and should be highlighted in AR5. | Rejected. Nuclear security has no relation to the 2008 financial crisis. |
| 10373 | 1 | 0 | | | | Financial crisis has been mentioned in 1.2.1.2 as one of the issues learned after AR4. But please pay attentions to avoid provoking financial crises in mitigation in the future. If substaintial mitigations are implemented in the US and China, which are the major economic leaders over the world, it would be dangerous for the world economy. So we suggest to take optimal economic growth considered in mitigation actions. Based on our research, an EKC can be obtained with optimal economic growth. I will submit our paper, which is about optimal growth with mitigations, for your reference. | Noted, we reference the discussion of energy modeling under different scenarios and the possibility of higher-than-expected costs as well as lower-than-expected costs. |

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| 2332 | 1 | 0 | | | | In this chapter, there is lack of attention on Least Developed Countries and small islands under climate change scenarios and economic globalization. Climate Change and Economic Globalization are referred in multi dimensional and multi-scale contextual view. However, the analysis is mainly based on the new concept of double exposure to accentuate winners and losers of both processes simultaneously on region, sector, social group and Economical perspectives. Economic globalization signifies uneven development creating many social crises such as poverty, spatial division of labor and unemployment through capital flow and capital accumulation. Ironically, winners of economic advancement would lose dignity i.e. East Asian Crisis in 1997. Conversely, climate change might affect any person or geographical location without concerning socioeconomic status. Climate Change vulnerabilities cause starvation, declining production and economic recessions. Karen O'Brien and Robin Leichenko (2000) distinguish double winners and double losers of both global processes through the concept of double exposure (O'Brien & Leichenko, 2000, 227). In the regional perspective some geographical areas such as Sub Saharan Africa suffer from climate change and economic globalization. Many African countries are exacerbated from lack of advantages of Globalization and devastated climate changes. On the other hand, Agrarian Capitalist class, who captured economic dominant in Mexico gain lot of advantages, makes suppression on rural farmers. This sectoral perspective is applied to realize the rapid climate changes in Mexico in 1998 which alleviate the socioeconomic level of rural farmers declining below poverty line. Thus, I would like to suggest for reconsideration of the bottom line of this arguments while report always dealing with BRICS, emerging economics in developing countries perspective. # Necessary reference for this argument:- O'Brien, Karen L. & Leichenko, Robin M. 2000, "Double Exposure: assessing the impacts of climate change within the context of economic globalization" Global Environmental Change 10, Elsevier Science Ltd. 221-232. | Noted - Ch.1 needs more "granularity" outside Annnex-I and BRICS. |
| 4212 | 1 | 0 | | | | Chapter 1, or an Executive Summary, needs to be clear about the path to mitigation. A possible statement appears in Chapter 6, p5, line 29 "all countries must ultimately bring their emissions toward zero to meet any stabilization goal." However, this statement is too weak and fuzzy. Does "ultimately" mean 2050, 2100, or some, too late, date like 2500? Are "emissions" net emissions after sequestration measures are considered? If not, near zero emissions would be infeasible. Does "toward" mean an easy 10% reduction or a very challenging 90% reduction? | Taken into account - text to be improved |
| 4213 | 1 | 0 | | | | Chapter 1, and the report throughout, should be clear on the key roles of the private sector (businesses and individuals) which needs to understand the needs for, accept its roles in , and act to achieve GHG reduction. Public policies should encourage such actions to be rational economically and desirable socially, but private buy-in and initiative is essential. | Taken into account - text added on businesses |
| 11387 | 1 | 0 | | | | The authors seem to take the view that "green growth" is separate and distinct from "sustainable development" in terms of the conceptual framework and the policy approach. This view reflects the approach that has been pushed largely by the policymakers of developed countries in, for example, the context of the Rio+20 process in relation to the concept of "green economy" as well as through the work of the OECD through its "Green Growth Strategy." However, it should be noted that in the Rio+20 outcome, green economy concepts (which have often been understood as also including green growth concepts) and policies are to be "in the context of sustainable development and poverty eradication as one of the important tools to achieve sustainable development" and that countries that seek to apply and implement green economy policies "can choose an appropriate approach in accordance with national sustainable development plans, strategies and priorities." Politically at the multilateral policy level, therefore, the conceptualization of green growth as distinct from sustainable development is not accepted, particularly by developing countries. Instead, it is merely among the many approaches that various countries can use in order to achieve sustainable development. The Introduction Chapter should reflect this political consensus that was adopted in Rio+20. | Noted |

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| 11388 | 1 | 0 | | | | The discussion in the section on “International institutions and agreements” does not sufficiently discuss the point that UNFCCC gridlocks may be the result of political differences rather than the result of the policy architecture or the design of the UNFCCC itself. In not doing so, it creates an implication that there is a need to revamp or replace the UNFCCC given the difficulties in obtaining agreement under the UNFCCC. This kind of message, if not adequately corrected, could be used in the future to argue for a shift away from a UNFCCC-based and –centered multilateral policy regime for climate change to a new regime that moves away from the UNFCCC’s principles, provisions, and conceptual approach | Rejected. We have cited a variety of perspectives on this. No further action needed. |
| 11389 | 1 | 0 | | | | There are inconsistencies in the sourcing of references. While most references indicated in the bibliography come from peer-reviewed academic or scientific journals or official publications or reports of international organizations, a non-peer-reviewed speech of the head of an international organization and a news release from the same organization are used in at least two instances to support assertions in the text in relation to the impact of the global economic and financial crisis on global economic relations – assertions that then become part of the argument for stressing that the future responsibility for global emissions will come from “emerging economies”. Given the important role that such assertions play in setting the overall paradigm of the Introduction Chapter with respect to the “emerging economies” and their role in climate change mitigation, such assertions should be more adequately referenced and supported, and should also be balanced by a discussion on the continuing important role of developed countries in the context of their historical responsibility for GHG emissions | Noted, team will check references |
| 11390 | 1 | 0 | | | | There are also inaccurate references to the Copenhagen Accord and its proper context within the UNFCCC framework of decisions. The Introduction Chapter seems to assume that the Copenhagen Accord was an official product of the UNFCCC when in fact it is not. It was merely taken note of by the UNFCCC COP15 in Copenhagen, rather than being adopted as an official UNFCCC COP decision. As such, it is not an official UNFCCC document | Rejected - We wrote delegate "took note" of the Copenhagen Accord. No such expression as adopted. |
| 16078 | 1 | 0 | 0 | | | Whole Chapter : Overall a fairly well designed chapter, good reading, fairly balanced views. Maybe needs more focus on the goal of IPCC WGIII in the present work, such as "can we do it"? "can we do it in our present knowledge"? Can we do it in the present framework of negociations? | Noted - some of this will come from the SPM. That, in turn, will feed into the roadmap that our chapter offers for the |
| 4025 | 1 | 0 | 0 | 0 | 0 | Overall, the chapter is well written, though there is always room for improvement. Thank you. | thank you |
| 4316 | 1 | 0 | 0 | 0 | 0 | It claims that some change in climate is “inevitable". If it means that the climate changes naturally, then it is what everyone knows. If it means that “dangerous man-made global warming" (the redefined meaning of climate change) is inevitable, then it goes against even the P CC who claim that they have no more than a 90% confidence level. I would also point out that this confidence level is unsubstantiated by the data and by the IPCC's own assessment of uncertainties. It needs to be changed. | Rejected. It doesn't mean either of these. It means that because of buildup of gases already (and building that will occur in future) that the climate will change. |
| 3685 | 1 | 1 | | | | The report seems very concise and well written. Congratulations to the entire team | thank you |
| 3686 | 1 | 1 | | | | Executive Summary page 3 line 21 the write up is very good, it accepts the academic work of “how public opinion influences the design and stringency of climate change mitigation policies”. | No action needed |
| 3691 | 1 | 1 | | | | I am not sure the document summarizes the public opinion research, if not it is good two add two or three pages. I am ready to write if needed. | Noted |
| 3692 | 1 | 1 | | | | New References | Noted - no action needed, insufficient |
| 17744 | 1 | 1 | | | | For the executive summary - consider the formats used in chapters 16 and 10 | Noted |
| 4849 | 1 | 1 | | | | Ch.1 Introduction | Rejected, insufficient information |
| 4865 | 1 | 1 | | | | MISPRINTS etc. | Rejected, insufficient information |
| 9188 | 1 | 1 | | | | terminology: geoengineering should be SRM or CDR? Otherwise define geoengineering. | noted - refer to glossary that explains the term "geoengineering" |
| 9189 | 1 | 1 | | | | it should be noted the costs presented here is assuming that the governmental intervention is cost effective - often it is not the case. As such these are minimum cost estimate. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5755 | 1 | 1 | 1 | 33 | | Please revise all citations, embedding in the text failed in many cases and there are far too many brackets, even in the references' section. | Editorial – copyedit to be completed prior to publication |
| 18404 | 1 | 1 | 2 | | 12 | gives the impression that the mitigation effort has been consistent with the target of important emission reduction and concentration stabilization, but that is not the case. Giving a positive impression is not bad as policy for the report but the chapter need to answer the question if emission continues to increase since AR4. See rows 42 to 46, see also page 13, rows 20-21 and 1.3.1 | Rejected - counterfactual comment. Text is balanced. |
| 18405 | 1 | 1 | 27 | | 27 | I miss the argument that mitigation is not in contradiction with development policies. I´m sure there is literature on that issue. | Rejected - insufficient information |
| 17004 | 1 | 1 | 33 | | | Who are the "G8+5"?; again, these nations should be listed so a complete snapshot of the current situation in the world is given, while also allowing posterity to read this report and assess what each nation has done, what impact it has had, etc. | Accepted - text added to list G8+5 countries |
| 18406 | 1 | 1 | 43 | | 43 | “widely discussed policy goal”, not a scientific one. The chapter continues to quote the target without explicit consideration to science. Later on the chapter there is a sentence related to science “been elusive”. I think scientist do not approve such kind of goals and are no committed to approve that. This goal have never been discussed from the scientific perspective. | Rejected - statement is incorrect. There is massive scientific work analyzing the goal. |
| 12215 | 1 | 1 | 1 | | | This chapter is very well written, it has a good structure, is highly interesting, and the main points are clearly communicated. Congratulations! | thank you |
| 3364 | 1 | 10 | 1 | 10 | 4 | Shale gas has some issues with GHG emissions related to extraction. As currently deployed the GHG footprint could be worse than for coal. There are deep issues with the dynamics of gas deployment, which can make it either good or bad, depending on the context. For an argument on this, see Daniel Schrag: "Is Shale Gas Good for the Climate?". More generally, authors should be careful with examples, because there are always a lot of dependencies, and rarely black/white technologies... | Rejected - this is too much detail for this chapter |
| 16998 | 1 | 10 | 10 | 10 | 11 | Incomplete thought | Taken into account - combined with |
| 9267 | 1 | 10 | 11 | 10 | 20 | Please note that the Global CCS Institute will be publicly releasing its annual Global Status of CCS Projects Report in October 2012 (as it will for its update in 2013 in about October 2013). This report contains the most recent global assessment of the number of large-scale CCS projects segmented by their: location, sectoral application, project lifecycle status and scale of capture capacity (tonnes of CO2-e). It also contains comprehensive project survey analysis on both policy and regulatory matters. | thank you - reference to the report has been added |
| 17734 | 1 | 10 | 12 | | | replace the word "carbon" by "CO2" or "carbon dioxide" - to be consistent with all other chapters | Accepted - word replaced with "carbon dioxide" as suggested by commenter and to maintain consistency with IPCC |
| 13021 | 1 | 10 | 12 | 10 | 12 | This is the first introduction of the term "carbon capture and storage (CCS)." It is recommeded that the term be revised to the formal term "carbon dioxide capture and storage (CCS)" to reflect the Glossary since this is, in fact, the first introduction of the term. | Accepted - word replaced with "carbon dioxide" as suggested by commenter and to maintain consistency with IPCC |
| 10462 | 1 | 10 | 12 | | | Add reference to IPCC Special Report on CCS in 2005 | Rejected - reference is not needed; since 2005 a lot has happened, and most of it relates to issues we discuss--about |
| 3547 | 1 | 10 | 13 | 10 | 13 | "450 ppm" should be "450 ppm CO2-e" | this comment is correct but the paragraph has been revised and relevant |
| 14789 | 1 | 10 | 13 | | 14 | "…450ppm, which roughly corresponds with stopping warming at 2 degrees" This is neither a scientifically accurate nor politically helpful characterization. This concentration corresponds with a roughly 50% chance of EXCEEDING 2 degrees of warming. | Rejected - this is a good point but the paragraph has been revised and that sentence has been removed |
| 9921 | 1 | 10 | 13 | | 14 | A more detailed and convictive statement on the relationship between 450ppm by 2050 and 2degree by 2100 should be given. | this is a good point but the paragraph has been revised and that sentence has been removed. Also this issue is treated |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16895 | 1 | 10 | 14 | | 20 | Is it possible to reframe this? -- chapters 6 and 7 make very clear that economic modeling shows how important CCS is in terms of a low cost mitigation technology -- the cost of CCS is a large determinant in the likely CO2 price in a tightly constrained cap. | Taken into account - the paragraph has been revised |
| 12612 | 1 | 10 | 15 | 10 | 18 | The GCCSI clasification of a large scale CCS project includes a number of enhanced oil recovery projects that do not monitor or verify their emissions. The IEA CCS Technology Roadmap has a more widely accepted number of five large scale projects which currently store 6.5 million tonnes per year. | Taken into account - CCS project data has been updated, referencing the Global CCS Institute 2012 report |
| 12613 | 1 | 10 | 15 | 10 | 18 | On a per tonne of CO2 basis CCS costs can be as low as $15/tonne which is no more "extensive" than other CO2 mitigation technologies. | Rejected - no scientific evidence/publication provided to support |
| 12655 | 1 | 10 | 15 | 10 | 18 | The GCCSI clasification of a large scale CCS project includes a number of enhanced oil recovery projects that do not monitor or verify their emissions. The IEA CCS Technology Roadmap has a more widely accepted number of five large scale projects which currently store 6.5 million tonnes per year. | Taken into account - combined with other comments |
| 12656 | 1 | 10 | 15 | 10 | 18 | On a per tonne of CO2 basis CCS costs can be as low as $15/tonne which is no more "extensive" than other CO2 mitigation technologies. | identical to previous comment |
| 4092 | 1 | 10 | 15 | 10 | 15 | mid-2011 - update here and elsewhere. | Accepted, we will update |
| 18411 | 1 | 10 | 16 | | 16 | Is correct to say “avoided emissions” with respect to CCS or better “stored emissions”? | Rejected - the word avoided is fine. |
| 7149 | 1 | 10 | 16 | | 18 | The sentence about the savings in CO2 emissions, is positive and maybe even hopeful, but I wonder if it should be placed in context as it represents only about 0.1% savings in the global annual emissions. | Rejected - this may be true but what really matters is marginal cost PLUS |
| 17648 | 1 | 10 | 16 | 10 | 18 | The number 33 million would also be more informative if it were put into perspective, e.g. through a comparison of number of projects and avoided emissions in earlier years. | Rejected - this may be true but what really matters is marginal cost PLUS |
| 16999 | 1 | 10 | 16 | 10 | 18 | Put this number in context - comparable to the emissions of country XX | Rejected - this may be true but what really matters is marginal cost PLUS |
| 16198 | 1 | 10 | 17 | | | Put 33 MtCO2e into context of global annual emissions as a percent (e.g. it is about 0.1% of annual emissions of ca.35 billion t CO2e)) | Rejected - this may be true but what really matters is marginal cost PLUS |
| 9246 | 1 | 10 | 18 | 10 | 20 | "absent" should read "absence", but it's not correct. Things have moved on from the 2010 source cited. Australia has extensive storage regulations, for example. This site gives a more recent overview: http://www.iea.org/newsroomandevents/workshops/name,27053,en.html. Note that the Gorgon project, which will be the largest storage project globally, and at the scale required for climate mitigation (if reproduced!) has regulations in place, and that's in a nature reserve. | Taken into account - the text revised, made more generic and the point about commercial incentives is pulled out into a separate sentence. |
| 14358 | 1 | 10 | 20 | | | Try to say whether CCS can become cost competitive over say a decade, and how much the extra cost is now (50%?1000%?). How much of a carbon tax would it take to make CCS competitive? | Rejected - other chapters do this in some detail |
| 4853 | 1 | 10 | 21 | | 36 | The regulatory framework of the EU on renewables is also an important development since 2007. | Rejected - this is too much detail for here |
| 10417 | 1 | 10 | 21 | 10 | 36 | Enumerate. Where are the percentages? | Rejected - this is too much detail for here |
| 17000 | 1 | 10 | 25 | | | Is this statistic true globally? Or only for specific regions? | Accepted the word "globally" has been |
| 5316 | 1 | 10 | 27 | 10 | 28 | It should be made clear that the rapid growth of renewable energy installations is merely a consequence of high subsidies (Mainly feed- in tariffs, notably for PV) rather than a success of the market. | Rejected - this point is made elsewhere and varies a lot; no further action needed |
| 5317 | 1 | 10 | 27 | 10 | 28 | It should be made clear that the rapid growth of renewable energy installations is merely a consequence of high subsidies (Mainly feed- in tariffs, notably for PV) rather than a success of the market. | identical to 522 |
| 11021 | 1 | 10 | 29 | | | This should recognise the potential for renewably-generated electricity to replace petrol and diesel, via electric vehicle uptake. After ‘transportation through’, insert ‘electric vehicles and’. | Rejected - too much detail for here |
| 16896 | 1 | 10 | 29 | | 36 | It might be interesting to readers to think about wind as a wholesale electricity commodity -- its value depends on the price of other fuels. Rooftop solar on the other hand tends to compete with the price of retail delivered electricity, so in some markets it is likely to be competitive without subsidy in the not distant future. | Rejected - a useful thought, but too much detail for here |
| 3879 | 1 | 10 | 29 | 10 | 30 | "including next generation fuels that have lesser impacts on food security and the environment." - Where are they. Be more careful avoiding creating false expectations to the reader. Be more realistic, describing the huge technical and economic difficulties faced by these technologies after 100 years of unsuccessful trials. | Rejected - this is covered in other chapters; no need for more detail here |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6433 | 1 | 10 | 32 | 10 | 33 | Since AR4 considerable progress has been made in modelling the integration of renewables and it is demonstrated that this is not 'diffilcult'.. References will be given in the review of Ch 7. I recommend that this progress be reported in the executive summary. I also suggest that 'variable' is more accurate than 'intermittent' in respect of renewables. It should be remembered that nuclear and coal-fired electricity plants regularly have intermittent outputs due to plant failures whereas in a geographically distributed renewables system occurences of complete failure to generate are rare. Finally it should be noted electricity system operators have for decades satisfactorily managed variability in demand; so managing variability on the supply side is not a new phenomenon per se. | Taken into account - revised text says "variable and intermittent". Chapter 7 can deal with this in more detail, but the point that it is not "difficult" strikes me as incorrect. |
| 10463 | 1 | 10 | 32 | | | The term "intermittent" implies on/off which is not correct for wind, solar, wave so the term "variable" is used. Suggest change here and elsewhere. | Taken into account - here and a few other places where there is discussion of "intermittent" renewables is revised to |
| 11022 | 1 | 10 | 33 | | 35 | Treatment of solar is too negative given potential for solar PV prices to reach parity with cost of coal-based electricity within a decade. See U.S. Department of Energy. (2010). $1/W Photovoltaic Systems: White Paper to Explore A Grand Challenge for Electricity from Solar: Advanced Research Projects Agency. | Rejected - outside the scope of the chapter. Topic is covered in chapter 7 |
| 4468 | 1 | 10 | 33 | 10 | 33 | Why single out solar of all the renewables as being particularly in need of feed-in tariffs, etc.? | Taken into account - sentence has been revised so as to not single out solar |
| 6810 | 1 | 10 | 33 | | | The misinformation and anti-solar propaganda is extraordinary in a document that purports to be concerned about climate mitigation: there is no evidence that solar is difficult to integrate into the grid - on the contrary. Also, feed-in tariffs are not subsidies - they are a contractual power purchase guarantee at a fixed price. And there is plenty of evidence that even solar PV is nearing grid parity with coal. There are new coal fired pwer plants likely to come on line soon in the US or Australia. Last year, Australia had - against all odds and without much support at all - the largest renewable electricity increase worldwide. | Rejected - the sentence has been revised per other comments |
| 10464 | 1 | 10 | 33 | | | Better to quote chapter 8 of IPCC 2011 which covers this specific issue of integration. | Accepted - cross reference added to |
| 4093 | 1 | 10 | 35 | 10 | 36 | particular reference could be made to the absurdity (e.g. under UK Planning Guidance PPS 22 and definitions of the UK Planning Inspectorate) of defining palm oil as a renewable source of energy for simply burning in proposed electricity generating plants EVEN WHEN THE ASSOCIATED CARBON DIOXIDE EMISSIONS, HABITAT & SPECIES LOSS ARE POINTED OUT, WITH REFERENCES. | Rejected - too much detail for this chapter |
| 14790 | 1 | 10 | 35 | | 36 | For "fears for fod security" reference recent scholarship on biofuels demand and food price volatility by Tim Wise, Tufts University "The Cost to Mexico of U.S. Ethanol expansion" | thank you; I think the point stands and we already have many references. No |
| 2567 | 1 | 10 | 35 | | | For contested biofuels better refer to SRREN Ch 9 | Accepted - added cross-reference to SSREN (IPCC 2011), chapter 11 |
| 3880 | 1 | 10 | 35 | 10 | 36 | "Some biofuels are contested due to fears for food security and high lifecycle greenhouse gas emissions of some fuel type". Why not present some successful cases like ethanol (Brazil and Thailand) and biodiesel (Argentina). Always preference is for failures? Probably failures call more attention than successes but this report is not a popular newspaper. Only nuclear energy deserve been reported as a success (see next paragraph in the text), even after Fukushima? | Rejected - We talk about the difficulties precisely to be balanced |
| 6434 | 1 | 10 | 37 | 10 | 42 | There is a growing recognition of the down-side of energy efficiency namely the 'rebound effect' which is mentioned in Ch 1. I suggest that the 'rebound effect' is significant enough to rate mention in the executive summary. | Rejected - This is a complicated topic and is extensively covered in the ch 15 . No need to repeat here. "rebounds" are no law of nature or economics and effects are mitigated under current (and |
| 10063 | 1 | 10 | 37 | 10 | 44 | The implementation of vehicle fuel economy standards can be supplemented as an important evidence. | Rejected - we think the text is fine. No |
| 7148 | 1 | 10 | 4 | | 5 | Provide a reference to support the statement (sentence) about the declining US coal use. | Accepted - references to EIA reports |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16059 | 1 | 10 | 45 | 11 | 8 | One sided paragraph. 60 countries "expressing interest in nuclear" has no meaning (it could be said of CCS or of wave power for instance). Then Page11 line 3 only Germany is quoted when Switzerland, Spain, Belgium are in similar situations. China did slow orders after Fukushima. Line 7 p11 the term "accelerating" is misleading and should be deleted. | Taken into account - replaced phrase about expressing interest with "more than 20 countries currently that have never had commercial reactors have launched national programmes" and |
| 8406 | 1 | 10 | 45 | 10 | 45 | It seems that the statement “Interest in the use of nuclear power has increased significantly since AR4” must be better sustained with data, not based only on IAEA data or some author’s opinion. It seems very difficult to believe, basing on the number of new plants already approved, that “Traditional countries with active nuclear power programmes have been contemplating replacing aging plants with new builds or expanding the share of nuclear power in their electricity mix”: in these countries (i.e., Europe, USA, Japan) the share of nuclear power in the electricity will stay stable or will decrease according to a lot of scenarios made by different researchers. The Fukushima accident is only another driver in this direction. In the IIASA Global energy assessment it is stated that prospects of nuclear energy are particularly uncertain because of unresolved challenges surrounding its further deployment. | Taken into account - the first has been revised. The IIASA assessment may be overly pessimistic; look at china and Korea, notably. |
| 3365 | 1 | 10 | 45 | 11 | 8 | Global aggregate numbers and trends of nuclear power plants don't substantiate the optimism on nuclear power reflected in this paragraph. More balance would be nice. | Taken into account - replaced phrase about expressing interest with "more than 20 countries currently that have never had commercial reactors have launched national programmes" and |
| 12510 | 1 | 10 | 45 | | | Add after “AR4” -- “however, experience has been disappointing.” Even aside from the Fukushima Dai-ichi disaster, so-called Gen III+ or Gen IV reactor designs have been difficult to put through review and approval processes, more expensive than projected, and have encountered long construction delays. Many projects have been cancelled, and the private financial markets have withdrawn most support for new nuclear projects, leaving direct and indirect government finance or guarantees as the remaining financial support for the industry globally. | Rejected - this coment is true mainly in the OECD (and is overly american) -- paragraph on nuclear rewritten |
| 2571 | 1 | 10 | 45 | 11 | 8 | Apparent contradiction here. Has the interest in nuclear power really increased? Are there evidences, such as growth of actual reactor construction and installed capacity? The IAEA is an authoritative but not neutral source. | Taken into account - the evidence points in all directions; the discussion on nuclear is rewritten with more details for |
| 6691 | 1 | 10 | 50 | 11 | 3 | Japanese energy and environmental policies are coming under review now. We can't predict whether nuclear reacters will work or not. So, “and wiii probably leave many reactors shut in that country” should be deleeted. | Accepted - phrase is deleted |
| 11719 | 1 | 10 | 50 | 11 | 3 | [and will probably leave …..difficult to parse.] have to be deleted. IPCC shouldn't predict whether it will happen or not. | Accepted - phrase is deleted |
| 9492 | 1 | 10 | 50 | 11 | 3 | delete this sentence - Ohi Power Station Units 3 and 4 have been operated in Japan from June 2012 | Accepted - phrase is deleted |
| 10635 | 1 | 10 | 50 | 11 | 3 | The statement is made with prejudication. It is still uncertain what patterns in nuclear power investment will be in Japan. There it should be deleted. | Accepted - phrase is deleted |
| 17733 | 1 | 10 | 6 | | | delete "one of the" | Accepted - deleted |
| 4880 | 1 | 10 | 6 | | 7 | {Del} "already is {one of the}one of the | Accepted - deleted |
| 15276 | 1 | 10 | 7 | 10 | 7 | remove "one of the" before "fastest" | Accepted - deleted |
| 11718 | 1 | 10 | 8 | | | It's not clear the meaning of this sentence. Koh et al. shows advanced coal combustion technology will be very competitive and effective in reducing GHG emissions so, this sentence should be amended to [The future of coal hinges, in particular, the defusion of the clean coal technologies].<br>1.Koh et al.:[Potential of Advanced Coal and Gas Combustion Technologies in GHG Emission Reduction in Developing Countries from Technical, Environmental and Economic Perspective. Energy Procedia, Volume 12, 2011], send attachment by another e-mail. | Accepted - Add to the sentence, after 'China and India", 'as well as the diffusion of clean coal technologies.' |
| 3308 | 1 | 10 | 9 | 10 | 11 | This sentence makes no sense. | Taken into account - combined with |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16058 | 1 | 10 | 9 | 10 | 20 | The paragraph on CCS is well balanced. It could include Zoback M., Gorelick 2012 “Earthquake triggering and large-scale geologic storage of carbon dioxide” PNAS 109:5185–5189 that shows not implausibility of CCS, but the risk that quakes would limit very much the potential. Alas, the paper came too late. | Rejected - this is a good paper, but this is too much detail for an introductory chapter |
| 13251 | 1 | 10 | 28 | 10 | 30 | The use of renewable energy for heating can be included in this sentence. | Rejected - a useful point, but there are lots of such embellishments that might be added and we will exceed our space |
| 8222 | 1 | 10 | 35 | 10 | 35 | example may be given | Rejected - a useful point, but there are lots of such embellishments that might be added and we will exceed our space |
| 13250 | 1 | 10 | 9 | 10 | 11 | The second part of the sentence is no sense. Maybe, there is a lacking verb between "that" and "many", or the word "many" must be replaced with a verb. | Taken into account - this sentence has been revised for clarity |
| 4302 | 1 | 10 | 9 | 10 | 20 | refers to CCS: a note to the emission trading system an its lack to give CO2 a price „good“ enough to invest in CCS would be helpful. In Germany, CCS had two main obstacles: low ETS-prices and public opinion. | Rejected - text is ok. No action needed |
| 3689 | 1 | 11 | | | | Page 11 line 34 onwards reference missing | Taken into account - references added on the engagement of international |
| 6807 | 1 | 11 | 1 | 11 | 8 | There is no evidence for accelerating investment in nuclear power; to the contrary: much are overstated intentions. There is also plenty of evidence for failed investment, and extremely slow progress, practically a failure of that industry. Reference: http://www.worldwatch.org/node/5795 and http://www.worldwatch.org/node/5447, well referenced. See also Page 18, line 15 in this chapter which states this also. | Rejected - this comment is incorrect, and citing a worldwatch report for these points would be inappropriate. Text is balanced |
| 17001 | 1 | 11 | 1 | 11 | 2 | This statement needs to be re-assessed as Japan is beginning to re-activate some of their reactors | Accepted - phrase is deleted |
| 9247 | 1 | 11 | 15 | 11 | 15 | There is no mention that biofuels with CCS offer the only realistic large-scale way of reducing atmospheric CO2. | Rejected - the suggest comment is too extreme. We disagree that it is THE |
| 8708 | 1 | 11 | 15 | | | this sub-section ends without noting the severe problems that siting new CCS facilities have encountered, and the technological uncertainties associated with CCS. It also does not quote the IEA on the peak oil issue, and it does not point out that conventional crude oil production has probably already peaked in the 2006-2008 period. | Rejected - we think the discussion on CCS is balanced. The paragraph has also be revised during editing. |
| 2243 | 1 | 11 | 16 | 14 | 30 | There is no evidence that emissions of greenhouse gases hav any harmful effect on the climate. The whole effort of this report should be changed to the task of dealing with the natural evolutionary c hanges which we face. | Rejected - beyond the mandate of WG III |
| 18012 | 1 | 11 | 17 | 11 | 28 | The discussion in the section of “International institutions and agreements” reflects part of the reason of the slow progress and the deadlock of the UNFCCC process, referring only to the architecture of the treaty frame work, leaving the lack of political unwillingness and non-action of Annex I country parties in silence. Comprehensive evaluation and analysis regarding the effectiveness and ineffectiveness together with the reason behind need to be elaborated more. | Taken into account - paragraph has been revised |
| 4881 | 1 | 11 | 20 | | | {Add} "The first {}session of the Conference of the Parties (COP) | Accepted - added 'session' |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12511 | 1 | 11 | 22 | 11 | 28 | Replace from "The main regulatory" to the end of the paragraph with the following -- "The main regulatory provisions of the Kyoto treaty concerned quantified emission limitation and reduction commitments for developed countries listed in Annex B of the Protocol. The initial five-year commitment period was set for 2008-2012, with further commitment periods contemplated. At its first meeting in 2005, the Conference of the Parties for the Kyoto Protocol launched an ad-hoc working group to develop emission reduction commitments for a second commitment period commencing in 2013. Subsequently, the UNFCCC Conference of the Parties adopted the Bali Action Plan in 2007, launching a parallel negotiating track to address broader emission reduction efforts incorporating further commitments by developed countries and nationally appropriate mitigation actions in developing countries, with financing, technology and capacity building support to be provided by developed countries. The Bali Action Plan also instituted a broader balanced work programme including the "four pillars" of mitigation, adaptation, financing, and technology transfer, with a view toward adopting a decision in two years. In 2009, the COP continued the two negotiating tracks and noted the separate issuance of the Copenhagen Accord, delineating a broad programme of climate response centered on an agreement to keep increased global average temperatures to 2o C. At Cancun in 2010, the COP launched global climate delivery channels for several of the pillars envisioned in the Bali Action Plan: the Green Climate Fund, Adaptation Committee, Climate Technology Center and Network. In 2011, the COP agreed Durban Platform for Enhanced Action and established a new working group to develop a Protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties to be completed no later than 2015 and enter into force by 2020. The COP also agreed to develop a work programme to raise the level of ambition on climate response informed by AR5 and the outcome of a 2013-2015 review of pathways to achieving a maximum of 2o C or 1.5o C warming. This combined, open ended effort will operate alongside the Kyoto Protocol pending a decision for continuation or termination. | Rejected - The suggested change is too long and is too detailed. Also some of the wording is not accurate -- no action needed |
| 14791 | 1 | 11 | 22 | | 25 | "…which meant a successor treaty would be needed…" and "… negotiations on a successor treaty were under way…" The references to "successor treaty" are factually incorrect. With the UNFCCC's Kyoto Protocol's first commitment period coming to a close, its Article 3.9 would determine subsequent commitments under the KP: "Commitments for subsequent periods for Parties included in Annex I shall be established in amendments to Annex B to this Protocol, which shall be adopted...". | Taken into account - text has been revised for clarity. "succssor" has been replaced as suggested by the commenter |
| 18015 | 1 | 11 | 23 | 11 | 24 | the reference to a “successor treaty” in relation to the Kyoto Protocol” is legally inaccurate. The mandate of the AWG-KP needs to be reflected in a accurate way. | Taken into account - text has been revised for clarity. "succssor" has been replaced as suggested by the commenter |
| 7344 | 1 | 11 | 23 | 11 | 24 | It is inaccurate to suggest that "a successor treaty wouldbe needed to cover the period after 2012" when discussing the Kyoto Protocol. The Protocol in its Art 3 (9) makes provision for "subsequent commitment periods" - hence an amendment is needed, not an entirely new treaty. | Taken into account - text has been revised for clarity. "succssor" has been replaced as suggested by the commenter |
| 11397 | 1 | 11 | 23 | 11 | 24 | The reference to a "successor treaty" in relation to the Kyoto Protocol is technically and legally inaccurate. The objective of the negotiations that were launched in 2005 under the Ad-Hoc Working Group on the Kyoto Protocol was to define and establish the period and numerical emission reduction targets for Annex I Parties who are Parties to the Kyoto Protocol for the KP's second commitment period that would commence after the end of the first commitment period in 2012. The AWG-KP negotiations were and are, therefore, NOT about a successor treaty to either the UNFCCC or the Kyoto Protocol. The reference should be "a second commitment period would be needed to cover the period after 2012" | Taken into account - text has been revised for clarity. "succssor" has been replaced as suggested by the commenter |
| 7345 | 1 | 11 | 24 | 11 | 26 | It is inaccurate to describe the negotiations launched at Bali as on a "succesor treaty"; as noted above, the Protocol provides for subsequent commitment periods. In addition the mandate of the negotiations was for an "agreed outcome" which may not have taken the form of a treaty. Negotiations on the second commitment period of the Kyoto Protocol had been continuing since 2005 and were mandated to continue and resolve in 2009 as well. | Taken into account - text has been revised for clarity. "succssor" has been replaced as suggested by the commenter |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18016 | 1 | 11 | 25 | 11 | 26 | the reference to "negotiation on a successor treaty were just under way" in 2007 is also legally inaccurate. The mandate of the Bali Road Map negotiation needs to be reflected in a accurate way. | Taken into account - text has been revised for clarity. "succssor" has been replaced as suggested by the commenter |
| 11398 | 1 | 11 | 25 | 11 | 26 | The reference to "negotiations on a successor treaty were just under way" in 2007 is also technically inaccurate. The negotiations that were launched in Balic in December 2007 under the Ad-Hoc Working Group on Long-term Cooperative Action (AWG-LCA) launched "a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012, in order to reach an agreed outcome and adopt a decision at its fifteenth session". It did NOT specify the legal form of such agreed outcome as a treaty (e.g. a new protocol). The legal form would be the subject of negotiations in the AWG-LCA. The reference should be accurate in terms of saying that the negotiations should be "on an agreed outcome" rather than "on a successor treaty". | Taken into account - text has been revised for clarity. "succssor" has been replaced as suggested by the commenter |
| 7871 | 1 | 11 | 26 | 11 | 27 | The flowery wording ("wide array of disagreement") is obscuring important issues. There was a lot of disagremment regarding the details of a treaty. However, among many nations was and is a general agreement that more ambitious emission cuts are urgently required and that high emitting countries must take the lead. In essence, the negotations were a complete fail for the US and China blocked each other. This report should acknowledge the lack of political will of some powerful countries. | Rejected - The wording is fine here. Also there is no practicality in blaming the US and china for a failure that has had many sources, not least because there is no scientific way to pin blame. No action |
| 16060 | 1 | 11 | 29 | 11 | 43 | This long paragraph seems to take positively the spreading of climate in many fora, a possible consequence of the limited progress in UNFCCC negociations. Maybe a word of caution is in order. | Noted - the idea is to signal the array of activities not to say if they are good or bad. Chapter 13 (cross referenced |
| 4882 | 1 | 11 | 29 | | | {Add} "on climate {}change mitigation | Accepted - "change" added |
| 4854 | 1 | 11 | 29 | | 43 | It would be worth mentioning also the GEF as an important complementary institution (financing inter alia mitigation projects in developing countries and IETs). | Rejected - text is ok. There are LOTs of unmentioned organizations here |
| 9784 | 1 | 11 | 3 | 11 | 8 | You discuss country policies from a strictly centralized perspective. Both, in industrialized and even more in developing countries decentralized energy systems will play a major role. | Noted - the previous paragraph AND the next paragraph talk about those kinds of |
| 17002 | 1 | 11 | 3 | 11 | 4 | What will this lost (zero-carbon) nuclear, baseload capacity be replcaed by? Coal? | Noted - Japan is looking at lots of actions--some involve restarting some reactors; some are renewables; lots are coal and right now there's a lot more oil and LNG. It is a mix. This kind of detail |
| 2575 | 1 | 11 | 37 | 11 | 37 | Rio+20 needs an update, namely in fossil fuel subsidies | Rejected - no action needed here. The previous sentence talks about fossil fuel subsidies through G20. The G20 reaffirmed that literally days BEFORE |
| 17005 | 1 | 11 | 37 | | | "Rio+20 process" needs to be defined/expnaded upon. | Rejected - text is ok |
| 4883 | 1 | 11 | 40 | | | {Add} "Organization – IMO {}(both focusing on emissions from bunker fuels) | Accepted - text added as suggested by |
| 17797 | 1 | 11 | 40 | | | While mentioning particular initiatives, I would like to see added here the UN family, e.g. WHO initiative of health benefits in the green economy - which in practice analysis those mitigation measures that do have the highest benefit for human health; or the UNECE the PEP programe - working on transport health and the environment - the list could probably be very long - and may even be thought as an Annex - however otherwise the list of new initiatives appears otherwise to be biased. One way out could be choosing a list of crieteria that | Rejected - There too many organizations to name them all. Edits in response to 559 point to a paper that looks at this fuller range in more detail. |
| 16061 | 1 | 11 | 44 | 12 | 12 | The interest of academics in international trade is a fact and a good thing. But the rest of the paragraph takes for granted that WTO could have a positive role for mitigation. The reverse might be true, as shown by recent disputes on carbon quotas levied on aviation by the EC, a mitigation policy contested in the name of free trade. | Noted - it could go either way. Our job here is to report on the science. |
| 12512 | 1 | 11 | 47 | | | Add after "mitigation" -- "and adaptation" | Accepted - words added in text |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16897 | 1 | 11 | 48 | | 49 | Suggest replace last line with the following: "as well as possible international trade of CO2 emission allowances." | the paragraph has been revised; comment no longer relevant |
| 10465 | 1 | 11 | 5 | | | Add "South" Korea | Accepted - added "South" |
| 15243 | 1 | 11 | 9 | 11 | 15 | what is the temporal scale used here for energy investment? | Rejected - the point is a generic one, not particular to a single temporal period |
| 15533 | 1 | 11 | 9 | | 12 | The benefits of carbon pricing might be mentioned in this context. | Rejected - we mention that a lot |
| 8407 | 1 | 11 | 9 | 11 | 15 | “do not depend on government subsidies”<br>Every energy transition has been based on huge government subsidies, either fossil or nuclear one.<br>The problem is to switch government subsides from fossil to non fossil energy.<br>I believe that this point must be clarified and underlined.<br>As an example, according to IEA (2011, IEA analysis of fossil-fuel subsidies) without further reform, spending on fossil-fuel consumption subsidies is set to reach $660 billion in 2020, or 0.7% of global GDP. Phasing-out fossil-fuel consumptions subsidies by 2020 would slash growth in energy demand by 4.1%, reduce growth in oil demand by 3.7mb/d and cut growth in CO2 emissions by 1.7 Gt | this paragraph has been removed; comment no longer relevant |
| 15289 | 1 | 11 | 9 | 11 | 10 | Describing nuclear power as a promising system is perhaps controversial. Perhaps it should be clearly stated that it is promising from a CO2 mitigation perspective | this paragraph has been removed; comment no longer relevant |
| 7870 | 1 | 11 | 9 | 11 | 15 | This is an implicit value-judgement in favor of nuclear energy and coal plus CCS. If you think that these energies are better overall than renewable energies you should say so and substantiate your claim with arguments. You seem to claim that while renewables will depend on subsidies, nuclear and CCS-coal do not. However, wihtout substantial government subsidies and tax brakes nuclear energy and coal would be more expensive than they are currently and CCS is supposed to raise the cost of generating power from burning coal by one third. If externalities such as damages from CO2 emissions are included, conventional energy gets even more expensive. On the other hand, renewable energies will get cheaper within the next two decades due to learning effects while fossil fuels will get more expensive. A recent German study estimates that by 2030 different forms of wind and solar energies will be as cheap or considerably cheaper than the conventional energy mix (fossil and nuclear) (Kost et al. 2012). | this paragraph has been removed; comment no longer relevant |
| 4303 | 1 | 11 | 1 | 11 | 2 | change: „and will probably leave many reactors shut in that country“ to „and will probably leave most - if not all - reactors shut in that country“. reason: recent activity by the Japanese governement due to continuing high intensity of protests and a new anti-nuke party (Greens). Phase-out is now basically a consensus (only the date is up to debate) | Taken into account - combined with other comments |
| 4304 | 1 | 11 | 9 | 11 | 9 | change: „these promising systems“ to „these systems“, calling CCS and nuclear promising is far from any consensus, especially in the European debate. | this paragraph has been removed; comment no longer relevant |
| 4361 | 1 | 11 | 9 | 11 | 10 | similar comment: presenting energy sources such as nuclear power as «promising» is of dubious meaning and could lead to believe that authors have a biased opinion. Low carbon energy production by no way does equal to desirable, as they can present other drawbacks. | this paragraph has been removed; comment no longer relevant |
| 11023 | 1 | 11 | | | | Around Section 1.2.1.4: There should be some acknowledgment around here of the fact that without a price on carbon dioxide, energy generation is biased away from low- or zero-carbon technologies such as renewables.<br>E.g. Insert around line 15: ‘Another key issue in influencing investment patterns is that, without a price on carbon dioxide, energy generation is biased away from low- or zero-carbon technologies such as renewables.’ | this paragraph has been removed; comment no longer relevant |
| 9248 | 1 | 11 | | 12 | | There should be mention that the UNFCCC recognised CCS as a way of reducing emmisions and provided guidelines for storage:<br>http://unfccc.int/files/meetings/durban_nov_2011/decisions/application/pdf/cmp7_carbon_storage_.pdf | Rejected - the suggested add is not needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 14792 | 1 | 11 | | 12 | | There is very little on the UNFCCC regime, and more on the WTO, etc. But, there is much experience with the UNFCCC that could be reviewed here: extent of compliance with UNFCCC (on targets, on finance and technological support), the effectiveness of the CDM, impact of various loopholes, etc. | Rejected - Chapter 13 deals with this in detail. Text is ok |
| 8223 | 1 | 11 | | | | It would be interesting if the authors can shed light on the lessons learned from the fallout of Kyoto by major partners to the initiatives undertaken at G8, G8 +5, G20 and Rio 20 +. What are the successes and failures? Can any conclusions be made on the design of an international institution that could provide effective mechanisms for climate negotiation? | Rejected - We can shed light on this, but not in a way that is concise or fully scientiific. So here we just introduce the issues. See chapter 13 for more |
| 11579 | 1 | 11 | 16 | 11 | 43 | This section is not clear on the emissions being referred to in the first sentenc., Is it to be assumed the authors are referring to all gaseous emissions?Its in the second sentence that it becomes more obvious its the GHGs, as the convention is mentioned. As the chapter seems to cover all agreements related to climate change, there should be a discussion on the vienna Convention and the Montreal Protocol that are good examples and lend credence from the UNFCCC that have universal acceptance. hereThe issue that first needs to be recognised here is that climate change is cross cutting issue hence the reason | Taken into account - added text to mention the Montreal Protocol. "...UN?based process. PROPOSALS EXIST WITHIN THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEPELETE THE OZONE LAYER TO REGULATE SOME OF THE GASES THAT HAVE REPLACED OZONE |
| 18108 | 1 | 11 | 22 | 11 | 28 | With regard to the Kyoto Protocol, the text states that a "successor treaty" was needed after 2012. Suggest framing this according to the language of the Kyoto Protocol which refers to the period of 2008-2012 as the "first commitment period" (eg: Arts 3 (1), (7), Kyoto Protocol) and which envisages the establishment of subsequent commitment periods under the Kyoto Protocol itself rather than negotiating a "successor treaty" (eg: Art 3(4), (9) Kyoto Protocol). The language as it stands could be misinterpreted to suggest that the Kyoto Protocol was only designed for the period of 2008-2012 which was not the case. | Taken into account - text has been revised for clarity. Combined with other comments |
| 5385 | 1 | 11 | 29 | 11 | 29 | climate mitigation ---- shoild be ---- climate change mitigation | Taken into account - combined with |
| 6785 | 1 | 11 | 37 | 11 | 37 | It may be helpful to refer to the following: "Additionally, UN Secretary General Ban Ki-moon is leading a global initiative on Sustainable Energy for All to mobilize action from all sectors of society in support of three interlinked objectives to be achieved by 2030: providing universal access to modern energy services; doubling the global rate of improvement in energy efficiency; and doubling the share of renewable energy in the global energy mix." | Rejected - too much detail for this chapter |
| 11680 | 1 | 11 | 46 | 11 | 47 | Add the following refereed journal article citations before the reference to 'see also Chapter 13':<br>Brewer 2003; 2004; 2010 The full citations are:<br>Brewer, T. (2003). The trade regime and the climate regime: Institutional evolution and adaptation. Climate Policy 3, 329-341.<br>Brewer, T. (2004). The WTO and the Kyoto Protocol: Interaction issues. Climate Policy 4, 3-12.<br>Brewer, T. (2010). Trade policies and climate change policies: a rapidly expanding joint agenda. The World Economy 33, 799-209. | Accepted - added cross reference to ch 13 and to Brewer (2010) since it's the only article is since AR4. |
| 17692 | 1 | 11 | 13 | 11 | 15 | From the second sentence the statement is not clear… The idea is there but ist hard to catch | paragraph has been removed. Comment |
| 7011 | 1 | 11 of 33 | 15 | 11 of 33 | 12 | Add "When energy services come out from solar flux, as is the case for renewables, fuel costs completely (or almost completely) disappear, as well as GHG emissions", after the final period in line 15. | paragraph has been removed. Comment is no longer relevant |
| 15244 | 1 | 12 | 13 | 12 | 38 | of interest but not mention of conflict resolution per se - see Ramsbotham et al (2011) "Contemporary Conflict Resolution", Chapter 12, 2011. Available at http://www.polity.co.uk/ccr/authors/woodhouse.asp accessed 13/9/12. | Rejected - suggested change is not needed here |
| 16062 | 1 | 12 | 13 | 12 | 38 | Too many sources repeated, the paragraph is not focused. Also, Victor is quite relevant here in the discussion, but five quotes in one paragraph may be exagerated… | Taken into account - deleted Hafner-burton et al reference at line 26-27. |
| 13366 | 1 | 12 | 13 | | | Social scientists' rather than 'scientists'. | Rejected - text is fine. These are, in |
| 13367 | 1 | 12 | 13 | 12 | 38 | The referencing here is tendentious. For balance, significant scholarship by Keohane,Oran Young, the Norwegian governance school, and others should beacknowledged and included at this point. | Rejected - this a framing chapter and not the chapter on climate diplomacy and regimes. Excessive references should be avoided and instead only major reviews |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4474 | 1 | 12 | 13 | 12 | 33 | It would seem appropriate in this paragraph to mention also the recent contributions in game theory as it has been applied to the climate negotiation problem. These may be covered in Chapter 13, but should be noted here also. | Rejected - Game theory remains highly theoretical, and chapter 13 deals with it in some detail. -- no action needed |
| 17800 | 1 | 12 | 13 | 30 | | This whole paragraph could be brought up more to the point and be much more informative - either use a design/figure or bring it to the point - not just the information that three different type of new research has been done - what are the results? | Rejected - our task is to talk about what scientists have done since AR4 |
| 7872 | 1 | 12 | 13 | 12 | 38 | What is the conceptual basis of this paragraph? The literature seems to rest on game theory, rational choice and neo-realistic schools of thought . This is only one - highly contentious - way of analyzing this important issue. One reason is that although it is often presented as value-free or -neutral it contains many normative assumptions. Also, such approaches alone cannot identify what SHOULD be done about climate change. Other perspectives should be included, such as institutionalism (e.g. Young 1999). For a rigorous criticism of (neo-) realism see e.g. Caney (2006). | Rejected - Young and Caney are pre-AR5. What is new that needs to be cited here? In fact, the reason we cite the Hafner-Burton et al piece is because it EXTENSIVELY reviews those varied paradigms. The conceptual basis of this |
| 17007 | 1 | 12 | 15 | 12 | 16 | Cite specificially what section in Chapter 13 the reader can go to to learn about the "body of research… to explain why negotiations on complex topics… are prone to gridlock." | Taken into account - on the topic, added additional references to Murase (2011) |
| 13675 | 1 | 12 | 16 | 12 | 16 | Insert "change mitigation" after "… such as climate". | Taken into account - combined with |
| 7150 | 1 | 12 | 16,22,25,27,29 | | | Remove all unnecessary parantheses. | Editorial – copyedit to be completed |
| 13676 | 1 | 12 | 19 | 12 | 19 | Insert "types of policy mechanisms to achieve mitigation cost reductions" after "… enforcement mechanisms". | Taken into account - edited sentence to say: "...the presence of enforcement mechanisms, SCHEMES TO REDUCE |
| 6458 | 1 | 12 | 2 | 12 | 5 | “Mitigations embodied” should be “carbon embedded”. | Taken into account - sentence has been |
| 17006 | 1 | 12 | 2 | 12 | 5 | Poorly worded sentence / not clear. | Taken into account - sentence has been |
| 3309 | 1 | 12 | 23 | 12 | 25 | I would consider adding a sentence after this one such as this: "However, some scholars believe that the normative structure of political legitimacy severely hinders the possibility of addressing climate change justly (Gardiner 2011)." Citation: Stephen Gardiner (2011). A Perfect Moral Storm: the Ethical Tragedy of Climate Change. New York: Oxford University Press. | Rejected - suggest sentence is not necessary. And adding another reference does not seem vital |
| 8475 | 1 | 12 | 25 | | 29 | A particularly informative text here is Fen Osler Hampson's (edited "Madness in the Multitude: Security and World Order" Oxford University Press 2002 | Rejected - adding another reference does not seem vital |
| 6815 | 1 | 12 | 31 | | 37 | This seems like useful question, since the sources of ozone layer deterioration are equally clearly defined. On the other hand, it is a question that neeeds to be answered here: the fossil enegy system that is the source of much of GHG is so much more fundamental and pervasisve to/in the global economy, and so it is no surprise that a diffusion of respnse results - even distratcions and disinformation. | Rejected - The pieces we cite examine exactly this in great detail. We don't have space to address it further here |
| 17735 | 1 | 12 | 39 | | | In the section title replace the word "beyond" by "other than" | Accepted - change "beyond" to "other |
| 13365 | 1 | 12 | 4 | | | There is asomething awry with this sentnce. The word mitigations' is erroneous. Should the sentence read… '...also allows trade in goods, such as x, y, z, whose production processes are…etc'? | Taken into account - sentence has been revised |
| 15446 | 1 | 12 | 40 | 12 | 46 | A point that could usefully be made more explicit in this introductory section is the fungibility of gases for accounting purposes, through the choice of a basket. | Rejected - Other chapters deal with this, as does WG1. Other comments lead to edits about flexibility of commitments, and that is one of the central reasons for |
| 17008 | 1 | 12 | 40 | | | Might be worth inserting that CO2 from burning fossil fuels accounts for about 60% of global GHG (IPCC WG1, 2007) | Accepted - percentage is added |
| 4884 | 1 | 12 | 41 | | | {Cor} "Kyoto [Treaty] Protocol cover | Accepted - changed Kyoto Treaty to |
| 17736 | 1 | 12 | 42 | | | replace the word "This" by "A" | Rejected - text is fine. No action needed |
| 11349 | 1 | 12 | 42 | 12 | 42 | Nitrogen trifluoride (NF3) is introduced in the second Kyoto compliance period (which can be mentioned in the foot note?). | Accepted - Added to the main text. "NF3 was added as a GHG under the Kyoto Protocol for its second commitment |
| 4885 | 1 | 12 | 44 | | | {Add} "mitigation {}of the emissions of these | Rejected - text is fine. No action needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9785 | 1 | 12 | 5 | 12 | 12 | The crucial issue is the starting point for the comparative assertion, when stating "Article 3 of the UNFCCC requires that "[m]easures taken to combat climate change, including unilateral ones, should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade." You risk to maintain the status quo of pollution havens and environmental dumping (for a comprehensive analysis of theories and empirical studies analyzing the interlinkage between competitiveness and environmental protection on a national scale: GÜNTHER, E.; HOPPE, H.; LAITENBERGER, K.: Competitiveness of nations and environmental protection. In: R. Hahn, H. Janzen, D. Matten (Hrsg.): The social responsibilities of business. Background, Core Issues and Future Perspectives. Stuttgart 2012, p. 467-495. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2145420 | Taken into account - added sentence "...have been a matter of long standing interest in climate diplomacy AND ARE CLOSELY RELATED TO A LARGER DEBATE ABOUT HOW DIFFERENCES IN ENVIRONMENTAL REGULATION MIGHT AFFECT ECONOMIC COMPETITIVENESS." cited Gunther et al. |
| 10741 | 1 | 12 | 50 | 12 | 50 | In addition to the reference given here to WGIII chapter 8 (on transport) a reference could also be given to WGI Chapter 8 on Anthropogenic and natural forcing, since this chapter gives an overview of the various forcing mechanisms. | Accepted - cross reference added to WG I chapter 8 |
| 10621 | 1 | 12 | 31 | | | For new work on why institutional arrangements vary across issue areas (from regime integration to regime complexes to regime separation), see: [Johnson, T., and J. Urpelainen. 2012. A Strategic Theory of Regime Integration and Separation. International Organization 66(4): 645-677.] The article tests its theory by examining the degree of integration or separation among four environmental regimes: climate, deserts, forests, and ozone. | Accepted - Johnson and Urpelainen (2012) cite added |
| 8224 | 1 | 12 | 13 | 12 | 38 | While this paragraph explains what scholars have focused on, it would be nice if a summary of findings are also made available. This will provide readers a good knowledge of what has been going on. | Rejected - too much detail for the space we have. |
| 5386 | 1 | 12 | 16 | 12 | 16 | such as climate ----- should be --- such as climate change | Accepted - changed to "climate change" |
| 7707 | 1 | 12 | 17 | | | What is a definition of the term 'political scientists'? Is this term used before in AR5 or even in AR4? | Rejected - This is the second largest field of social science. We don't need to |
| 4016 | 1 | 12 | | | | authors might wish to update information on (1) RF of black carbon whose best estimate of the central values is now from 0.0 to 1.3 W/m2. However the total effective forcing from all BC effects is unlikely to be greater than 1 W/m2 (section 3.3.7 of the report ref. to below); and (2) tropospheric ozone. For tropospheric ozone a central estimate is 0.35±0.10 W/m2 (section 3.5). Source: Integrated Assessment of Black Carbon and Tropospheric Ozone, available at http://www.unep.org/dewa/Portals/67/pdf/BlackCarbon_report.pdf | Numbers will be updated according to WGI AR5 |
| 14793 | 1 | 12 | | 13 | | While non-cossil CO2 GHGs are worth a mention, it is not clear why they warrant an entire sub-section as one of the six key observations. | Noted - because the world is focused on CO2 and when you look at the other pollutants they dominate the short-lived |
| 3548 | 1 | 12 | 39 | 13 | 11 | Should mention the climate impacts of the "Montreal gases" | Taken into account - added point on the Montreal Protocol and added citation to Velders et al (2007) which is best study |
| 7811 | 1 | 12 | 39 | 13 | 16 | The different temporal scales of different climate impacts and following implications should be mentioned. | we will discuss |
| 11580 | 1 | 12 | 40 | 12 | 40 | Burning of fossil fuels is the largest contibuting source of GHGs hence the concentration.That countries have been reporting on all the gases, beyond fossil fuel CO2 is an indicator that there is awareness on all gases and the matter of their GWP. | what is the point here? |
| 18109 | 1 | 12 | 41 | 12 | 41 | Suggest referring to the Kyoto Protocol as such rather than as the Ky0t0 Treaty here and troughout the entire document in this and other chapters. | another comment addresses this |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12085 | 1 | 12 | 44 | 12 | 45 | Current text "Indeed, depending on the region, mitigation of these 45 different pollutants varies enormously in cost." It is worth considering if this statement should be qualified with a statement stating something like "for many countries mitigating non-CO2 gases has been shown to be a cost effective strategy because many of these gases have long lifetimes and global warming potentials much higher than CO2." eg: An MIT study found that focusing on non-CO2 gas mitigation reduced the overall costs of action by two-thirds. Please see at Reilly, J. Jacoby, H. Prinn, R (2008) Multi-Gas Contributors to Global Climate Change: Climate Impacts and Mitigation Costs of Non-CO2 Gases. MIT. Available At http://www.pewclimate.org/global-warming-in-depth/all_reports/multi_gas_contributors | Taken into consideration - added sentence and cites "varies enormously in cost. A VARIETY OF STUDIES HAS SHOWN THAT ALLOWING FOR TRADING ACROSS THESE DIFFERENT GASES WILL REDUCE THE OVERALL COSTS OF ACTION; HOWEVER, MANY STUDIES ALSO POINT TO THE COMPLEXITY IN AGREEING ON THE CORRECT TIME HORIZONS AND STRATEGIES FOR |
| 11581 | 1 | 12 | 47 | 13 | 10 | There is a lot of work that has been carried out by the WHO that could be used to beef up the contribution here if these gases are to be considered. | Taken into account - agreed. Discussion on co-benefits has been beefed up but a detailed assessment of the topic is |
| 4606 | 1 | 13 | | | | AIE is not defined in the graph | Chart has been redrawn. Comment is no |
| 13252 | 1 | 13 | | | | The acronym AIE is not explained | Chart has been redrawn. Comment is no |
| 17011 | 1 | 13 | | | | Where is Forestry? | Chart has been redrawn. Comment is no |
| 17012 | 1 | 13 | | | | "AIE" in the legend should be defined - Aerosol Indrect Effect (I'm assuming) | Chart has been redrawn. Comment is no |
| 10466 | 1 | 13 | | | | Change "Household biofuel" to Household biomass. "Biofuel" is the term used for transport fuels - need to also confirm that in Glossary. Need to cross-check with chapters 7,8,10,11 for consistency with data from this single reference. Put "AIE" in full. Is rail included in "off-road transport" or is that agriculture and construction vehicles? Needs clarifying in caption. | Chart has been redrawn. |
| 6864 | 1 | 13 | | | | Please ensure consistency with WGI AR5 estimates of net radiative forcing -- see Chapter 8 of WGI AR5. | Chart has been redrawn. we have totally redone discussion of GWPs |
| 10742 | 1 | 13 | 1 | 13 | 16 | It is good that the non-CO2 forcings are presented and that the cooling effects are given some attention. But one important aspect is missing, and that is the temporal behaviour of the various mechanisms. Some agents cause strong warming effects on shorttime scales (e.g. black carbon and tropospheric ozone), while some are "medium long lived" like methane, and finally some are very long-lived. CO2 shows a special behaviour due to the very slow removal of excess CO2 (see Box 6.2 in WGI SOD). On the other hand there are some strong short-lived cooling effects. These aspects (time scales and effects of both signs) are illustrated in a recent paper by Aamaas et al. (see http://www.earth-syst-dynam-discuss.net/3/871/2012/esdd-3-871-2012.pdf. Figure 13 shows contributions by sectors and components. (see als fig 11 and 12). While figure 1.3 on page 13 uses RF as indicator the figures in Aamaas et al used temperature. See also WGI, chapter 8; figures 8.32, 8.33 and 8.34. | Taken into account - combined with other comments |
| 17010 | 1 | 13 | 11 | | | Shindell et al. in Science 2012, "Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security" deserfves to be cited. Also, a mention/discussion of the recently launched (Feb 2012) Climate and Clean Air Coalition is warranted. | Taken into account - combined with other comments |
| 15246 | 1 | 13 | 12 | | | is this meaningful given the complexity of interactions? | Figure has been redone. |
| 12217 | 1 | 13 | 13 | | | Please explain AIE (Aerosol Indirect effects) in caption | Chart has been redrawn. Comment is no |
| 4886 | 1 | 13 | 18 | | 19 | {Add}" totality of {}existing policy efforts do not put the planet on track for meeting the objectives [of Article 2] of the United .. (UNFCCC {}Article 2)<br>That is:<br>" totality of existing policy efforts do not put the planet on track for meeting the objectives of the United .. (UNFCCC Article 2) | Reject - we can't say this. We can say something about 2 degrees (and we have done that, with some revisions to those statements to come). |
| 11025 | 1 | 13 | 24 | | | Suggest adding at the end of the sentence ending with 'deep cuts' the words 'that would be consistent with the precautionary approach suggested by Article 3.3 of the UNFCCC.' | Rejected - the "precautionary approach" has lots of meanings, and article 3.3 doesn't say this precisely. So we can't |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15247 | 1 | 13 | 28 | | | "adapt naturally" is interesting vis-à-vis 'geo-engineering' | interesting indeed - no action needed |
| 17009 | 1 | 13 | 3 | | | Insert at the end of sentence on aerosols "… i.e., they cool the atmosphere LARGELY THROUGH THEIR ROLE IN CLOUD FORMATION, EXTENT, THICKNESS AND LIFETIME" | Rejected - we don't need to describe mechanisms here. |
| 11399 | 1 | 13 | 30 | 14 | 2 | The reference to Art. 3(3) of the UNFCCC is a truncated reference that selects only a limited part of the provision referred to. In doing so, it creates the potential for suggesting that only the precautionary principle is worthy of highlighting and stressing among the other principles that are included and referred to in Article 3 of the UNFCCC. Considering that Article 3 is a framing article in the UNFCCC in terms of identifying the principles that should guide Parties' actions in implementing the UNFCCC, it should therefore be quoted in full so as to ensure a fair and accurate reflection of the relevant framing principles as provided for in the UNFCCC. | Taken into account - this is a fair point. But if we quote all principles included in Article 3, it may be redundant and consume too much space. Instead the quote has been deleted |
| 11024 | 1 | 13 | 5 | | | The word 'purposely' should be deleted in the sentence 'Interpreting the UNFCCC goals is purposely difficult.' It is ill-judged and inappropriate. | Accepted - deleted 'purposely' |
| 7873 | 1 | 13 | 5 | 13 | 5 | If "optimal" is understood in terms of economic efficiency, this should be stated clearly, for in ordinary language "optimal" means "the best". This is an important difference. | Taken into account - sentence has been removed |
| 11350 | 1 | 13 | 5 | 13 | 6 | I would suggest that the sentense "for optimal radiative forcing reduction policies the integrated total effect should be estimated" be revised or removed because it is not clear why radiative reduction policies are brought up here and also why the integrated total effect (implying the GWP) is important. | Taken into account - sentence has been removed |
| 11351 | 1 | 13 | 6 | 13 | 8 | This statement can be supported by Ramanathan and Carmichael (2008, Nature Geoscience, 10.1038/ngeo156). | Accepted - added cite to Ramanathan and Carmichael (2008) |
| 15245 | 1 | 13 | 7 | 13 | 11 | a little speculative given the state of current research? I.e. 'could' with what degree of certainty? | Taken into account - combined with |
| 12513 | 1 | 13 | 7 | 13 | 8 | The reference should be to "black carbon (soot)" and should not assert that this is simply a positive forcing; refer to WGI for the more mixed role soot plays | Accepted - we will put soot in brackets and add xref to WG1 per comment 664 |
| 10467 | 1 | 13 | 8 | | | "soot" not a good technical term as used here and elsewhere. Suggest use black carbon (as used in Fig 1.3 and 8.2), or particulates or aerosols, as appropriate. | Taken into account - combined with other comment |
| 4362 | 1 | 13 | | 13 | | I cannot make sense of the first phrase from the legend; Numbers within brackets do not seem correct for aviation and shipping; those for biomass burning and industry are surprising (do they contribute to climate cooling?); misses definition of AIE; | Figure has been redone. |
| 6862 | 1 | 13 | 2 | 13 | 3 | You may want to insert reference to WGI AR5 Chapter 7 here. | Taken into account - combined with |
| 8225 | 1 | 13 | 3 | 13 | 3 | Why currently? Can it change in the future? Why? How large are the negative contributions with respect to the total global warming problem? | Rejected - too much detail for this text |
| 6863 | 1 | 13 | 6 | 13 | 8 | Please provide a reference supporting this statement. | Taken into account - combined with |
| 3549 | 1 | 13 | 18 | 13 | 18 | Reference to Chapter 1 in AR4, specify if this is in WG III report (which is likely) | The cite at the end of that sentence (IPCC 2007a) points to WGIII. No action |
| 3550 | 1 | 13 | 31 | 14 | 2 | Format citation | Editorial – copyedit to be completed |
| 3881 | 1 | 14 | | | | What does AIE means?? | Figure has been redrawn |
| 11401 | 1 | 14 | 13 | 14 | 15 | The wording in the Bali Action Plan (decision 1/CP.13) referring to the footnote that cites the work of Working Group 3 of AR4 should be accurately reflect what is contained in the footnote - i.e. "Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Technical Summary, pages 39 and 90, and Chapter 13, page 776." Footnote 1 of decision 1/CP.13 did NOT specifically refer to only "Table SPM5 and Box 13.7" as the current text seems to imply. | Taken into account - The sentence has been revised to point to the Bali Action Plan generally rather than specific boxes and tables, as suggested by the comment |
| 11720 | 1 | 14 | 16 | 14 | 18 | G8 declaretion says [suport] not [agree]. Correct word should be used. | Accepted - changed 'agreed' to |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 9493 | 1 | 14 | 16 | 14 | 18 | revise this sentence to the correct fact - L' Aquila G8 Leaders Declaration says, "we reiterate our willingness to share with all countries the goal of achieving at least a 50% reduction of global emissions by 2050, recognising that this implies that global emissions need to peak as soon as possible and decline thereafter. As part of this, we also support a goal of developed countries reducing emissions of greenhouse gases in aggregate by 80% or more by 2050 compared to 1990 or more recent years."<br>(G8 Leaders Declaration: RESPONSIBLE LEADERSHIP FOR A SUSTAINABLE FUTURE/65. in page 19)(attached on email) | Taken into account - combined with other comment |
| 10636 | 1 | 14 | 16 | 14 | 18 | Yamaguchi et al argued in his essay Climate Change Mitigation  A Balanced Approach to Climate Change that in sipte of the inclusion of the 2 degree target, the leaders remained to recognize the broad scenetific view, and they have not agreed to the view yet. I will send it by email later. | Taken into account - combined with other comment |
| 10677 | 1 | 14 | 16 | 14 | 18 | If the agreement L'Aquila specifically referred to 2 degrees being a "scientific view" then this text should be placed in quotation marks, like the COP15 text. Otherwise these words should not be used, as it sounds like the IPCC authors are endorsing the idea of 2 degrees as the logical scientific interpretation of Article 2. | Accepted -  Reasonable comment. Quotation marks added as suggested by the comment. The phrase was revised to say "recognized the broad scientific view that the increase in global average |
| 17013 | 1 | 14 | 18 | | | "at least 80% by 2050… BELOW WHAT BASELINE?... Any conditions (e.g., domestic legislation, etc.)? | Rejected -  Exact wording is 'compared to 1990 or more recent years'. It doesn't seem necessary here to state this here. |
| 14341 | 1 | 14 | 19 | 14 | 23 | This omits an important addition: At COP16 in Cancun, Parties, for the first time, adopted the 2 degree goal through consensus (paragraph 4 of Decision 1/CP.16). | Accepted - Revised sentence to include mention of Decision 1/CP.16. |
| 11402 | 1 | 14 | 19 | 14 | 19 | In the context of the UN's treaty and mulitlateral negotiations practice, the UN General Asssembly had decided that "the term 'takes note of' or 'notes' are neutral terms that constitute neither approval nor disapproval" (see UNGA decision 55/488 of 7 September 2011, as reproduced in UN Doc. A/56/250 and UN Doc. A/64/250). Hence, when the UNFCCC COP took note of the Copenhagen Accord, it should be read as the COP not approving or disapproving the Copenhagen Accord, but rather simply noting its existence without necessarily endorsing or unendorsing its contents. As such, the 2 degree Celsius goal recognized in the Copenhagen Accord cannot be deemed to have been adopted by the UNFCCC Parties at COP15. It was, in fact, only at COP16 in Cancun that the Parties adopted the 2 degree Celsius goal under paragraph 4 of COP decision 1/CP.16. If the intent of the referenced sentence is to indicate when the COP adopted the 2 degree Celsius goal, then the reference to the Copenhagen Accord would be legally and factually inaccurate. The reference should, instead, be to COP decision 1/CP.16 | Taken into account - combined with other comments |
| 4855 | 1 | 14 | 20 | | 22 | Actually, the goal of limiting warming to 1.5o has also been mentioned already in the Copenhagen Accord (see its para  23). | Taken into account - revised text to say "Ever since the 2009 Copenhagen Conference the goal of 1.5 degrees has |
| 16063 | 1 | 14 | 22 | 14 | 23 | The target in temperature is a political choice of Nations, in particular those most vulnerable, that want to minimize the risk of overshooting tolerable warming. IPCC can say -as righly in Victor 2011- that it is expensive or not attainable through consensus negociations, but its role is not to limit such political ambitions. | Taken into account - we are not trying to limit ambitions but just to lay out the facts.  We think (with edits suggested by |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13370 | 1 | 14 | 22 | 14 | 23 | The assertion that the scientific foundations for these targets 'has remained elusive', is inaccurate. 'Dangerous' is a value -laden term. However the physical and biological sciences are able to provide reasonably accurate indications of species' and ecosystemic responses to changes in average and extreme temperatures, associated changes in weather, water availability etc. This body of research and observation is hard to summarise and varies signficantly by region. Nevertheless, it is based on a firm and growing volume of biological and physical evidence for impacts - including on ocean acidification and sea levels, glaciers, ice shelves (over time), coral reefs, and a broad range of individual species. These impacts accumulate and amplify substantially as global average temperatures rise above 1.5C. There is also good evidence about the iplications for sea-level rise and the likely fate of coastal settlemnts and biosystems. In terms of compounding effects, the scientific foundations for these targets - read in the contexty of Article 2 - are substantial and not elusive. I suggest the appropriate sentence would be: 'The scientific foundation for establishing these targets - in the light of the broad goals articulated for the UNFCCC - is substantial and compelling'. | Taken into account - We might want to have a substantial base of science, but we don't really know. Some of the sicence says 1 degree is too much. Some says that in some settings 3 degrees is too much. Variations in what different societies mean by "dangerous" and the risks they are willing to endure further amplify that observation. Sentence has been revised to reflect the variation. |
| 13677 | 1 | 14 | 22 | 14 | 23 | Replace "However … Victor 2011" by "Researchers disagree regarding the scientific foundations for setting temperature targets - Schneider and Lane (2006) see them as sufficiently robust, Victor (2011) does not." Source: Schneider, S.; Lane, J. (2006): An overview of dangerous climate change, in: Schellnhuber, H.-J. (ed.): Avoiding dangerous climate change, Cambridge University Press, Cambridge, p. 7-24 | Taken into account - Sentence has been revised per other comment. Added citation to Schneider and Lane (2006) |
| 17737 | 1 | 14 | 23 | | | should be UNFCCC | Sentence has been replaced and word was removed. Comment no longer |
| 15534 | 1 | 14 | 23 | | | Perhaps worth mentioning that the 2degC ceiling was endorsed at Cancun. | Taken into account - combined with |
| 4887 | 1 | 14 | 23 | | | the UNFCCC— | Sentence has been replaced and word was removed. Comment no longer |
| 17014 | 1 | 14 | 23 | | | This paragraph could benefit by reference to the National Academy of Sciences 2011 report, "Climate Stabilization Targets", chaired by Susan Solomon | Accepted - added reference to NAS (2011) |
| 8476 | 1 | 14 | 24 | | 30 | Much of this chapter, and in fact most of AR5, is largely premised in the "deficit model" of knowledge transfer and policymaking, where it is often an a priori assumption that public policy simply needs the "right" data, knowledge or instruments in order to rectify the problem(s). This is a problematic starting point, as (while the emphasis on evidence is important) it tends to ignore or downplay the political, fiscal and path dependent realities of decisionmaking in the public domain. See for example Stone's "Policy Paradox" (1997) or Lawton 2007 (Presidential Address)Ecology, Politics and Policy | Noted - This is an interesting point but too detailed for Ch 1. You might be reading into this more than we are trying to say. We are explictly not doing this. |
| 7874 | 1 | 14 | 24 | 14 | 30 | Any critical literature on geoengineering is missing and should be mentioned here in order to provide a balanced view (Gardiner 2010, 2011b, Goes et al. 2011, Rickels et al. 2011, Robock 2008, Robock et al. 2010, Svoboda et al . 2011, Ott 2012, as well as the contributions in Preston 2012). | Accepted - expanded text to mention the controversy on geoengineering and added cross reference to chapter 6.9 and citation to Rickels et al (2011) and Gardiner (2010) as suggested. More |
| 7347 | 1 | 14 | 24 | 14 | 30 | This paragraph is very clumsy and has poor English usage and grammar ("facing with"; "number of literatures" "from various footings"). It also conflates possible extreme effects and appropriate policy responses - better to break these two ideas apart. Then it would be better not to elevate "geoengineering", as currently it is the only appropriate policy response measure discussed. | Taken into account - paragraph has been revised and the mention of geoengineering expanded to be more balanced |
| 4856 | 1 | 14 | 25 | | | "reference could also be made to the relevant/recent IPCC SP on extremes | Rejected - IPCC SR on extremes does not cover catastrophic losses such as collapse of THC or antarctic ice sheet. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7875 | 1 | 14 | 25 | 14 | 25 | The observation that emissions are not on track for stabilization let alone deep cuts is correct. But it would substantially improve the analysis of what has happend so far and in identifying current challenges to say something about how "this reality" came about and who created it. One reason that is not mentioned throughout the first chapter is that one of the largest emitter in terms of absolute and per-capita emissions, the US, has refused to implement any meaningful climate policy on a national level until today. See also comment 26. | Rejected - assigning cause is not helpful here. |
| 14794 | 1 | 14 | 26 | | | "Weitzman (2009) raised the concern that standard policy decision tools such as cost-benefit analysis and expected utility theory are not able to deal with climate change decisions, owing to the uncertain probability of high or catastrophic impacts." | Accepted - adopted suggested sentence to replace existing one |
| 13678 | 1 | 14 | 27 | 14 | 30 | Replace "Facing …Society 2009" by "Partly driven by these concerns, the literature on geo-engineering options to remove CO2 from the atmosphere or manage solar radiation has been increasing exponentially (see Chapter 6.9)". | Accepted - adopted suggested sentence |
| 15248 | 1 | 14 | 28 | 14 | 30 | contradicting Article 2 | Noted - insufficient information. No |
| 14331 | 1 | 14 | 28 | 14 | 30 | The brackets in line 28 suggest that their content is a definition of geoengieering. Yet finding a definition, e.g. for scientific or governance purposes, is still a major challenge. On definitions see e.g. Williamson, P., Watson, R.T., Mace, G., Artaxo, P., Bodle, R., Galaz, V., Parker, A., Santillo, D., Vivian, C., Cooper, D., Webbe, J., Cung, A. and E. Woods (2012). Impacts of Climate-Related Geoengineering on Biological Diversity. Part I of: Geoengineering in Relation to the Convention on Biological Diversity: Technical and Regulatory Matters. Secretariat of the Convention on Biological Diversity. Montreal, Technical Series No. 66. | Sentence has been replaced per other comment. Comment no longer relevant |
| 14332 | 1 | 14 | 28 | 14 | 30 | The literature cited does not cover current key aspects of geoengineering governance and ist interrelation with mitigation policy. More recent literature such aspects includes e.g.:<br>- Bodle, R., with Homan, G., Schiele, S., and E. Tedsen (2012). Regulatory Framework for Climate-Related Geoengineering Relevant to the Convention on Biological Diversity. Part II of: Geoengineering in Relation to the Convention on Biological Diversity: Technical and Regulatory Matters. Secretariat of the Convention on Biological Diversity. Montreal, Technical Series No. 66;<br>- Bodle, Ralph, "International governance of geoengineering: Rationale, functions and forum", in: William C.G. Burns and A. Strauss, (eds.), Climate Change Geoengineering: Legal, Political and Philosophical Perspectives, Cambridge: Cambridge University Press (submitted February 2011; in press);<br>- Lin A.C., International Legal Regimes & Principles Relevant to Geoengineering (in press). In: W.C.G. Burns and A. Strauss, (eds.), Climate Change Geoengineering: Legal, Political and Philosophical Perspectives. Cambridge: Cambridge University Press, Cambridge (submitted 2011, in press);<br>- Rickels, W.; Klepper, G.; Dovern, J.; Betz, G.; Brachatzek, N.; Cacean, S.; G ssow, K.; Heintzenberg J.; Hiller, S.; Hoose, C.; Leisner, T.; Oschlies, A.; Platt, U.; Proelß, A.; Renn, O.; Sch fer,S.; Z rn M. (2011): Large-Scale Intentional Interventions into the Climate System? Assessing the Climate Engineering Debate. Scoping report conducted on behalf of the German Federal Ministry of Education and Research (BMBF), Kiel Earth Institute, Kiel, available at http://www.fona.de/mediathek/pdf/Climate_Engineering_engl.pdf | Taken into account - We don't' have a lot of space here on this topic, added the Rickels et al cite. |
| 9786 | 1 | 14 | 28 | | | When political decision makers read such paragraphs, they might tend to draw the conclusion that geo-engineering might save it all. | Taken into account - sentence has been replaced per other comments |
| 14795 | 1 | 14 | 28 | | | Add: "...literature on risks and potential of geo-engineering..." | Taken into account - sentence has been replaced and discussion expanded per |
| 5459 | 1 | 14 | 3 | | | this paragraph describes different summits and their respective goals- they all seem well intentioned but it is not clear what the point of the paragraph is. It seems that the point is integrating the scientific basis and knowledge on climate change into political goals- but a sentence or two to direct the reader would be helpful | Noted - The purpose is to show how ultimate objective or 2 degree target has been treated. The idea of this paragraph is to convey the role of these parallel processes. Paragraph has been revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7346 | 1 | 14 | 3 | 14 | 23 | It does not seem appropriate to cite political declarations of the G8 as evidence for a global interpretation of Article 2 of the Convention. If political statements are to be referred to then the range of submission by country groupings to the UNFCCC (usually consisting of more than eight members) could be referred to here. As the African Group, the Least Developed Countries gorup, the Alliance of Small Island States and the Bolivarian Alliance of the Americas (ALBA), representing over 100 countries collectively, have suggested a 1.5C target. The material as presented suggests the G8 declarations are more relevant to determining what constitutes "safe" or "dangerous" interference than submissions from more sizeable and more representative groups of countries. It would be preferable to perhaps remove the discussion of political considerations if the conclusion that no scientific foundation for establishing the targets is to be maintained. Otherwise reference to the Cancun Agreements, with reference to below 2C with the intention to review and consider a 1.5C target, may be more appropriate. | Taken into account - Cancun has been added though it was touched upon in more general way. The reasons why G8 declaration is included here are 1) leaders have first agreed to explore halving global emissions by 2050 (in 2007 at Heiligendam), and 2) they supported to cut their emissions at least 80% by 2050. There are many G8 Summit statements, but only important two among them from the standpoint of mitigation target are cited here. The |
| 3311 | 1 | 14 | 30 | 14 | 30 | I would add a reference to an ethical skeptic: Gardiner (2010). "Is 'arming the future' with geoengineering really the lesser evil? Some doubts about the ethics of intentionally manipulating the climate system" in Gardiner, Caney, Jamieson, and Shue (2010). Climate Ethics: Essential Readings. New York: Oxford University Press | Taken into account - combined with other comments |
| 3062 | 1 | 14 | 30 | | | Also cite the Novim report http://www.arxiv.org/abs/0907.5140 (2009) | Rejected - several citations already added per other comments. I think we |
| 8506 | 1 | 14 | 30 | 14 | 30 | It would be appropriate to mention that in the framework of the G8+5 summit (Tokyo, 2008) the meeting of leading academies of science stated in its resolution that “there is also an opportunity to promote research on approaches which may contribute towards maintaining a stable climate (including so-called geo-engineering technologies and reforestation), which would complement our greenhouse gas reduction strategy”. | Rejected - too much detail for this chapter |
| 9787 | 1 | 14 | 31 | 14 | 47 | Multidimensional optimization will gain importance, time issues as later on stressed in chapter 2 as well. I would add a sentence that both decision dimensions and the time-frame are specific and thus different for different decision makers and must be dealt with accordingly. There is no "one size fits all" | Taken into account - other edits to the text will emphasize this point--about article 2, about time horizons for |
| 3312 | 1 | 14 | 32 | 14 | 36 | I don't understand, precisely, what this sentence is referring to. Why are the costs harder to make precise? | Taken into account - sentence has been |
| 7876 | 1 | 14 | 32 | 14 | 43 | This view is based on a portfolio perspective as it is adopted in the Royal Society report on climate engineering (Shepherd et al. 2009). However, such a perspective seems implausible to assess the triangular affair of mitigation, adaptation and geoengineering. It supposes that one can choose between any combination of the measures and thereby ignores possible trade-offs. For instances, if employment of measure A undermines measure B it does not make much sense to speak of a portfolio. In addition, the portfolio perspective obscures conflicts of interests and, hence, justice for a different mix of measures will affect different people (differently). For further criticism of the portfolio pespective see Gardiner (2011). | Taken into account - text has been revised |
| 15249 | 1 | 14 | 37 | 14 | 38 | see point 7 | Noted - insufficient information. No |
| 12218 | 1 | 14 | 40 | 14 | 40 | Please use consistent language. Here soot is used, earlier balck carbon is used e.g. on page 12, line 49. The term Black Carbon is preferred. | Accepted - changed "soot" to "black carbon" |
| 14796 | 1 | 14 | 41 | | | It is not the case the because the world is not on track for 2C that analysts have had to look at higher temp goals; the higher temperature goals (3C, 4C, 5C, etc.) have always been among the scenario runs. What would be correct would be to state... "And the evidence that the world is not on track to stop warming at 2 degrees Celsius means that analysist have had to explore solutoins that compensate for this slow progress, through more rapid emission declines later and/or negative emission options." | Taken into account - sentence has been revised. The term "slow progress" suggested is too emotive. And I think when you look at the history the number of STABILIZATION runs at these higher |
| 7348 | 1 | 14 | 41 | 14 | 43 | Firstly this sentence accepts or suggests that 2C is an accepted global goal, which should be stated in the context of the review of that goal, as that is how many countries agreed to it. Secondly, it is unclear why a failure to reach a goal determined to be "safe", should then result in the need for "another goal." Surely 1C, 1.5C or 2C can all continue to serve as goals and the science can continue to inform policy-makers how far they are from those goals. | Taken into account - combined with other comments. There is extensive discussion elswehere in the text about the origins of 1, 1.5 and 2 degrees. No further action needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11026 | 1 | 14 | 42 | | | The phrase 'analysts have had to devise a larger number of alternative goals' is poorly expressed and should be amended to 'analysts have had to consider a number of alternative goals, and the costs of inaction relative to the costs of accelerated policy action.' | Accepted - phrase has been adopted to replace the original, as suggested |
| 13679 | 1 | 14 | 42 | 14 | 43 | Replace "… have had to devise… goals" by "have to assess new policy instruments that could achieve substantial mitigation or assess the costs and benefits of alternative goals". Reason: The fact of not being on track could mobilize higher political will to get back on track. | Taken into account - combined with other comment |
| 2244 | 1 | 14 | 44 | 14 | 47 | We need scientific evidence. Scentific "understanding" is insufficient | Rejected - Science is a combination of evidence and understanding. This is off topic for this chapter. No action needed |
| 13368 | 1 | 14 | 5 | | | It is unclear what 'purposely difficult' is intended to mean. Written to be obscure? I suggest it is clearer to write simply 'Interpreting the UNFCCC's goals is sometimes difficult'. | Taken into account - combined with other comment. We are removing |
| 11400 | 1 | 14 | 5 | 14 | 5 | The sentence "Interpretiing the UNFCCC goals is purposely difficult" injects a subjective opinion as a scientific truth, implying that the treaty framers intended to make the UNFCCC's provisions to be unclear and ambiguous. The word "purposely" should be deleted. | Taken into account - combined with other comment. We are removing "purposely" |
| 13369 | 1 | 14 | 7 | 14 | 9 | 'The second part of Article 2...etc.' This sentence's assertion about the second part of Article 2 is inaccurate. It is scientifically possible to indicate when species and ecosystems are/were adapting naturally rather at a point when such adaptation is breaking down or impossible, in relation to climate-driven pressures (temperatures, patterns of species reproduction, water avaialbility, and so on). Similarly it is possible to indicate when human-engendered and climate-related threats are affecting food systems and sustainable economic development. | Rejected - This isn't really the point we are making--we are making a point about the ability to nail down precisely what is "dangerous". Other edits (suggesting a variety of points of view, see comment 686) address this |
| 4607 | 1 | 14 | 9 | 14 | 9 | Do you mean "natural science analysis"? | No--we mean the totality of scientific assessment. No action needed. |
| 6507 | 1 | 14 | 18 | | | Replace "agreed to cut their emissions" with e.g. "supported a goal of developed countries reducing emission of greenhouse gases in aggregate" according to the text of L'Aquila G8 Summit. | Taken into account - combined with other comments. Text has been revised |
| 3552 | 1 | 14 | 27 | 14 | 27 | "Facing with the increasing…", delete "with" | This sentence has been removed per an previous comment. Comment no longer |
| 6865 | 1 | 14 | 27 | 14 | 28 | Suggest to refer to both WGI and WGII AR5 as the basis for such statements. | This sentence has been removed per an previous comment. Comment no longer |
| 3551 | 1 | 14 | 7 | 14 | 7 | Reference to Chapter 1 in AR4, specify if this is in WG III report (which is likely) | Taken into account - text has been |
| 6866 | 1 | 14 | 41 | 14 | 42 | Supporting evidence for this statement needed. Suggest to add reference to relevant sections of WGI AR5, Chapter 12. | Taken into account - addressed through responses to other comments such as |
| 4018 | 1 | 15 | 10 | | | after "Shindell et al., 2012" add "Anenberg et al., 2012". The full reference: Anenberg, S.C., J. Schwartz, D. Shindell, M. Amann, G. Faluvegi, Z. Klimont, G. Janssens-Maenhout, L. Pozzoli, R. Van Dingenen, E. Vignati, L. Emberson, N.Z. Muller, J. Jason West, M. Williams, V. Demkine, K. Hicks, J.C.I. Kuylenstierna, F. Raes, and V. Ramanathan. Global Air Quality and Health Co-Benefits of Mitigating Near-Term Climate Change through Methane and Black Carbon Emission Controls. Environ Health Perspect 120:831–839 (2012). http://dx.doi.org/10.1289/ehp.1104301. | Rejected - we are already overloaded with refs. |
| 2245 | 1 | 15 | 11 | 22 | 35 | Your theory seems to believe that the climate is influenced by CONCENTRATIONS of greenhouse gases in the atmosphere. Why do you place so much attention on EMISSIONS?. What evidence is there that they have any effect on atmospheric concentrations? | Noted - Emissions lead to concentrations. See WG1. No action needed |
| 10823 | 1 | 15 | 11 | 15 | 18 | Given the use of Figure 1.3, and the previous reference to Shindell et al 2012 and UNEP 2011, you seem to be expanded GHGs to be more than just the long-lived (wel-mixed) GHGs as in the Kyoto Protocol. I think this is good and overdue. Yet, in section 1.3.1 you focus on the long-lived greenhouse gases. I think you should justify why you focus on these. | Taken into account - The first two paragraphs have been revised to explain. |
| 14359 | 1 | 15 | 12 | | | Try to say something about likely emissions after 2008. There was a temporary slowdown (decline?) because of global recession, but I believe there was an especially large increase in 2010. The point could usefully be made that despite the recession the medium-term path is still about what was expected before. | Accepted - data will be updated as they become available |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10837 | 1 | 15 | 12 | 15 | 12 | Footnote 1. If it fine to use EDGAR. Why did you stop at 2008? When I believe EDGAR has numbers to 2011 now? And it is probably worth referencing what you write, e.g., http://www.biogeosciences-discuss.net/9/1299/2012/bgd-9-1299-2012.html | Accepted - data will be updated as they become available. Cite added to WGIII Annex II |
| 10679 | 1 | 15 | 12 | 15 | 12 | Given the importance of global GHG emissions data, it would be helpful if the authors provided pointers to some of the other sources out there (e.g. WRI CAIT, UNFCCC). There could even be a box listing these sources and comparing their different characteristics (sectoral coverage, temporal coverage, estimated uncertainties, etc.) | Taken into account - cross reference added here. |
| 9922 | 1 | 15 | 12 | | | A url should be given in the footnoot to the EDGAR dataset. | footnote has been removed. Full citation to the database in the reference list |
| 12219 | 1 | 15 | 17 | 15 | 18 | Does the explanation in paranthesis mean that the EDGAR database does not include BC, or is it another explanation to exclude BC? | Taken into account - text has been revised |
| 10743 | 1 | 15 | 19 | 15 | 21 | It should be specified that it is the IPCC reports FAR to AR4 that presented GWPs for transforming emissions of different components to a common scale. And I think it is important to mention here that the GWP concept has been subject to critisism and that several alternatives have been presented. (See AR5 WG1 SOD as well as Report from IPCC Expert meeting on Metrics (Plattner et al., 2009)). | Taken into account - Revise sentence to say: "Starting with the first assessment report, the IPCC has calculated global warming potentials (GWPs) to convert these gases with different properties into common units over 20, 100 and 500 year time horizons (chapter 2, IPCC First Assessment Report, 1990). In the Kyoto Treaty diplomats chose the middle value--100 years--despite any published conclusive basis for that choice (Shine, 2009). The GWP concept has been subject to criticism, including as more experts focus on the potentials for mitigation of pollutants with short atmospheric lifetimes whose radiative impacts are relatively under-counted |
| 10744 | 1 | 15 | 19 | 15 | 21 | Regarding footnote 2: Very good. | Noted |
| 10745 | 1 | 15 | 19 | 15 | 30 | Somewhere in this para (or in a footnote) it should be made clear that IPCC did not choose 100 years time horizon, but presented GWPs for 20, 100 and 500 years. And that it was for the Kyoto Protocol that 100 years was chosen (without any published conclusive basis for this; see e.g. editorial by Keith Shine in Climatic Change, 2009). | Taken into account - combined with other comment |
| 18017 | 1 | 15 | 19 | 15 | 30 | could more reason be given on why to select 1970 to 2008 as the timeframe for reviewing historical GHG emission? | Accepted, data will be updated as they become available |
| 10824 | 1 | 15 | 19 | 15 | 21 | I release the "footnote 2" keeps a door open, but as the WGI text clearly explains is that the use of GWP100 is a value based choice that has no real justification. I know it is used broadly, but I think a stronger link to the actuall WGI text. For example, the use of "the IPCC has long used" implies that there is broad agreement on using the GWP100, which is not the case. Perhaps word something like "we use the GWP100 as in the Kyoto Protocol, but we recognise that other equally valid choices exist (ref WGI)". | Taken into account - combined with other comment |
| 11352 | 1 | 15 | 19 | 15 | 21 | Although the GWP100 is the most commonly used metric for research and policy purposes, emission conversions using the GWP100 have drawn various criticisms (Fuglestvedt et al., 2003, Climatic Change, 10.1023/a:1023905326842; Fuglestvedt et al., 2010, Atmospheric Environment, 10.1016/j.atmosenv.2009.04.044). To avoid promoting the use of GWP100, it can be stated that the GWP100 is used only to illustrate the change in greenhouse gas emissions on a common scale and to faciliate comparison. Issues related to the GWP and other metrics are summarized in Tanaka et al. (2010, Carbon Management, doi:10.4155/cmt.10.28). | Taken into account - combined with other comment |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11403 | 1 | 15 | 19 | 15 | 30 | There should be an explanation of why the timeframe 1970 to 2008 was used for purposes of reviewing historical GHG emissions. Why should not the historical range be extended back to at least 1900 or 1850? Starting from 1970 would essentially discount pre-1970 historical emissions as a factor in calculating future emissions responsibility. | Accepted, we will be adding a figure on cumulative emissions. |
| 4019 | 1 | 15 | 26 | 30 | | Please check the percentage. As all non-CO2 GHG have GWP higher then CO2 total emissions of all greenhouse gases - weighted by their global warming potential (GWP) with 100 year time horizon should have increased by more than 80% since 1970, even though some of them have shorter life times compared to CO2 | Rejected - non-CO2 weigh only 1/4 altogether and they increased less than 80%. No action needed |
| 16064 | 1 | 15 | 28 | 15 | 18 | The "collection" of flunorinated gas is probably inaccurate. "Net emissions" or "production" may be correct. | Rejected - collection is OK. No action |
| 18412 | 1 | 15 | 3 | | 4 | Such country or group of countries related statements do not need to be repeated within the chapter. That's a bad policy. | Rejected - this shift is correct and important for the assessment. No action |
| 10825 | 1 | 15 | 31 | 15 | 31 | "warming gases" would be better to be "GHG", as Figure 1.3 shows some are cooling | Accepted - changed "warming gases" to |
| 10826 | 1 | 15 | 31 | 15 | 32 | This could be confusing to some people. State more clearly, that "by weighting the GHG with a GWP100, CO2 contributes…". | Accepted - Changed sentence to "Looking at the total source of warming gases AND WEIGHTING WITH 100- |
| 10827 | 1 | 15 | 31 | 15 | 32 | Do the percentages refer to a single year, and average of all years, etc? State. | Taken into account - combined with |
| 7349 | 1 | 15 | 31 | 15 | 36 | Why is some detail of the country of origin provided for some of these statistics (e.g. China's contribution to CO2 from cement) but not others? Particularly as no such information is present in the figure referred to it may be better to remove the references. | Rejected - we are just illustrating so that people get a sense of how the activities are allocated |
| 17016 | 1 | 15 | 31 | | | Are these %'s for a 100-yr time-span, as well? | Taken into account - combined with |
| 17017 | 1 | 15 | 33 | | | Does "agriculture" here include all aspects of LULUCF / AFOLU? What about forests? Are these numbers consistent with those coming out of WG1? It is critical that numbers like these are cross-referenced for consistency. | Taken into account - All categories of emissions are listed in Annex II. See Annex II for emissions included in |
| 9778 | 1 | 15 | 36 | 15 | 36 | Emphasizing "originated in China" is not fit. Suggest to delete "of which half originated in China" | Rejected - we are just illustrating so that people get a sense of how the activities |
| 17015 | 1 | 15 | 5 | | | Insert , "… to encourage shifts TO LOWER GHG EMISSIONS in the energy system, …" | Accepted - adopted wording as |
| 17406 | 1 | 15 | 6 | | | Here or somewhere else that biofuels are referenced, it is important to discuss the potential negative effects of large-scale deployment of biofuel approaches for land use (eg, under growing conditions of inadequate global food supply, diverting existing cropland to biofuel production risks exacerbating conversion of natural systems to agriculture with large resulting release of C to the atmosphere). | Rejected - other edits create this balance; there is a whole chapter on these issues too. No action needed |
| 10678 | 1 | 15 | 7 | 15 | 10 | Little evidence is given here or in the rest of the chapter to support the claim that there has been substantially more effort to mitigate soot and methane (the Shindell Science paper does not discuss past trends, only future mitigation; the full UNEP report has a brief discussion of trends but only ozone precursors show much decline in the charts there). | Accepted: edited sentence to say: "...there ARE SUBSTANTIALLY STRONGER INENCITVES TO LIMIT SHORT-LIVED POLLUTANTS LIKE BLACK CARBON (SOOT) and methane—in part because these other pollutants are also linked to many local environmental ills AND THUS THE |
| 4017 | 1 | 15 | 9 | | | suggested wording: "many local environmental ills and human respiratory diseases" | Taken into account - combined with |
| 18428 | 1 | 15 | | | | historical and future trends<br>When the report presents the trend (pag 15 paragraph 1) it should say that emissions are growing horribly, and not only "shifting". | Rejected - but they are shifting, and using the word "horribly" is sure to earn ire from others. No action needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17018 | 1 | 15 | | | | It's unfortunate that the data used only goes through 2008 - just at the height of the recession. Some very interesting trends have emerged in the 4 years since the deepest part of the recession and it may come across as tone-deaf for a report that is to be published in 2014 to be based on 2008 data, esp when databases such as IEA, NEAA and EIA have more up-to-date emissions data. AR4 came out in 2007 and used 2004-05 emissions data, so it should follow that AR5 which comes out in 2013-14 should use 2011 data, FF CO2 data of which will be available by IEA later this year. Does the TaskForce on National Greenhouse Gas Inventories have anything to add to this data? | Accepted, data will be updated as they become available |
| 11892 | 1 | 15 | 11 | 17 | 34 | This section is too long and not easy to catch the point. Suggest to add a table to summarize the changes in GHG (in %) and the major driven factors for these changes. | Taken into account - section has been revised |
| 18113 | 1 | 15 | 19 | 15 | 30 | There is reference to 2008 emissions in this paragraph. However Fig 1.4 shows data only till 2006. This paragraph also discusses % rise in emissions between 1970 - 2008. Either the text or the figure (1.4) needs to be changed. | Accepted, data will be updated as they become available |
| 6867 | 1 | 15 | 20 | 15 | 21 | Please add reference to WGI AR5 Chapter 8. | Taken into account - combined with |
| 3553 | 1 | 15 | 31 | 15 | 36 | Mention contribution from transport in thsi paragraph. | Rejected - the paragraph is just illustration. Each sector does not need |
| 6508 | 1 | 15 | 31 | | 36 | Quote the year, for which contributions of gases are calculated. | Taken into account - combined with |
| 18111 | 1 | 15 | 31 | 15 | 36 | The sector categorisation in this paragraph does not match that shown in Figure 1.4 (right). Suggest harmonising them for ease of understanding. | Accepted - edited line 34 to say: "Other sources of greenhouse gases INCLUDE CO2 from biomass burning (11%, mostly forest and peat fires and post?burn decay in non?Annex I countries), and INDUSTRIAL |
| 6868 | 1 | 15 | 31 | 15 | 36 | Please ensure consistency in numbers with WGI AR5, Chapters 2, 6, 8, ....; this also applies to the quantitative results provided in the subsequent sections. | Accepted - will double check for consistency |
| 17694 | 1 | 15 | 9 | 15 | 10 | Must be better explained why countries create policies to limit the emission of some pollutants. Their budget is limited and they can obtain more percibable results in the reduction of these contaminants with less money. | Taken into account - combined with other comments |
| 9249 | 1 | 16 | | 16 | | Are biofuels incorporated here under Energy? Too small a component to split out? | Figure has been redrawn. Modern biofuels production are in the energy sector, consumption in transport sector (only non-CO2). Traditional biofuels and |
| 14797 | 1 | 16 | | | | "2% in Ax1 and 87% in non-Ax1" < 100% ? | it is a percentage of a percentage (first derivative), not absolute. No action |
| 3063 | 1 | 16 | | | | Figures show that IPCC is essentially wasting its advocacy effort---emissions have steadily increased WGI and II are performing a useful function in collecting and summarizing the science, but the discussions of “mitigation” of emissions (that is not proper English usage; effects may be mitigated, but emissions are reduced, or not) are wishful thinking. It hasn't happened, and there is nothing to indicate it will. | Noted - no action needed |
| 11891 | 1 | 16 | | | | The legends and captions are too small. | Figures will be re-designed for print and on-screen for final draft. |
| 7447 | 1 | 16 | | | | The GHG emissions for ALFOU seem high. Most biomass used for energy is from sustainable sources. It seems that some is assumed to be non-sustainable. I have discussed this in detail in chapters 7 & 11. | Taken into account - Added cross-reference to chapters and beefed up the |
| 7308 | 1 | 16 | 1 | | | Waste sector is missing from sectoral estimates in this figure. | Taken into account - waste sector will be |
| 7307 | 1 | 16 | 10 | | | "landfills and wastewater (together an increase of 90%, with 20% since 1990)" No citation given. | The figure has been redrawn and corresponding text removed. Comment |
| 14360 | 1 | 16 | 11 | | | Explain why rice emissions declining | The figure has been redrawn and corresponding text removed. Comment |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14361 | 1 | 16 | 11 | | | Lumping livestock and other agriculture emissions together with land use is a problem. Should separate out deforestation. Is agriculture (including livestock) a large source of emissions once deforestation is removed? (I think not.) | The figure has been redrawn and corresponding text removed. Comment no longer relevant |
| 10468 | 1 | 16 | 17 | | | Delete "gases" | The figure has been redrawn and corresponding text removed. Comment |
| 15535 | 1 | 16 | 19 | | 29 | How are the regions defined? | Taken into account - this paragraph has been removed but descriptions of the categorization of countries can be found |
| 9094 | 1 | 16 | 19 | 16 | 29 | The reducing the emissions of the greenhouse gases (GHG) requires the inclusion in the analysis of real quantities of emissions originated in developed countries, because their historical and actual emissions are very very high in comparison with the developing countries emissions. | Taken into account - we are adding a cumulative emissions charts and the whole purpose of the discussion here is |
| 18413 | 1 | 16 | 19 | | 35 | From an ethical and policy perspective the use of the basis year 1990 is controversial and misleading. Is the purpose of the text to focus on the “bad guys” again? Assessing long term changes in trends is more reasonable. | Noted - 1990 was chosen by UNFCCC and Kyoto so we are following that. No action needed |
| 11582 | 1 | 16 | 19 | 16 | 29 | There is need to interrogate these figures and references be provided. | Noted - The paragraph discusses figure 1.4. No action needed |
| 4888 | 1 | 16 | 20 | | | [Del] generally used terminology w/o "highly":: ["highly] industrialized | Taken into account - "highly" has been |
| 3555 | 1 | 16 | 21 | 26 | 24 | References to Annex I, Annex II and Annex B countries mixed up. If retained, each should be defined clearly. | Taken into account - edited sentence to sy "Since 1990 CO2 emissions from electricity and heat production increased by 27% for the group of OECD countries; the rest of the world has risen |
| 17019 | 1 | 16 | 21, 35 | | | In l21, it cites that 87% of the rise in FF CO2 emissions sicne 1990 is from NA1 nations. In l35, it states that the rise in CO2 emissions from energy from non-A2 nations since 1990 is 64%. How can these nubemrs be reconciled? This is a significant difference for seemingly similar metrics with similar baselines. | Taken into account - combined with other comments, edits (see 781) remove the annex II distinction and simplify. |
| 17020 | 1 | 16 | 23 | | | "newly industrialized countries"; again, these nations should be listed so a complete snapshot of the current situation in the world is given, while also allowing posterity to read this report and assess what each nation has done, what impact it has had, etc. | this paragraph has been revised. The discussion on newly industrialized countries has been removed. Comment |
| 7151 | 1 | 16 | 24 | | | The word 'in' should be struck. Otherwise the sentence does not make sense. | this paragraph has been revised. The sentence has been removed. Comment |
| 17021 | 1 | 16 | 24 | | | "other developing countries"; again, these nations should be listed so a complete snapshot of the current situation in the world is given, while also allowing posterity to read this report and assess what each nation has done, what impact it has had, etc. - does this refer to Least Devleoped Nations (LDCs)? | this paragraph has been revised. The sentence has been removed. Comment is no longer relevant. |
| 4889 | 1 | 16 | 26 | | 27 | many readers may not know these abbreviations (esp. the case of Mexico and S-Korea): "OECD North America .. OECD Europe .. OECD Pacific | this paragraph has been revised. The sentence has been removed. Comment |
| 12220 | 1 | 16 | 27 | 16 | 28 | The description explaning EIT in page 17, line 31-33, could better be introduced here where it is mentioned the first time. It should also be in the Glossary naming the countries that are included in the EIT group. | this paragraph has been revised. The sentence has been removed. Comment |
| 17022 | 1 | 16 | 27 | | | "Economies-in-transition" ; again, these nations should be listed so a complete snapshot of the current situation in the world is given, while also allowing posterity to read this report and assess what each nation has done, what impact it has had, etc. | this paragraph has been revised. The sentence has been removed. Comment is no longer relevant. |
| 17023 | 1 | 16 | 28 | | | Emissions from EIT declined in the 1990s and have since levelled… IN LARGE PART BECAUSE OF THE BEAK UP OF THE SOVIET UNION (and wahtever inefficient centralized industrial policies may have | this paragraph has been revised. The sentence has been removed. Comment |
| 10470 | 1 | 16 | 28 | 16 | 33 | Sentence "Emissions …… to 1970." is out of place. Move to line 33 after "doubled." | Accepted - sentence moved |
| 10469 | 1 | 16 | 30 | | | Think this should be "Fig 1.5" not 1.6 | Figures have been changed and renumbered. Text is updated accordingly. |
| 10680 | 1 | 16 | 30 | 16 | 30 | There is a reference to a Figure 1.6 here that is not the actual Figure 1.6 in the draft (properly referenced on p17 line 8). I suspect there is a missing chart... | Figures have been changed and renumbered. Text is updated accordingly. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17024 | 1 | 16 | 32 | | | "CO2 EMISSIONS FROM the energy ssytem have nearly tripled…" (The ernegy system itself has not tripled since 1970, ahs it? If so, fine, but it sounds like the intent of this statement is in regard to emissions, not the energy system itself. | Accepted - edited to say "EMISSIONS FROM THE energy system…" |
| 17025 | 1 | 16 | 33 | | | Simialr to previous comment - Has transport doubled since 1970? Or have CO2 emissions from transportation doubled? | Taken into account - text has been revised for clarity |
| 4890 | 1 | 16 | 34 | | 35 | [Del and Cor] "[highly] industrialized (so-called “Annex II” countries) .. in Annex II (I guess: Annex I) | Taken into account - combined with |
| 16199 | 1 | 16 | 7 | | 18 | Using %s to describe change within a gas limits ability to compare across gases--perhaps add actual values in parentheses (drawn from the charts--and/or refer reader to charts) | Rejected - chapter 1 is just an overview. For more detail you can go to sectoral chapters or to WG1 where there is a lot |
| 11404 | 1 | 16 | 7 | 17 | 26 | The effect of choosing 1970 as the starting year for looking at historical emissions becomes clear in these paragraphs - these highlight the point that emissions growth in the post-1970 period come from developing countries rather than developed countries, which could create the implication that future responsibility for emissions will then lie largely with developing countries and that, therefore, the focus for mitigation actions will have to be on developing countries rather than on developed countries. Choosing 1970 as the starting year allows the analysis to disregard the fact that the vast majority of anthropogenic GHGs currently in the atmosphere was contributed by developed countries if historical emissions between 1850 or 1900 up to the present were taken into account. | Accepted, we will be adding a figure on cumulative emissions. |
| 10828 | 1 | 16 | 8 | 16 | 8 | "higher emissions from livestock". Is this a per unit increase or do you really mean "increase in the number of livestock" | this paragraph has been revised. The sentence has been removed. Comment |
| 3882 | 1 | 16 | 9 | 16 | 9 | "oil and gas production and transmission"". What does it means transmission in this context? | this paragraph has been revised. The sentence has been removed. Comment |
| 14798 | 1 | 16 | | | | Format for reporting emission rises is inconsistent. Generally, if the Ax1 and nonAx1 breakdown is probably more informative if given as "X% of the rise has been in Ax1 and Y% has been in nonAx1" rather than "Ax1 has risen by X% and nonAx1 has risen by Y%" since the latter requires the reader to know the relative proportions of Ax1 and nonAx1 base year emissions in order to understand the implications of the reported rises in emissions. | Taken into account - these are really broad trends and the point is just to illustrate them generally. Text is revised and added a pie chart for further illustration |
| 18110 | 1 | 16 | | 16 | | The caption states that the figures show the long term trend from 1970-2009, however the figure only contains data till 2006. Caption needs to be amended to 2006. Also, is "buildings" an economic sector? Does this refer to the construction industry or something else (direct energy use in buildings?) This may need further explanation. Finally, under which category would methane emissions from landfills be captured? | the sectors reflect the breakdown in the rest of WG3. figures will be updated later |
| 4363 | 1 | 16 | | 16 | | time period (1970-2009) does not matches that of fig 5.2.3, although it is the same graph | Accepted - figures to be updated |
| 13656 | 1 | 16 | 19 | 16 | 27 | Comparison of the contribution to emissions increase by Annex-I and non-Annex-I countries has been done from 1990 even though it has been mentioned earlier that data is available in almost all databases from 1850 onwards. It is unclear why the comparison is only for the period after 1990 then. It should begin from an earlier period.(CAIT, EDGAR) | the comparisons are illustrative; we are adding a cumulative emissions chart which will help address this. |
| 18114 | 1 | 16 | 19 | 16 | 29 | a) For consistency, the increase in CO2 from 1970 should be mentioned again here as it was in lines 7-18 for the other GHGs (which reinterated the information in pg 15, lines 26 and 27).<br>b) The text write-up cannot be easily matched with the information presented in Fig 1.6. For example t is not apparent which are the "newly industrialised countries", "other developing countries", "OECD NOrth America", "OECD Europe", OECD Pacific", "Economies in Transition".<br>c) Where is the information about international transport reflected in Fig 1.6? The transport sector should arguably include domestic transport emissions as well. Also, why is international transport as a sector suddenly singled out in a paragrapgh discussing emissions from regions? More explanation on this is required in this paragraph. Is it linking it to embodied emissions, in which case this is not very clear.<br>d) Caption under Fig 1.6 should explain what OECD, REF, LAM, MAF and ASIA stand for. | Taken into account - text is revised, figure redrawn and caption expanded |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6509 | 1 | 16 | 30 | | 31 | Modify the description , as "Figure 1.6" dose not "look at global emission by sector". | Figures have been changed and renumbered. Text is updated accordingly. |
| 18115 | 1 | 16 | 30 | 16 | 33 | This part does not appear to be related to Fig 1.6 which it refers to and seems to be more relevant as an introduction to Fig 1.4. | Figures have been changed and renumbered. Text is updated accordingly. |
| 4364 | 1 | 16 | 30 | 16 | 17 | I assume link is to fig 1.5, not 1.6 | Figures have been changed and renumbered. Text is updated accordingly. |
| 18116 | 1 | 16 | 33 | 17 | 1 | This needs supporting data/figures or reference. | Rejected - the reference is in the figture. The text has been revised and the |
| 18112 | 1 | 16 | 7 | 16 | 18 | This paragraph discusses the source of increase of all GHGs except CO2, It can therefore be enhanced by including a discussion of the source of increase of CO2. | Rejected - the next two paragraphs discuss CO2 in detail |
| 3554 | 1 | 16 | 8 | 16 | 8 | "mainly to higher", insert "due", i.e. "mainly due to higher" | Sentence has been removed. Comment |
| 10746 | 1 | 17 | | | | Since"CO2 equivalents" is the unit used, it should be explained in the figure caption how these are calualted; e.g. emissions weighted by GWP-100. (And whether the GWPs are from AR4 or those used by the Kyoto Protocol (i.e. SAR). This applies also to figure 1.4 | Taken into account - other edits address this point in detail, which is a good point |
| 11893 | 1 | 17 | | | | The legends and captions are too small. | Figures will be re-designed for print and on-screen display for final draft. |
| 3883 | 1 | 17 | | | | Difficult to read both figures. | Figures will be re-designed for print and on-screen display for final draft. |
| 17407 | 1 | 17 | | | | Figure too small to read easily. | Figures will be re-designed for print and on-screen display for final draft. |
| 17027 | 1 | 17 | | | | The regions at the tope of each panel need to be defined on the plots themelves or in the caption | Taken into account - combined with |
| 5756 | 1 | 17 | | | | These figures are too small. Regions need to be explained prior to using the abbreviations, too. | Figures will be re-designed for print and on-screen display for final draft. |
| 10471 | 1 | 17 | | | | Text (P 16, l 35) talks of only "road transport". Is that the case for Fig 1.5? Change legend accordingly if so. Both figures mention "Energy" in their legends BUT I suspect right hand figure " CO2 energy" includes transport emissions whereas "Energy" in left figure excludes transport. Needs clarifying by changing legend terms. | Taken into account - figure covers all transport; text focuses on road transport. Text has been modified and a note added |
| 16007 | 1 | 17 | | | | text of figure not readabel | Figures will be re-designed for print and on-screen display for final draft. |
| 17026 | 1 | 17 | 1 | 17 | 2 | Should "from fuel combustion" be deleted from this last sentence? Otherwise it implies that 60% of CO2 emissions are from fuel combustion from electricity production and transportation - this sems to low to leave 40% of CO2 emissions from fuel combustion to other non-electricity and non-transportation sectors?? | Accepted - sentence revised and phrase deleted. Text added on the largest sectors comprising this share. |
| 6511 | 1 | 17 | 10 | | | Replace "The sum" with e.g. "the function" to make it correct. | Accepted, changed "sum" to "product. |
| 4608 | 1 | 17 | 12 | 17 | 12 | E is not defined | Accepted - replace C/E with C/TPES |
| 18117 | 1 | 17 | 12 | | | C/E should be C/TPES. | Accepted - replace C/E with C/TPES |
| 15250 | 1 | 17 | 15 | | | it is worth pointing out that reduced growth (the "credit crunch") is proportional to lower emissions - see point 5 | Rejected - suggested change is not needed |
| 17028 | 1 | 17 | 15 | 17 | 16 | The recession was due to more than "the credit crunch", so it is suggested that "due to the credit crunch" be deleted. | Accepted - edited to "when the global recession BEGAN TO HAVE ITS |
| 14362 | 1 | 17 | 18 | 17 | 22 | See Cline (2011, pp. 10-11) for decomposition analysis for 1990-2006 by major country. William R. Cline, Carbon Abatement Costs and Climate Change Finance (Washington: Peterson Institute for International Economics, 2011) | Accepted - cite to Cline added and text revised |
| 17738 | 1 | 17 | 19 | | | While discussing CO2/TPES - the rate of CO2 growth actually slowing, see recent IEA reports on CO2 emission. | Taken into account - the section was rewritten |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7877 | 1 | 17 | 22 | 17 | 24 | We highly agree with this analysis ("most important driver of emissions is economic growth"). This is an important point. However, throughout the first chapter traditional DGP-growth is (more or less implicitly) affirmed by a value-laden language (growth is "sluggish" or "robust", "slow performance" in terms of growth etc.) and by statements in which GDP-growth is deemed "necessary" or investment in exploitation of fossil fuels is deemd "insufficient". If so, Working Group III affirms the main driver of emissions. Then, reaching the 2° goal is indeed not viable anymore and other options such as Solar Radiation Management become more attractive. Unfortunately, the chapter does neither mention the many well-known problems associated with and critiques of economic growth in terms of GDP (instead of many: Jänicke 2012a) nor does it mention proposals to generate/maintain prosperity without relying on tradinional growth patterns (WBGU 2011, 2012, SRU 2011). | Taken into account - this section has been revised and added cross reference to ch 5 which discusses the kaya identity more in depth |
| 15251 | 1 | 17 | 23 | 17 | 24 | see point 13 | Noted - insufficient information. No |
| 17029 | 1 | 17 | 25 | 17 | 26 | Reword after the semicolon to be more clear: "while in the last few years, emissions in emerging economies have grown much more rapidly." | Accepted - text edited |
| 14363 | 1 | 17 | 27 | | | Edit for clarity (“decreased” … “twice as much” - ??) | Taken into account - text has been |
| 16201 | 1 | 17 | 27 | | 34 | when describing a decrease that is 'good' (e.g. from negative=uptake of 1.4 to a negative=uptake of 2.7), might want to describe it as 'improving' even though the trend is increasingly negative. Readers will think negative means bad when in some cases, it represents an improvement. | Taken into account - text has been rewritten for clarity |
| 7309 | 1 | 17 | 3 | | | Waste sector is missing from sectoral estimates in this figure. | Rejected - waste is not a sector in the WG3 macro sector scheme |
| 4891 | 1 | 17 | 31 | | 32 | {Cor} in generally used terminology those are EiTs to a market economy: "underwent transition from [Soviet-style] central planning {to a market economy} [(the so-called economies in transition, or] “EIT” countries) and<br>That is:<br>"underwent transition from central planning to a market economy (“EIT” countries) | Taken into account - text has been rewritten for clarity |
| 15252 | 1 | 17 | 32 | | | not quite seeing the point here - does central planning result in fewer emissions or vice versa? | Taken into account - text has been |
| 15536 | 1 | 17 | 33 | | 34 | Why 'ultimately to the same level'? I would expect differing natural endowments to mean that there are always likely to be differences. | Taken into account - text has been rewritten for clarity |
| 14799 | 1 | 17 | 33 | | | "Slowly the … same level." This may be a premature or simplistic extrapolation, since the ultimate carbon intensity is certainly a function of domestic energy resource endowment, not merely technological "catch-up". | Taken into account - text has been rewritten for clarity |
| 12221 | 1 | 17 | 4 | | | Region names should be explained in the caption. Colour codes for different sectors and pollutants should be kept the same throughout the chapter. | Figure will be revised. |
| 9788 | 1 | 17 | 7 | 17 | 11 | Here you should make a reference to COMMONER, B. (1972): The Environmental Cost of Economic Growth. In: Ridker, R. G. (Hrsg.): Population, Resources and the Environment. Washington, DC 1972, S. 339-363, who published on this topic earlier. | Rejected - suggested change is not needed for our purposes here |
| 17408 | 1 | 17 | 8 | 17 | 26 | This analysis seems too narrowly focused for this section which addresses more than just energy systems (see categories in Fig 1.5). | Taken into account - text has been rewritten for clarity |
| 3556 | 1 | 17 | 10 | 17 | 10 | "Total emissions are the sum of…" should be "Total emissions are the product of…" | Accepted, changed "sum" to "product. |
| 13657 | 1 | 17 | 10 | 17 | 12 | Kaya identity is used for factor analysis which privileges population over all other indicators. If numbers are compared between 1850 or 1970 and 2000 however, it is seen that a high share of emissions is from countries which have had small very small shares in the total global population increase (Sattherwaite et al.) | Taken into account - text has been rewritten for clarity |
| 18118 | 1 | 17 | 10 | 17 | 11 | The Kaya Identity is Impact (CO2) = Population X income per capita X energy intensity of GDP x carbon intensity of energy OR Population x GDP/capita x Energy/GDP x CO2/energy. (Kaya 1990, Raupach 2007) The statement that total emissions is the sum of the individual forces (population, GDP and TPES) needs to be improved. | Taken into account - combined with other comment |
| 13253 | 1 | 17 | 12 | 17 | 12 | What is "E" in the ratio C/E? not explained | Taken into account - combined with |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18119 | 1 | 17 | 16 | 17 | 26 | a) Figure 1.6 does not support the information provided here which further decomposes the drivers of global emissions between industrialised and emerging countries.<br>b) Standardise reference of carbon intensity of energy throughout the document. In lines 19 and 34 for example, it is referred to as CO2/TPES while on line 10, carbon intensity is C and in line 12, it is C/E. | Taken into account - both points are combined with other edits. Text has been rewritten |
| 3557 | 1 | 17 | 27 | 17 | 28 | "…decreased to about 2%, about twice as much.." Missing minus sign, and unclear language. | Taken into account - combined with |
| 18120 | 1 | 17 | 27 | 17 | 34 | a) It is not clear how the percentage figures mentioned in this paragraph are derived from Fig 1.6 (which is indexed to 1970).<br>b) EIT has already been defined earlier.<br>C) Reference for the last sentence is required. | Taken into account - combined with other comment |
| 6510 | 1 | 17 | 8 | | 34 | Make the abbreviated symbols (e.g. (P), (G), etc.) consistent, including those used in Figure 1.6. | Figure will be revised. |
| 10831 | 1 | 18 | | | | A regional breakdown, like in Raupach et al (2007) would be good, particularly considering you discuss it in the text. | Rejected - I don't think we have the space for this, but added references to others who have done regional |
| 5757 | 1 | 18 | | | | What does "cap" mean (in "GDP/cap")? | Accepted, cap stands for capita, figure |
| 4020 | 1 | 18 | 11 | 18 | 18 | facts and figures provided in this paragraph need to be referred to relevant sources | Taken into account - will update to IEA, 2012 and provide clarification on the |
| 6816 | 1 | 18 | 11 | | 14 | These unreferenced share data are misleading and false, since they are not comparing comparable quantities (example: the primary energy of nuclear is the uranium potential, while that of renewables is - the sun? These comparisons typically look at the primary energy of nuclear power and compare it with the end-energy of renewables. Such methods / figures are used to falsely inflate nuclear and statistically lower the share of renewable energy. Using the substitution method of primary/end energy content place nuclear energy closer to 2.5 % of global supply, whole renewables as a whole stand at 18%. For a much better and comparable final-energy consumption comparison for 2009 see page 17 of REN21's Global Status Report: http://germanwatch.org/klima/gsr2011.pdf. See also http://www.europeanvoice.com/article/2012/march/blowing-away-nuclear-power/73977.aspx and http://www.eia.gov/todayinenergy/detail.cfm?id=5750 | Taken into account - text has been revised for clarity and cite added to IEA 2012 |
| 10472 | 1 | 18 | 11 | | | Assume this is global "primary" energy supply. | Accepted - edited to say global |
| 10473 | 1 | 18 | 12 | | | Change 'biofuels" to "biomass" | Rejected - suggested change is not |
| 4984 | 1 | 18 | 16 | 18 | 18 | Sentence: decline in overall share of fossil fuels from 88 % in 1990 to about 86 % . the lowest in decades. Indicate which year decline was 86 % ? | Taken into account - combined with other comments |
| 13514 | 1 | 18 | 16 | 18 | 18 | Sentence: decline in overall share of fossil fuels from 88 % in 1990 to about 86 % . the lowest in decades. Indicate which year decline was 86 % ? | Taken into account - combined with other comments |
| 5758 | 1 | 18 | 16 | 18 | 18 | Neither "renewables" nor nuclear power are zero emission electricity sources! There is no such thing as a "zero emission energy source", just the timing of the emissions is different (see LCAs of energy sources). | Accepted - edit to say "…two largest sources of ESSENTIALLY zero GREENHOUSE GAS emission |
| 10475 | 1 | 18 | 16 | | | For nuclear reduction by 0.5% need to state what accounting method used. Also lack of references in this whole section to supprt data quoted. | Taken into account - combined with other comments |
| 12515 | 1 | 18 | 17 | | | Change “zero emission” to “low emission.” “Zero emission” is a misnomer; as discussed extensively later in the draft, all generating sources have some life cycle emissions. | Taken into account - combined with other comments |
| 10832 | 1 | 18 | 17 | 18 | 17 | "zero emission electricity" does not, as far as I know, exist. You probably mean zero emissions at the power plant, but there are plenty of emissions elsewhere in mining, construction, etc. I would reword and refer to the WGIII chapter that deals with this | Taken into account - combined with other comments |
| 7879 | 1 | 18 | 19 | 18 | 20 | Please be more explicit about the relation of costs and benefits. In economic terms, if an activity is highly beneficial, the costs are outghweiged by the benefits. Then, an activity cannot be both, beneficial and costly, at the same time. Or are you referring to upfront investments? Or are you suggesting that renewable energies are more expensive than conventional energy sources? This is not correct (see comment 18). | Taken into account - edited to say "(and OVER THE LONG TERM, IF IMPLEMENTED WELL, highly beneficiaL)". |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7350 | 1 | 18 | 19 | 18 | 24 | It is not clear that it is the potential cost of transformation that causes "many different perspectives"- where and how is this established? It would seem that diverse concepts of responsiblity and justice are large drivers of differing perspectives. Also it is not clear what it means to say that something is "costly (and highly beneficial)" - is that referring to the "benefit" of mitigating climate change or of some co-benefit? This should be elaborated further. | Rejected - this is a very controversial topic because there are many ways to view the underlying facts and options. Text is properly balanced. No action needed |
| 17031 | 1 | 18 | 19 | 18 | 24 | This paragraph gets into very murky "science" and is no longer an objective presentation of scientific findings, but rather an introduction of value judgements - which IPCC should probably stay away from. | Rejected - we disagree. See 861 |
| 10681 | 1 | 18 | 19 | 18 | 20 | Something being both costly and highly beneficial needs a bit more explaining! | Taken into account - combined with |
| 12222 | 1 | 18 | 2 | | | Consider to use colours that makes it easier to distinguish between the different indicators. Please consider to indicate the purpose of this figure in the caption (driving forces). Further PPP, TPES, cap should be explained or written out in legend. | Figure will be revised. |
| 7152 | 1 | 18 | 20 | | | Rather than use 'costly (and hightly beneficial)', maybe use 'costly, but nevertheless highly beneficial,' would be better. Nonetheless, even if the cost is high, it could also prove to be cost-effective in the long term. If so, it is a point worth making in the text I think. | Taken into account - combined with other comment |
| 15277 | 1 | 18 | 20 | 18 | 20 | "peoples" to be "people"? | Rejected - plural was intentional. No |
| 7878 | 1 | 18 | 3 | | | Of course, the energy system is slow to change. Rather than mentioning this well-known fact, the report should address that already there have been two decades of inaction and eventually discuss the reasons why this is so (lack of political will, successful lobbying of powerful stakeholders (Oreskes/Conway 2011), etc.). | Rejected - the report addresses the consequences of inaction in more detail elsewhere. No action needed |
| 9250 | 1 | 18 | 5 | 18 | 6 | But there has been rapid fuel switching in the USA - coal to gas - thus reducing emissions at some point sources? Not necessarily slow to change. And China seems to be making changes rather quickly. I think the paradigm is changing slightly; we should not be wholy pessimistic, as there is some cause for hope, even though overall emssions are rising. | Rejected - the overall system is in fact quite slow to change. Look at the data on the US which is the only place on the planet where this gas revolution is happening. IN the last 13 months we have seen a big shift in the switchable power supply (coal to gas, from 42% coal to about 33%) - but it could easily |
| 16243 | 1 | 18 | 5 | 18 | 6 | The challenge of slow change is not limited to the energy system, but includes also long-living buildings and infrastructures that create energy demand and often create lock-ins. | Rejected - that is why we use the term "energy system" rather than energy |
| 17409 | 1 | 18 | 5 | | | Again, it's unclear why focus is given only to energy systems -- this seems at odds with data presented in the chapter and also with one of the six core arguments that multiple mitigation approaches will need to be pursued simultaneously. Also, later in the page, it seems that "world emissions" are being conflated with emissions from energy systems. Greater precision seems important. | Taken into account - the paragraph has been revised for clarity |
| 10830 | 1 | 18 | 5 | 18 | 6 | A good reference here is http://www.sciencemag.org/content/329/5997/1330 | Accepted - added this cite to the end of the sentence referred to here; also, added cite to World Economic Forum Global Agenda Council White paper on |
| 10474 | 1 | 18 | 5 | 18 | 18 | This paragraph confuses "energy" with "electricity".Suggest start new para at line 13 and change "renewable energy"in line 16 to "renewable electricity". | Taken into account - The paragraph has been edited for clarity. |
| 18121 | 1 | 18 | | | | PPP (Purchasing Power Parity) should be defined in the caption. Source of data for GDP and Population should be added. | Figure will be revised |
| 8226 | 1 | 18 | | 18 | | In this section 4 perspectives (mitigation obligation, trade, per capita emissions and efficiency of the economy) are discussed. Another perspective may be added is the resource endowments or country circumstances. For example, countries in early stage of development and those are rich in natural resources tend to have more per capita emissions. Also other factors such as location (arctic vs. temperate) have significant influence on emissions. | Rejected - there are lots of perspectives. We don't have space for this. No action needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17030 | 1 | 18 | | | | These are NOT perspectives on mitigation, but rather perspectives on emissions trends and they are entirely arbitrary. Why not look at emissions per km^2 or emissions per capita per kim^2 or plots of wealth transfers / trade deficits assocaited with emissions? Like earlier, this is an interesting academic exercise, but this section adds little value to the objective, policy-relevant discussion due to its arbitrary, selective frmaing. Its deletion is suggested. | Rejected - we disagree completely with this comment and have documented extensively that these different perspecitves DRIVE the starting point for diplomacy on mitigation and on policy |
| 18122 | 1 | 18 | 11 | 18 | 18 | Reference required for the information on the changes in renewable, nuclear and fossil fuel energy in total energy mix over time. | Taken into account - combined with other comments |
| 3558 | 1 | 18 | 16 | 18 | 16 | "by half a per cent." should be "by half a percentage point." | Accepted - text changed as suggested |
| 6786 | 1 | 18 | 16 | 18 | 18 | New data / evidence available: "Taken together nuclear and renewable energy sources-the two largest sources of zero emission electricity-have led to a decline in overall share from 88% to about 83.3%". Reference: REN21. 2012. Renewables 2012, Global Status Report, Page 21, Figure 1<br><br>Delete text from the above sentence: "of fossil fuels" | Rejected - cited IEA 2012. Sentence has been revised |
| 3446 | 1 | 18 | 17 | | | The assertion: nuclear and renewable energy are the two largest sources of zero emission electricity, could be relative if it is consider the CH4 emitted from dams constructed in Amazonas. See Brazil experience in accounting these emissions. | Rejected - there's a couple dams for this we know this is true (e.g., Balbina). Generalizing this globally is much |
| 13254 | 1 | 18 | 17 | 18 | 17 | Strictly speaking, nuclear and renewable are note zero emission (taking in account the whole life cycle or direct emissions, example, nuclear installation and decomission, solar PV panel making, some amount in geothermal), so it would be better to say "the two largest sources of near zero emission electricity" | Taken into account - combined with other comment |
| 13255 | 1 | 18 | 18 | 18 | 18 | It is not clear for the context, if the percentages of 88% and 86% are referred to primary energy or only electricity. | Taken into account - combined with other comment |
| 3559 | 1 | 18 | 24 | 18 | 24 | "-illustrated on four…" should be "-illustrated in four…" | Rejected - we have added a fifth and will fix grammar when we insert that extra |
| 15450 | 1 | 18 | 4 | | | Although all the four perspectives described here are useful, the rationale for the selection is not really clear. For example, the first case (AI and NAI under the Kyoto Protocol) deals with emission reduction of the whole economy in absolute terms based on country groupings (and production-based in contrast to the second case). Technically, there could be other country groupings other than the Kyoto-way and there are some other proposals (e.g. South-North Dialogue). But there is no mentioning of that. The first category seems to be about "country-, production- and historical responsibility-based emission and mitigation"; the second is "emobodied, consumption-based" emission; the third is "per capita (population-based)"; the forth is "intensity-based." It might be better categorize them by either "what emissions" or "based on what". | Rejected - the perspectives are perspectives on the strategy of mitigation, not groupings. no action needed |
| 17695 | 1 | 18 | 12 | 18 | 23 | Why not use the data for 2011 on Renewables? Also in line 23 Scientific analysis not only can help frame but must be taken into acount. | Accepted - data will be updated as it becomes available |
| 16065 | 1 | 19 | | | | Complex, too small prints, and mysterious. Even in the large IPCC report, this is not very useful. | Figures will be re-designed for print and on-screen display for final draft. |
| 8911 | 1 | 19 | | 19 | | In Figure 1.7, panel (b) the direction is not clear; i.e., what is the source (producing) region and what is the receiving region (to which commodities are exported). | All figures have been redrawn and captions revised |
| 13371 | 1 | 19 | | | | This figure is extremely hard to follow. It should be broken into its components, with each presented and discussed separately. | All figures have been redrawn and captions revised |
| 4021 | 1 | 19 | | | | this figure might require a thorough review: for example how come that all non-Annex B oil&gas exporting countries transfer less emissions than Russia? | All figures have been redrawn and captions revised |
| 11894 | 1 | 19 | | | | The legends and captions are too small. | Figures will be re-designed for print and on-screen display for final draft. |
| 17410 | 1 | 19 | | | | Figures too small to read. | Figures will be re-designed for print and on-screen display for final draft. |
| 17649 | 1 | 19 | | | | Figure - in particular country names - is hardly legible. | Figures will be re-designed for print and on-screen display for final draft. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7351 | 1 | 19 | | | | The heading "perspectives on mitigation" is misleading - this figure merely shows emission levels using a variety of metrics, it does not suggest any mitigation levels or indication of mitigation "burden sharing." If the authors intend for this to be a presentation of ways in which to determine who should have greater mitigation responsiblity, they should also include a representation of a historical emissions, and of historical emissions per capita, and of contribution to current warming/or atmospheric concentrations. | All figures have been redrawn and captions revised |
| 17034 | 1 | 19 | | | | This data is outdated. Data throguh 2011 exists from the recent (2012) report from PBL-NEAA :Trends in Global CO2 Emissions". As stated in an earlier comment, It's unfortunate that the data used only goes through 2008 - just at the height of the recession. Some very interesting trends have emerged in the 4 years since the deepest part of the recession and it may come across as tone-deaf for a report that is to be published in 2014 to be based on 2008 data, esp when databases such as IEA, NEAA and EIA have more up-to-date emissions data. AR4 came out in 2007 and used 2004-05 emissions data, so it should follow that AR5 which comes out in 2013-14 should use 2011 data, FF CO2 data of which will be available by IEA later this year. Does the TaskForce on National Greenhouse Gas Inventories have anything to add to this data? | Accepted, data will be updated as they become available |
| 17032 | 1 | 19 | | | | Showing emissions reductions from former Soviet nations (e.g., Ukraine and Russia) from 1990 levels is misleading as broader pattersn caused the decline. If you were to start from say 1992 or 1994, you would see starkly different results that more accurately reflect the current world reality. | All figures have been redrawn and captions revised |
| 5759 | 1 | 19 | | | | I suggest to split the panels appart and divert this figure into 3 or 4. Panels a and b are too small and have no stringent, inherent connection to panels c and d. | Rejected - We are mindful that figure 1.7 is hard to read, and other comments have led us to need to create still more panels for figure 1.7. Thus we have redrawn all the figures to make them easier to read and will consider splitting |
| 11108 | 1 | 19 | | 19 | | The sub-figures are too small to read. This applies to many other figures in the draft, too. | Figures will be re-designed for print and on-screen display for final draft. |
| 16008 | 1 | 19 | | | | text of figure not readabel | Figures will be re-designed for print and on-screen display for final draft. |
| 15469 | 1 | 19 | 1 | | | Having four graphs on one figure makes it too busy. The impt points made with this figure may get lost. Suggest breaking it into 2 or 3 figures, esp as there is a long discussion of the graphs in the section. | Rejected - We are mindful that figure 1.7 is hard to read, and other comments have led us to need to create still more panels for figure 1.7. Thus we have redrawn all the figures to make them easier to read and will consider splitting |
| 7352 | 1 | 19 | 16 | 19 | 20 | Needs to clarify that "Annex I" is a list under the Convention, and the Kyoto Protocol provided for parties included in Annex I to join its Annex B with a QELRO. Currently reads as if Annex I is a category of the Kyoto Protocol alone. | Taken into consideration - edits earlier in the chapter make it clear where Annex I came from. Text here is accurate and helpful for nonexpert reader who will get |
| 10834 | 1 | 19 | 17 | 19 | 18 | Well, not all Annex I countries have targets, so this sentence is factually incorrect. | Rejected - text says "…Annex I countries that agreed to targets.." where "that" is a |
| 12223 | 1 | 19 | 2 | | | The caption is very long. Please consider to give seperate captions for the different Panels. Caption for Panel A) page 19, line 6-7. The description of the 4 colours in the caption do not match the 3 colours in the figure. Panel B is a very omportant figure, but should have been describes better, e.g. to indicate in the figure what is increase in "import"/"export". Panel C and D, region names are not fully visible. Also: please consider to give each panel a heading indicating its purpose, such as "Panel A) Trends in GHG emission" etc. | Rejected - a long caption here is needed to explain the figure. We are mindful that figure 1.7 is hard to read, and other comments have led us to need to create still more panels for figure 1.7. Thus we have redrawn all the figures to make them easier to read and will |
| 3560 | 1 | 19 | 6 | 19 | 6 | "Kyoto" should be "Kyoto protocol" | Accepted - text will be changed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17033 | 1 | 19 | 6 | 19 | 7 | There are no blue bars in this panel (a), so this statement should be deleted, "Blue bars show non-Annex I countries." | Accepted - figures to be updated |
| 3561 | 1 | 19 | 7 | 19 | 7 | "non-Annex I" should be "non-Annex B". Ref. Comment no 11 above. | Taken into consideration - text has been |
| 4365 | 1 | 19 | | 19 | | fig has too many components that are printed too small, I recommend spliting | Rejected - We are mindful that figure 1.7 is hard to read, and other comments have led us to need to create still more panels for figure 1.7. Thus we have redrawn all the figures to make them easier to read and will consider splitting |
| 6513 | 1 | 19 | 16 | | 17 | Modify the description, as "mitigation obligations under Kyoto Protocol" do not appear on the panel. | Rejected - we think the sentence is correct. By dividing countries into color-coded groups based on whether they are members of Annex B under the Kyoto Protocol, we show whether they have mitigation obligations under the Protocol |
| 3562 | 1 | 19 | 17 | 19 | 17 | "Annex I" should be "Annex B". Ref. Comment no 11 above. | Taken into account - combined with |
| 18125 | 1 | 19 | 17 | 19 | 20 | Fig 1.7a shows Annex B and non-Annex B as per the Kyoto Protocol listing of countries with and without obligations. While the characterisation in terms of Annex 1 and non-Annex 1 is not incorrect (as per the UNFCCC), to avoid confusion for the reader, it may be best to refer to these groups of countries consistent with how it appears in the figure. | Figure will be revised. |
| 6512 | 1 | 19 | 6 | | 7 | Modify the description, as "Blue bars" do not "show non-Annex I countries". | Taken into consideration - text has been |
| 18123 | 1 | 19 | 6 | 19 | 7 | a) Reference to Blue bar showing non-Annex 1 countries to be deleted as line 5 says non-Ammex B countries are shown in red.<br>b)The names of the countries in Figures 1.7c and d are not clear - they can either be presented at an angle to fit the entire name, or a key should be provided with the full names. | Accepted, figure and caption will be revised. |
| 18418 | 1 | 2 | | | | It is right when it says that climate mitigation is bigger than climate policies. I have two objections though (pag 2 paragraph 5): first, sustainable development (SD) and green economy (GE) are clearly convergent with mitigation, but energy security it is not: that difference is not clear. Second, how many national governments are actually investing in green economy and SD?<br>I think the tone of the summary is excessively optimistic, and does not accurately acknowledge the gap between science and policy. □ | Taken into account - portions of the text has been rewritten for more balance |
| 18407 | 1 | 2 | 12 | | 12 | The concept of sustainable development arose 1980/ 81 , not with the Bruntland Report. See AR4 WGIII, Chapter 12 Sustainable Development and Mitigation | Taken into consideration - there were LOTS of ideas related to this for decades prior, but Brundtland crystallized it. The |
| 17794 | 1 | 2 | 13 | 15 | | And possibly have multiple benefits simultaneously (economy, social, environmental, health, ect) | Taken into account - combined with other comments. No further action |
| 7153 | 1 | 20 | 1 | | | Replace 'an' by 'a'. | Accepted - text changed |
| 3605 | 1 | 20 | 1 | 20 | 1 | Please add in brackets "(including Canada and the US, the total emission reduction target was 5.2%)." | Rejected - this is too much detail for here |
| 10835 | 1 | 20 | 1 | 20 | 1 | Where did the 4.2% come from? Article 3 of the KP states "with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012" | Taken into account - If we exclude USA, Canada and Turkey (Turkey has no numerical target under the Kyoto Procotol), base year emissions are 12,055,187 tCO2e and target emissions |
| 17035 | 1 | 20 | 1 | 20 | 5 | It might be worth discussing how the EU cut their emissions between 1990-2005 (and have since stabilized), whereas others - like the U.S. - have cut their emissions post-2005. | Rejected - this is too much detail here |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4022 | 1 | 20 | 11 | 20 | 13 | suggested wording: "The big decline in Ukraine's and Russia's emissions, for example, reflect the collapse of their economies in the early 1990s in the aftermath of the desintegration of the Soviet Union in 1991." (Reason for correction: In fact, there has been no major "restructiring" since then. Unless the authors imply almost total elimination of some high-tech industries with marginal emissions.) | Rejected - Getting into this level of detail may create problems about getting the exact details of which sectors changed when and we don't have space for that level of detail here. Also, getting into those details takes the topic away from the purpose of our chapter. There is no doubt that some of this is economic collapse, but a lot is restructuring, there |
| 14801 | 1 | 20 | 12 | | | "Russia, Ukraine, EU+12, and part of EU15 (former East Germany)." | Taken into consideration - text edited to say " The big decline in Ukraine, Russia, the 12 new members of the EU (EU+12) and one of the original EU members |
| 7880 | 1 | 20 | 13 | 20 | 16 | These lines seem to be based on the stage model of economic development from W.W. Rostow (1960). If such a model is presumed here, it should be stated explicitly. | Rejected - they aren't fully based on the model, so adding a Rostow cite here would not be fully appropriate for what |
| 4470 | 1 | 20 | 17 | 20 | 28 | This paragraph is incoherent and internally inconsistent. Many of the countries that have ratified Kyoto are not meeting their Kyoto obligations, and others have not ratified Kyoto. Countries can't both be "selective" and compliant at the same time. | Noted - in fact, that is exactly the point. Countries select which obligations to join and then they "comply." That's the key insight of Downs et al (which we cite) |
| 4857 | 1 | 20 | 17 | | 28 | The purpose of the lamentation on various interpretations is unclear; it would be better to avoid .. | Noted - suggested action by commentor is not clear. We simply offer that there are many ways to interpret the trends in |
| 7353 | 1 | 20 | 17 | 20 | 28 | It is not clear that this is "the message" of that panel. Nor is the importance of CBDR an "intepretation" in the same sense that "countries have complied with their targets" is an observation, and it is not clear why they are described as "alternate" interpretations, when they could easliy be complementary. | Taken into account - when we add a cummulative perspective then CBDR will be beefed up. No further action is |
| 14802 | 1 | 20 | 18 | | | eliminate "big" | Accepted - changed "big" to "some" |
| 11896 | 1 | 20 | 18 | 20 | 18 | Harmonize the use of "Kyoto treaty", "Kyoto" as "Kyoto Protocol". | Accepted - text changed as suggested |
| 11895 | 1 | 20 | 2 | 20 | 4 | Move this statement to the caption of Figure 1.7. | Rejected - our view is that this point is so important to accurate understanding of what kyoto does (see for example the Peters comment about where the 4.2% |
| 14804 | 1 | 20 | 20 | | 24 | It is not clear how this is a fitting illustration of common but differentiated responsibilities ("and respective capabilities"). This inference would require comparing the magnitude of the action required of a Party to its responsibility and capability, which is not reflected in this chart. This inference is further blurred by the fact that other effects played large roles: UK dash to gas, soviet collapse, and recession/financial crisis in particular. | Taken into account - We think the allocation of QELROs to developed countries is a fitting illustration to that point. Also, we are adding a fifth perspective on historical emissions. No |
| 14803 | 1 | 20 | 25 | | | eliminate "strict" | Accepted - removed "strict" |
| 17036 | 1 | 20 | 25 | 20 | 28 | This statement may cause offense to some nations whose domestic circumstances preclude comprehensive actions desired by certain branches / entities wiithin their governments. Everything after the semicolon on l25 should be deleted as it is not a constructive addition to the text. | Rejected - we are mindful that this statement may cause offense but it is correct and scientific. Other topics may cause offense to other countries but we |
| 15253 | 1 | 20 | 26 | 20 | 28 | this seems most obvious? | Noted - lots of other comments point in the oppposite direction. Insufficient |
| 16066 | 1 | 20 | 29 | 20 | 37 | True, linking trade and emissions is key. Maybe link this paragraph with parts of the report relevant to (1) indirect and sectoral emissions (2) international negociations | Noted - insufficient information. No action needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12224 | 1 | 20 | 29 | 20 | 31 | Is it always the case that are allocated to the country where they occur, one example is international transport. | Taken into account - text in the paragraph has been revised. Also, revised second sentence to say "nearly all of the statistics presented in this |
| 9463 | 1 | 20 | 29 | | 37 | Indeed! Chapter Eleven would benefit from explicit discussion of this priority. It mentions the challenge, but does little to examine frameworks that seek to internalize emissions from trade (i.e. the California LCFS and the US RFS). | Noted |
| 17038 | 1 | 20 | 29 | 20 | 37 | Unusual weight is given to a single study throughout this section (the Peters et al 2011 study). It is merely one framing and one that has not gaiend traction in the practical world of international negotiations. As a result, it's unusual influence, persistence and recurrence throughout this Chapter is inappropriate. For example, there is also the Chakravarty article in PNAS (2009) on sharing glboal CO2 emission reductions among 1B highest emitters. Neither paper deserves to be the source of a single framing | Taken into account - The Peters et al study is about trade. The Chakravarty et al study is about per-capita assignments (largely ignoring trade but indexing on economic prosperity and explicitly avoiding national accounting). But adding the other per-capita perspective is important. Two points here: First, on trade, we are illustrating this with one study because we can only use one figure. Second, on per-capita we add a sentence at end of paragraph: "Other |
| 4858 | 1 | 20 | 32 | | 33 | Avoid one-sided evaluation. There is another side of the coin, too: the fundamental demand by China to maintain econ. growth (for higher living standards for its people) and the partially export-oriented national steel industry is part of meeting that demand. So: common (coupled) but differentiated demands .. | Taken into account - cross reference to section 1.2.1.2 on macroeconomic situation discussion on embedded |
| 17037 | 1 | 20 | 32 | | | While the emissions are "embodied" in products that are exported, the economic benefit of those emissions go to the producing nation. This very important aspect cannot and should not be overlooked/glossed over. In theory, producing nations *could* increase prices to produce consumer goods via clean energy. | Noted - This is true to some degree, but so do the local externalities. Our point is not to get into those weeds here. |
| 7155 | 1 | 20 | 34 | | | Remove unnecessary paranthesis. | Accepted - deleted parenthesis |
| 17039 | 1 | 20 | 35 | 20 | 37 | This final statement of the paragraph is a total value judgement and IPCC should NOT be in the business of making value judgements. This is a pervasive problem in this Chapter. Calling for the incorporation of trade into a process that is already gridlocked (as stated earlier in the Chapter) would NOT be a productive policy-relevant recommendation. | Noted - it is not total value judgment, but is a direct logical extension of the argument. This sentence has since been deleted in editing. |
| 14805 | 1 | 20 | 37 | | | "… trade rules, and the consideration of embedded carbon when assessing possible meanings of "common but differentiated responsibilities and respective capabilities". | Rejected - too much detail that obscures the main point here |
| 4859 | 1 | 20 | 38 | | 47 | Besides consideration of per capita emissions another essential factor is the consideration of the "historical emissions" – which is not illustrated on the panels, however, these are also of key importance for scientific and political assessments of the mitigation. | Taken into account - we are adding this perspective. |
| 7882 | 1 | 20 | 38 | 20 | 47 | The paragraph fails to mention the significant differences in per-capita emissions within the group of developed countries. This difference should not go unmentioned because it highlights at least to important points: first, a high level of prosperity can be reached with substantially lower per-capita emissions than in countries such as Australia or the US; second, it points to different responsibilities for the impacts of climate change (see chapter 3.3). | Rejected - there are LOTS of things this paragraph doesn't mention. But the data are in the figure so we don't need to do this. We need to be careful in adding more text, for example, on per capita emissions as this might overly endorse |
| 7354 | 1 | 20 | 38 | 20 | 47 | It is noted with "interest" the diversity within categories (i.e. between countries in A1 or NA1) but the difference between Annex I and Non-Annex I is not commented on; it appears remarkable that the highest per capita emissions by country of non-Annex I are not much more than the highest per capita emissions of Annex I. Further, the highest per capita emissions come from Korea, a country that is particularly unique within the Annex distinction, due to its membership of the OECD. | Noted - no clear action suggested |
| 7881 | 1 | 20 | 39 | 20 | 40 | Again, the stage model seems to be presumed. | Taken into account - combined with |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3884 | 1 | 20 | 4 | 20 | 6 | I understand a few words about the EU economic crises should be mentioned here, as a driver for CO2 mitigation success | Rejected - It is hard to comment on that right now it is still playing out. Solid literature on this is still missing so we |
| 4471 | 1 | 20 | 41 | 20 | 42 | This sentence is unwarranted. Quantitative information by itself cannot provide a justification for any particular scheme for allocating emissions reduction obligations or emissions rights. Any such allocation has to be the result of negotiations, and may take account of various criteria such as historical emissions, capacity, the possibility for "leapfrogging" over carbon-intensive technologies in the course of rapid development, and most importantly, national interests. Allocation along lines of population (does this mean per capita allocation?) is one possibility, but can hardly be considered either a scientific or consensus position. | Rejected - this is not what we are saying. We are saying if you take this perspective THEN that's the logical implication. -- the text has been revised for clarity |
| 7883 | 1 | 20 | 41 | 20 | 41 | Here might be a minor mistake. Do you mean "emission reduction obligations" instead of "emission obligations"? | Taken into account - edited to say: "emission CONTROL obligations" |
| 17040 | 1 | 20 | 41 | 20 | 42 | This third perspective does NOT suggest that emissions obligations be allocated along lines of population! It's tone deaf to the reality ofg moving people and goods within sovereign border of vastly differing sizes and across vastly different landscapes. Again, these perspectives - this section - is nota constructive contribution to the report and should be deleted. | Rejected - See 945. We disagree. The literature and concepts need to be reviewed. |
| 17650 | 1 | 20 | 43 | 20 | 44 | In Figure 1.7, there is explicit example of one of the least developed countries, thus the figure also does not show differences among them. | Accepted. Figure and discussion will be revised. |
| 14806 | 1 | 20 | 44 | | | replace "state of the economy" with "income per capita" | Rejected - text is ok as is. No action |
| 14364 | 1 | 20 | 48 | | | Need to clarify whether using purchasing power parity GDP or market exchange rate. | Taken into account - clarified text in the caption to figture 1.7, panel D. |
| 14807 | 1 | 20 | 48 | | | "efficiency" is an inappropriate term here. It is clearly more than simply efficiency, as subsequently stated in the same para. It is also a measure of resource endowment, economic structure (agri/industry/service), state of development (which determines rate of investmentin infrastructure), etc. | Rejected - it is a measure of lots of things, including prices. The overall crude indicator, though, is efficiency-- |
| 14800 | 1 | 20 | 5 | | | The phrase "exceed their target" is ambiguous. (Emissions exceed their targeted emissions, or reductions exceed their targetted reductions?) | Taken into account - edited sentence to say: "FOR 2008-2012, THE COUNTRIES THAT JOINED THE KYOTO PROTOCOL AND ADOPTED |
| 7154 | 1 | 20 | 5 | | | The antecedent of 'they' is unclear. Do you mean 'Canada and the US' or the 'other Annex I countries'? | Taken into account - combined with |
| 13372 | 1 | 20 | 7 | 20 | 8 | The comment is made that countries will be unable to meet their emissions targets without also engaging in a degree of emissions trading and purchasing credits internationally. Given the faith in these markets and mechanisms, it is hard to see this as problematic without a further explanation why this might be so. | Noted - The point is really just about collective effort and dealing with shortfalls. See edits per 952 |
| 11721 | 1 | 20 | 9 | 20 | 11 | Everyone can understand the meaning without this sentence and all anex I countries are making efforts to meet their target by using Kyoto mechanism. So,there is no need to pick-up the indivisual country's case. | Accepted - deleted the sentence. But it is important to note that power companies that cannot comply with their own target do not have extra money to |
| 9494 | 1 | 20 | 9 | 20 | 11 | delete this sentence - Japan is making effort to meet 6% cut and CDM credits is acceptable system by Uns | Taken into account - combined with |
| 9357 | 1 | 20 | 9 | 20 | 11 | The example of Japan should be deleted because Japan contributes to the reduction of CO2 through the CDM project, from which Japan get the credit. | Taken into account - combined with other comment |
| 18429 | 1 | 20 | | | | perspectives on mitigation<br>The interpretation done regarding KP is far too optimistic (pag 20 paragraph 2) | Rejected - other comments say the opposite. I think balance is ok here |
| 18126 | 1 | 20 | 40 | | | The perspective on how per capita emissions depicts differences in stages of development requires elaboration. Alternatively, this perspective can be limited to the difference in sizes of populations in countries. | Rejected - this is an overview chapter-- we don't have space for this. But, sentence is edited for clarity: |
| 6514 | 1 | 20 | 42 | | 44 | Modify the description, as "the least developed countries" do not appear on the panel. | All figures have been redrawn and descriptions and captions revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18127 | 1 | 20 | 43 | 20 | 44 | There is no LDC grouping in figure 1.7. How is this comparison made? | All figures have been redrawn and descriptions and captions revised |
| 18128 | 1 | 20 | 47 | | | a) Which countries are Indonesia's economic peers as shown in Fig 1.7c? Elaboraton required. Also land use change (deforestation) is arguably a depiction of the state of the economy - one that relies on natural resources? The distinction drawn in this regard is not clear. Also, how would this be related to population which is the main focus of this perspective?<br>b) The point that could be made here is the argument for the right to atmospheric space to develop based on population base which this perspective shows. Hence China and India for example could justify greater total emissions on this basis as their per cap is still far lower than that of industrialised countries. | Rejected - Our statement about land use in Indonesia is correct. For clarity, edited the sentence at line 46 to say "…when compared with OTHER COUNTRIES AT THE SAME LEVEL OF PER-CAPITA INCOME." |
| 14809 | 1 | 20 | | | | These claims about whether a given target is acheivable or "impossible" based on these studies must be stated with much more clarity about what can actually be substantiated by such modeling exercises. They are based on assumptoins about technological progress on a 50 (or greater) year timeframe, they rely on assumptions about policy effectiveness, maximum penetration rates, acceptable reductoins in GDP growth (or absolute GDP). These assumptoins might simply not apply under conditions significantly different from today under societies are acting in earnest to fend off climate change. Such caveats should be stated. | Rejected - Page 20 is about very near-term issues--not 50 years. We think the comment refers to pages 21-22. For the first part, we will take these into consideration. However, relationship between the first half and the second half is unclear. Even today, asumptions mentioned here (for example policy |
| 3564 | 1 | 21 | | | | Label on vertical axis should read "GtCO2/yr" | Figure will be redrawn |
| 17644 | 1 | 21 | | | | Please put proper names of model on footnote or another spaces, so that it would be easy to understand for readers who is not expert in economic research fields | Figure will be redrawn |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17044 | 1 | 21 | | | | This plot should NOT be replaced with a chart showing mitigation gaps. Such a plot cannot capture the ineherent, vast uncertainties of such an analysis. A detailed explanation of why such a presentation is unwarranted follow: • Even before you look at scientific uncertainties, the political uncertainties leave a range of 18 Gt CO2e (i.e., 3 Gt gap in case 4 vs. 21 Gt gap in BAU).<br> Note, these numbers were updated in the Bridging the Emissions Gap report to be 4-16 Gt, showing how fluid our knowledge is of this science<br><br>• Even if the political realities could be confined to a single “case”, you’re left with a range of close to 5 Gt – or more than 10% of current global emissions.<br><br>• But let’s accept that we could confine the pledges to a single case. Where would the science leave us?<br><br>• 2°C is a very nebulous goal given the propagation of uncertainties that occurs when going from emissions to atmospheric concentrations to transient / equilibrium temperature change.<br><br>• Many studies have made informed predictions, but it remains an awfully challenging parameter to quantify accurately. As a result, the level of emissions reductions called for under a “2°C scenario” may actually only limit warming to 3°C… or – there’s an equal possibility that that same amount of emission reduction would limit warming to only 1°C.<br><br>• In general there are three critical scientific / objective / analytical aspects to the 2°C goal and the idea of an “emissions gap” that really make it unworkable from an operational standpoint.<br><br> Uncertainties in quantifying emissions.<br> Uncertainties in the carbon cycle (i.e., translating emissions to concentrations)<br> Uncertainties in Earth’s climate sensitivity (i.e., translating atmospheric concentrations to a temperature change)<br><br>• As a recent study by Chinese scientists published in Nature Climate Change demonstrates, we are still woefully inaccurate in our ability to consistently and accurately report emissions.<br><br>• The Guan et al. study found that in China alone, an emissions gap of 1.4 Gt existed in 2010 between the nationally-reported emissions and the aggregation of provincial level data – an uncertainty of 1.4 billion tons of CO2 – roughly equivalent to half the 3 Gt gap in case 4.<br><br>• In other words, more accurate reporting from one nation could close the emissions gap by 50%(!).<br><br>• Along these lines, estimates for cumulative carbon emitted to date, globally, range from about 400 to 700 Gt. | Figure will be redrawn. -- we are going to defer to IPCC WG3 chapter on modeling and look at gaps related to many different goals. |
| 14365 | 1 | 21 | 1 | 21 | 5 | What about the question of whether energy subsidies are causing excessive use of energy per unit of GDP that cannot be justified by high ratio of goods (and manufacturing) to services sector associated with lower per capita income? | Taken into account - a good point. Sentence at line 1 edited to say: "primary processing using energy intensive methods OFTEN REINFORCED WITH SUBSIDIES |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15537 | 1 | 21 | 10 | | 22 | An important issue that should be mentioned here is that national planning aspirations often envisage more rapid growth than do the BAU modelling assumptions. If the planners are right, then the outlook is more difficult still. As the Blanford et al piece in EMF22 suggests, it is not clear that BAU projections have taken on board the rapid growth of Asia since the 1990s. | Rejected - The Blanford et al (2009) paper is clear. However the paper was published in 2009 and global economy, including China and India, are still struggling. If we adopt this comment, that may invite many comments arguing the paper was writen more than 3 years |
| 17043 | 1 | 21 | 13 | 21 | 15 | The EMF22 is NOT the most recent study. IEA's World Energy Outlook 2012 (due out in Nov) has 3 scenarios and will be the most recent effort. Even last year's WEO2011 is more recent than the EMF22 effort. | Rejected - IEA is a single model study. EMF's strength is multimodel comparison. Edited the sentence to say: |
| 12910 | 1 | 21 | 13 | 21 | 21 | the results of EMF22 are the latest published right now. However, EMF27 is about to be published and some of the draft numbers even are used in this FOD in other chapters. EMF27 gives a much more optimistic picture with repect to achievability of low emission targets. Chpter 1 should reflect this saying that EM22 shows that is difficult , meanwhile we are more optimistic (albeit the task still being a difficult one). If emf27 is not mentioned in chapter 1 we run into inconsistencies because it will be used in other chapters! | Accepted, data will be updated as they become available |
| 7156 | 1 | 21 | 14 | | | Remove unnecessary paranthesis. | Editorial – copyedit to be completed |
| 2154 | 1 | 21 | 16 | 21 | 18 | This is the sentence which will become the press headline (linked to my comment above on the central question is "can we achieve 2°C?"). The press will state "IPCC says 2°C is not achievable". If the IPCC really comes to this harsh conclusion, you need to triple think about it. I do not think so. Yes, the chances are small, but not impossible - in my view a neutral picture should be drawn which shows hope, as well as the need to act. Specifically, my suggestion is to consider a picture with a RANGE of BAU trajectories on the top, and a RANGE of maximum possible mitigation pathways at the bottom. In a separate exhibit you can then compare the "mitigation range with the 1.5 / 2.0./ 2.5 etc RANGES of temperature stabilization | Taken into consideration - the whole section has been rewritten to be more clear about our intentions that achieving the goal will be challenging but not impossible |
| 17046 | 1 | 21 | 18 | footnote | | The footnote should specify that this is "above pre-industrial levels". | Taken into account - This paragraph has been rewritten for clarity and the footnote |
| 16067 | 1 | 21 | 2 | 21 | 8 | Not very helpful. Is it something that will be precised by research ? By improved international accounting and date collection? Or just not knowable? | Noted - There are various perspectives and we simply offer a few. Here we discuss the typical stages of development and offer the logical |
| 7885 | 1 | 21 | 21 | 21 | 22 | The statement "a Herculean task" is value-laden and misleading. With the technologies available today Germany can genrate 100% of its electricity with renewable energy sources by 2050 (SRU 2011). Thus, the taks is not so much Herculean in any technical meaning although it might be so in terms of political feasibility (see comment s19 and 26). This, however, is an important difference. This difference is brought out well in chapter 6. A reference to and eventually some key messages of chapter 6 should be included. | Taken into account - a good point. Section has been rewritten to more accurately reflect our message |
| 12909 | 1 | 21 | 21 | 21 | 21 | value judgement: "Herculean" should be avoided! | Taken into account - combined with |
| 12225 | 1 | 21 | 24 | | | Y-axix should read Gt CO2/yr not Gt/CO2. It should be included in the caption that this figure picture the BAU emissions, and is without further measures. | figure will be replaced |
| 4860 | 1 | 21 | 29 | 22 | 22 | Some clarity would be needed since the EMF scenarios are on fossil and ind. CO2 while references to the pledges (gaps) and to the ppm-ranges (for 2C) are for CO2e | EMF 22 is based on CO2e. Fig. 1.8 focuses on Energy related CO2 only to make it consistent to Table TS2 cited in Bali Action Plan. Figure will be redrawn. |
| 7355 | 1 | 21 | 29 | 21 | 30 | This says "at least in half" when above it says "most of those scenarios were based on emission controls that envisioned a 60% reduction" these are quite different and it does not seem appropriate to "downplay" the depth of cuts necessary later in the section. | Rejected - This comment is incorrect. Here we are talking about what IPCC AR4 showed. The previous paragraph describes about EMF 22. The figure will |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17045 | 1 | 21 | 29 | | | There's a more recent body of literature than AR4 on this topic. See the work of Rogelj, Meinshausen, etc. | Rejected - Of course--but one of the purposes of AR5 is to comment on what was said in AR4 and what has changed; so this statement MUST STAY so that |
| 15452 | 1 | 21 | 29 | 22 | 12 | For the purpose of being comprehensive, it would be better to have a reference to UNEP study on the "gap" (UNEP (2011) Bridging the Emissions Gap. UNEP) because the study is a synthesis report of existing studies. | Taken into account - combined with other comment |
| 15254 | 1 | 21 | 3 | 21 | 5 | this too seems good policy! | Noted - no action needed |
| 17041 | 1 | 21 | 3 | 21 | 5 | Allocation Emissions obligations is not the business of the IPCC. Making value judgement statements like this may have a detrimental effect on the integrity of the IPCC. These concluding statements in each of these paragraphs ought to be deleted, if the entire section is not deleteed altogether. | Taken into account - combined with other comment |
| 11897 | 1 | 21 | 4 | 21 | 4 | Avoid to use "should". | Rejected - "should" is ok because the beginning of the sentence says "From |
| 7884 | 1 | 21 | 5 | | | We do in not oppose improvements in energy intensity. Still, what matters with repsect to mitigating climate change are absolute and per capita emissions. Low intensity goals alone will not lead to any meaningful reduction in emissions as is well demonstrated by figure 1.6. | Noted -- no specified action suggested |
| 8912 | 1 | 21 | 6 | 21 | 7 | There is something wrong with this sentence, too many "interpretations". | Accepted - edited sentence to say: "well, WITH VARIED IMPLICATIONS FOR POLICY STRATEGIES AND THE ALLOCATION OF BURDENS AND |
| 3885 | 1 | 21 | 6 | 21 | 7 | "Still other interpretations are possible as well, and the exact interpretation of what explains these interpretations has large implications for policy".. Please improve wordings to express your view. | Taken into account - combined with other comment |
| 17042 | 1 | 21 | 6 | 21 | 8 | This statement more or less implies that this entire section is all relative, subjective and attempting to be prescriptive. As a result, this section should be deleted. | Rejected - this comment is incorrect. Sentence has been revised per previous |
| 9216 | 1 | 21 | 9 | 22 | 35 | It should be notd that the "concentration stabilization" is not a likely future and this has implication on the scale of emission reductions. In (T. Matsuno, K. Maruyama and J. Tsutsui “Stabilization of atmospheric carbon dioxide via zero emissions-----An alternative way to stable global environment”. Part 1 and 2 In Proceedings of Japan Academy Ser. B, Vol. 88, No.7 (July, 2012),p 368-395.), the authors critically examine the traditional “stabilization” concept in which the atmospheric CO2 concentration and corresponding temperature are held constant for many centuries to a millennium. They claim that such long-term constancy of concentration and temperature is not a likely future state. Instead they propose “zero-emissions stabilization” in which emissions will be diminished close to zero, and after that the concentration will decrease approaching the final equilibrium state for which the temperature rise can be made much lower to avoid the risk of sea level rise. Another advantage of the zero-emissions stabilization strategy is that emissions in the near future can be made larger compared with ordinary stabilization pathways under the same temperature rise constraint. This would be beneficial to respond to current socio-economic needs. These points are shown by simple model calculations for illustrative cases. | Rejected - This comment should be addressed to WG1or to WG3/Ch. 6. This paper raises the important issue whether the world can tolerate to delay the timing of stabilization, for example at 450 ppmCO2e level, for another century or centuries in comparison to generally anticipated. This is beyond chapter one's mandate. |
| 3447 | 1 | 21 | 1 | 21 | 2 | An additional argument justifying that emissions of greenhouse gases are higher in emerging economies, is due to the relocation of highly polluting firms from developed countries into developing countries. Maybe a comment on this issue should be mentioned in the document. | Rejected - this is exactly why we added the "embodied emissions" perspective. No action needed |

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| 4366 | 1 | 21 | 2 | 21 | 8 | Pannel B of Fig 1.7 suggest that «mature» economies have seen part of their industry related emmissions transfered to developping economies, so how much more carbon efficient economies really become as they mature when emission transfers are accounted for. What is the contribution of those emission transfers to meeting the Kyoto objectives, compared to “real” emission reductions ? | Rejected - the piece we cite (Peters et al) deals with this in detail, and one implication is that OECD countries haven't made much progress. UK emissions are down 20% but embodied emissions pretty much offset that cmopletely. That's the implication. If we go too far down the road of spelling this out in the text then some reviewers |
| 6515 | 1 | 21 | 4 | | 5 | Modify the description after "and", taking into consideration that a rapid transition of a developed country to low emissions can lead to importing more GHG emissions embedded in trades from developing countries and promote GHG leakage to such developing countries, as suggested in section 5.5.4. | Rejected - this edit not needed because exactly this general point (if not the details) is in our treatment of embodied |
| 3563 | 1 | 21 | 6 | 21 | 7 | "…exact interpretation of what explains these interpretations…" unclear and bad language. | Taken into account - combined with |
| 18130 | 1 | 21 | 6 | 21 | 7 | Needs rewording. For example, the word interpretation appears thrice in this sentence. | Taken into account - combined with |
| 14808 | 1 | 21 | | | | This section is quite difficult to follow. The text seems to confound BAUs with mitigation scenarios. It does not make sense to show a set of 11 BAUs shown and state "BAU projections such as in Figure 1.8 are wildly at odds with those ambitions and global emissions continue to ncrease" ... is this not true simply by virtue of the fact that these are BAUs, not mitigation scenarios? | The commentator misunderstood the text and the figure. The text and figure has been revised |
| 14810 | 1 | 21 | | | | This section is focused on making the case that meeting the 2C target would be exceedingly challenging, which is undoubtedly true as has been evident for quite some time. However, as presented, this section appears to be presenting a case for relaxing this exceedingly challenging target. What is not discussed, but is equally relevant to such a decision, is whether it would also be exceedingly challenging to MISS the 2C target? That is, what demands and pressures would be put on societies to bear the impacts of a higher level or warming? Not only is there no basis provided in this section to suggest that meeting the 2C target would be less challenging than missing the 2C target, but the text does not even raise this as the relevant comparison to make. | Noted - WG3 is about mitigation centrally, and the exact role for adaptation (and bearing impacts) is unclear to us. Thus we have added a discussion of adaptation near the end of the chapter. Talking about the cost of 2 degrees on societies is more of a WG2 topic but we have added a sentence highlighting the challenges of missing |
| 4367 | 1 | 21 | | 21 | | A figure model outputs showing that targets are not achievable would be more interesting | Noted - that is exactly what we are doing. Figures will be redone. |
| 13658 | 1 | 21 | 10 | 22 | 12 | The entire section draws from projection of emission trajectories for the future, which are based on business as usual scenarios. This is a high uncertainty methodology as the nature of the the BAU trajectories is counter-factual and mitigation efforts are highly sensitive to the assumption of a BAU trajectory. Why have other approaches (budget approach – Meinshausen et al) not been used to measure the scale of the mitigation effort required, as it provides a more concrete basis to gauge total available carbon for the future. □ | Taken into account - The budget approach isn't any more helpful--there is no way to escape the need to look at BAU-like projections and the "gap" between likely and desired trajectories. This section has been rewritten for clarity |
| 8227 | 1 | 21 | 16 | 21 | 18 | It is not clear if the targets are not achievable even with mitigation actions? Please clarify. | |
| 6869 | 1 | 21 | 16 | 21 | 18 | Please check definition of Climate Sensitivity in the Glossary. We suggest to stick very closely to this Glossary definition. E.g., here the equilibrium component of the formal defintion is missing. The Glossary definiton reads: "In IPCC reports, equilibrium climate sensitivity refers to the equilibrium change in the annual mean global surface temperature following a doubling of the atmospheric equivalent carbon dioxide concentration." | This section has been rewritten for clarity. No further action needed |
| 13256 | 1 | 21 | 19 | 21 | 20 | the expression "small majority" is contradictory. What it is intended to be said? That a small portion of scenarios will find the target achievable, or that a majority of scenarios will find the target achievable? | Taken into account - This section has been rewritten for clarity. we will add text '8 among 14 scenarios', and also add 'in case of delayed participation, 2 out of 14 |
| 17728 | 1 | 21 | 21 | | | replace the phrase "a Herculean task" by "an increasingly difficult task as actions are delayed" | Taken into account - this section has |
| 6870 | 1 | 21 | 29 | 21 | 29 | Which part of AR4? Need to provide specific references to previous IPCC reports. | Taken into account - figure and discussion on the figure has been |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15451 | 1 | 21 | 9 | | | It would be useful to view the challenge from the perspective of cumulative emissions up to 2050, too, as described in Meinshausen et al. (2009) Greenhouse-gas emission targets for limiting global warming to 2 ºC. Nature. 458: 1158-1163 (doi:10.1038/nature08017). For example, the paper says having emissions by 2050 results in 12-45% probablity of exceeding 2 ºC (assuming 1990 level as the base year, though). To keep the probability below 25%, the cummulative emissions must be less than 1,000 Gt CO2. This way of thinking would add another useful insight to the discussion and it is worth mentioning. | Taken into account - Here discussions are based on the best estimate of climate sensitivity of 3 degree C. Meinshausen's paper deals with the broad range of climate sensitivity (2-4.5 degree) and this point has been dealt with separately in our text. See page 22, lines 13-17. This description will be |
| 10779 | 1 | 21 | 9 | 22 | 12 | This statement is so strong that it should be part of the summary of the report. It says, in simple English, that warming control is nearly hopeless. The author, though, softens the writing with the weak word "challenging..." | Noted - section has been rewritten |
| 4861 | 1 | 22 | | | | 1.4.1 It could also be mentioned, that many of these priorities, goals (MDGs and climate change mitigation and adaptation related goals), and the means to achieve those are interrelated to some extent.( Such interrelations should be taken into account with reconciling the priorities.) | Noted - This is what we wrote in this section. Also for interaction between mitigation and adaptation, refer to 1.4.5. |
| 14366 | 1 | 22 | 10 | | | Cline (2011) sees mitigation capable of staying within the 2 degree limit as cutting per capita emissions to 1.4 GtC02 b 2050, not 1.1. | Taken into account - Section has been rewritten. Added cite to Cline and Yamaguchi et al (see comment 1008) |
| 11722 | 1 | 22 | 11 | 22 | 12 | Yamaguchi et al says [the feasibility of the 2 degree target is too slim, if not possible]. So [1 degree or 1.5 degrees would be extremely challenging] is more apropriate expression.<br>1.Yamaguchi et al.:[Climate change mitigation,P23], send attachment by another e-mail. | Taken into account - combined with other comment |
| 10637 | 1 | 22 | 11 | 22 | 12 | Yamaguchi et al says that "the feasibility of the 2 degree target is too slim, if not possible". So it is better to express that "1 degree or 1.5 degrees would be extremely challenging".<br>Yamaguchi et al Climate change mitigation will be sent be email later. | Taken into account - combined with other comment |
| 17048 | 1 | 22 | 11 | 22 | 12 | Reword this setence to be more clear: "By logical extension, limiting warming to 1 degree or 1.5 degrees is even more challenging [and prehaps even impossible given emissions lock-in, etc.]" | Accepted - text changed as suggested |
| 9971 | 1 | 22 | 11 | 22 | 12 | This part should be revised into "is extremely challenging". The 1.5 ℃ target is not realistic and even 2℃ target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract). These literatures are listed in the No10 line of this table. | Taken into account - Rogeli et al. discussed the gap (see 981). Added after 'target' in line 4, p. 22, '(den Elsen |
| 16068 | 1 | 22 | 12 | 22 | 12 | Noun missing | Taken into account - combined with |
| 16202 | 1 | 22 | 13 | | 17 | uncertainty bit is not clear. What is the point? Point is not made; be more direct. | Taken into account - text has been revised for clarity but basic concept remain unchanged. Meaning is quite |
| 9926 | 1 | 22 | 14 | | 18 | The Unit for concentration is inconsistent in the context. Ppm and Ppm CO2e are all used, but the difference is not stated. | Rejected - We use the unit accurately. Only when we indicate concentration of CO2 only, we use ppmCO2. When it |
| 16069 | 1 | 22 | 18 | 22 | 22 | "Exceptionally difficult if nor impossible" is not acceptable without a qualification such as "in the present state of play" or "with the policy instruments presently on the table". If the political goal of Nations is indeed 2°C, then other instruments should come in play such as banning most plane transport or limiting drastically the use of individual cars. Thus the construction of this paragraph is misleading. In particular, even consensual policy (e.g. universal pricing of carbon) is presently not given serious consideration. Also, no technological barrier exist to implement technology based changes (see other chapters). Only political proposals, instruments and consensus are lacking. You should say so, for example "technology and economic policy proposals, sufficient to limit GHG emissions, do exist but are presently excluded from serious policy consideration, making the 2°C goal nearly impossible". | Taken into account - The text has been rewritten. Though we soften the language, this comment is a political statement. Our role is to provide policymakers policy relevant information based on scientific literatures. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14367 | 1 | 22 | 18 | 22 | 22 | This comes close to throwing in the towel. In general it seems to me there is a risk that the chapter essentially implies it will be extremely costly and almost impossible to stay within the 2 degree limit. Cline (2012, p. 4; p. 81) calculates that by 2030 the path needed would only impose economic costs of about 2/3 of one percent of GDP or less annually on both industrial and emerging market economies, with the cost reaching 1 to 2 percent by 2050. It would be unfortunate to imply instead that the 450 ppm target is simply impossible, thereby discouraging efforts to meet it. | Taken into account - That is what we are saying, to some degree. But we will qualify this. In this particular point, we need to know the condition that enable achieving 450ppm (CO2e?) target at the cost of 1-2% of global GDP. We are looking forward to see several modeling studies (EMF 27, RoSE, AMPERE |
| 9251 | 1 | 22 | 18 | 22 | 18 | 350 ppm is an old figure - was it that low at the AR5 cut-off date? Now locally 400 ppm. | Accepted - change 350 to 390 |
| 7886 | 1 | 22 | 18 | 22 | 22 | You write that to stop warming at 2° will be exceptionally difficult if not impossible. It is not clear though in what sense it is deemd impossible: scientifically/technologically or economoically or politically (in terms of political will)? If you have the first or second meaning in mind, you should critically discuss those studies and politcal plans that suggest otherwise. See also comment 33. | Taken into account - Good suggestion. Our discussions are based on literatures that are based on analysis of technology, cost, speed of energy system transformation etc. and not on political will. Political will stems from |
| 17049 | 1 | 22 | 18 | 22 | 22 | There is a body of literature that would be very informative to this discussion: Many studies have addressed the question of feasibility from different angles, but with remarkably concordant conclusions: for normative climate sensitivity, limiting warming to 1.5 deg C is no longer possible because the mitigation rates required (c. 20% per annum – Raupach, Tellus, 2011) are not technically feasible. Large-scale energy technologies require 50 years for full-scale penetration (Smil, V., Energy. Myths and Realities, American Enterprise Institute, 2010; Victor, D., Global Warming Gridlock, Cambridge Press, 2011); for the penetration of zero-emission technology, this timescale is equivalent to a mitigation rate of ~5% per year. Limiting warming to 2 deg C is still feasible in principle, but would require an immediate start to mitigation at rates exceeding 5% per annum. Alternatively, one can use estimates of the emission gap for year 2020, which are 3 to 9 Gt CO2-eq per year, compared to the required level to meet the 2 deg C target of 44-46 Gt CO2-eq per year (UNEP, Emissions Gap Report, 2010, and IEA, World Energy Outlook, 2010).<br>The prognosis for limiting warming to 3 deg C is more optimistic. Raupach (Tellus, 2011) demonstrate that a 3 deg C limit could be achieved for mitigation start times from 2011 to 2030 with decarbonization rates of 2 to 3.5% per year, respectively. These rates fall within realistic energy technology turnover rates and have been met by some nations in the last decade; e.g., Denmark, Germany and Spain decarbonized by 1.9, 2.2 and 3.6% per year, respectively, from 2005-2010, although some of these declines likely reflect recessionary effects. | Taken into account - Thanks for useful information. On this point, our idea is to mainly rely on large model comparison projects now on-going. But we will cite some of those in our text. |
| 11405 | 1 | 22 | 2 | 22 | 12 | The reference to "pledges" should be with respect to the Cancun outcome under decision 1/CP.16 rather than to the Copenhagen Accord, as only the former is the multilaterally agreed instrument under the UNFCCC for such pledges. | Rejected - Legally speaking this comment is correct. However the pledge is generally known as the Copenhagen Pledge and exactly this language is used in chapter 6 (ref. to Fig. 6.34). What we do is to add the following after 'Copenhagen Conference' in p. 22, line |
| 14811 | 1 | 22 | 20 | | | eliminate "…if not impossible…" This is is presented as if it is an analytical scientific result. It is not. It is a conclusoin based on a set of assumptions regarding whether society is capable of rallying the political will to achieve a appropriately ambitious mitigation pathway. | Taken into consideration - the text has been rewritten |
| 16071 | 1 | 22 | 23 | 22 | 27 | Scenario consideration is too complicated in the paragraph. Why not a graph? | Rejected - other chapters will address |
| 16070 | 1 | 22 | 23 | 22 | 35 | Same remark on the paragraph. Only fairly "mild" conditions are tested in the scenario, and not rather more radical options such as ban in some coal trade, drastic limitation of plane travel, quotas in the use of cement… So the implausibility of the 2°C scenario should be qualified e.g. "with policy already on the table". | Rejected - this comment is much too extreme and not linked to the scientific research. No action needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14812 | 1 | 22 | 23 | | 35 | Again, this is reporting modeling results as scientific results, without acknowledging the sensitivity to assumptoins. Most importantly, the claim that emissions must peak around 2020 is based on optimal path assuming earnest reductions started today. That does not mean that meeting the 2c target *requires* emissions to peak by 2020 and is impossible otherwise. If earnest reductions do not start in the next few years, then the peaking year of the optimal path would be pushed out later than 2020, (with subsequent reductions greater than 4% and/or negative emissions to compensate for the delay). Please see section 6.2.3 "Interpretation of model infeasibility" | Taken into account - All figures will be redone. The new approach to figure 1.8 will focus exactly on the conditions. We will cite cumulative emissions from WG1/SPM as follows; 'The 2°C temperature target implies cumulative carbon emissions by 2100 to be below about 1000–1300 PgC in the set of scenarios considered, of which about 545 [460 to 630] PgC were already emitted by 2011 (AR5/WG1/SPM)'. If SPM will not be ready we can cite similar wordings from |
| 7887 | 1 | 22 | 23 | 22 | 35 | The message seems to be that the 2° goal is (almost) out of reach. If this is the case, will (should?) mitigation still have priority? Please be more explicit about this point. | Rejected - we can't make that statement |
| 17050 | 1 | 22 | 29 | 22 | 30 | "… reduction of annual emissions by 4% per year THROUGH WHAT YEAR?" | Taken into account - Exact wordings are 'around 4% of 2000 emissions annually over a period of decades' p. 111. |
| 6817 | 1 | 22 | 31 | | | Drop 'nuclear' from this line. It is not possible to power up nuclear in time to meet these timeframes - see above. Furthermore, any signicant investment in nuclear acts as a wasteed financial resource sink lowering the potential for faster methods, ie renewables. | Rejected - The idea is to expand all near-zero sources, including nuclear |
| 11898 | 1 | 22 | 31 | 22 | 32 | For "nuclear power", consider to mention the Fukushima accident may affect the policy of the use of nuclear power; as it has been mentioned in page 10, line 50. | Rejected - not needed here--too much detail. We discuss that earlier |
| 12614 | 1 | 22 | 32 | 22 | 32 | Bioenergy and CCS is a very valid technology but may be constrained by the availability of sustainable biomass. This must be taken into account when estimating the infultration of bio CCS into any overshoot scenario. | Taken into account - The comment is correct. What the literature and the text shows, however, is that without all technologies including BECS, 2.6W/m2 |
| 12657 | 1 | 22 | 32 | 22 | 32 | Bioenergy and CCS is a very valid technology but may be constrained by the availability of sustainable biomass. This must be taken into account when estimating the infultration of bio CCS into any overshoot scenario. | Taken into account - combined with other comment. No action needed |
| 11027 | 1 | 22 | 32 | | | 'It is uncertain at this stage whether all those conditions could be met. For example, in view of the Decision at COP 17 that "a protocol, a legal instrument or agreed outcome with legal force" applicable to all parties to take effect from 2020—the very year that global emissions would need to peak.'<br>This is an understatement, i.e. the words should be strengthened to state: 'it is almost impossible at this stage that those conditions would be met, in view of the Decision that ….parties is to take effect from 2020—the very year that global emissions would need to peak. An assessment of risks and the need for policy strengthening will need to take into account likely implementation lags and the likely shortfall from full global participation, and the possibility that stronger top-down policy pressure may discourage participation.' | Taken into account - We have other comments (notably from USG) arguing that we strip out all interesting content related to such points. The text in this section has been rewritten |
| 17051 | 1 | 22 | 34 | | | It might be worth explainging why the year 2020 was chosen - some 8-9 yers after the agreement in Durban. | Rejected - we can offer no scientific explanation for this, only political ones, |
| 11899 | 1 | 22 | 37 | 22 | 40 | Consider to make this paragraph more simple and clear. | Noted - paragraph seems simple enough. No specific action suggested |
| 18414 | 1 | 22 | 39 | | 39 | Please which ones? | Noted - insufficient information. No |
| 17047 | 1 | 22 | 4 | 22 | 7 | See detailed comment on emissions gap presented in comment 84 | Taken into account - combined with |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3888 | 1 | 22 | 42 | 22 | 42 | Can the authority for the assertion that this is 'one of the most serious challenges' be cited and the reasons given for rejecting differing expert assessments (eg Lomborg's Copenhagen Consenus http://en.wikipedia.org/wiki/Copenhagen_Consensus)? Otherwise this looks like a statement of personal bias by the authors. | Rejected - this is the authors' assessment of a vast literautre, which is exactly what the authors were asked by ipcc to do |
| 3891 | 1 | 22 | 44 | 22 | 47 | This sentence confuses the humanitarian MDG goals with the urgent priorities of actual governments. The urgent priority for the Syrian government right now is to retain power. Once again the problem here is the absence in the chapter of a positive theory of the incentives that governments actually face. Where there is an inadequate understanding of the reasons for government failure, otherwise unjustified disappointment with political outcomes can lead to unreasonable disillusionment with democracy itself. | Accepted - line 43 edited to say: "only challenge. FOR EXAMPLE, a survey…" |
| 18430 | 1 | 22 | | | | mitigation challenge<br>Here the report is more realistic since considers almost impossible to avoid a 2C raise in global temperature. However, when it leaves hard data and enters in international politics it says that the adoption of measures consistent with a 2C scenario is uncertain (pag 22), when is clear that is also almost impossible. This happens in the same page: 22 paragraphs 3 and 4. | Rejected - We have lots of comments urging us to do the opposite--to talk about the feasiblity of 2 degrees. And some models (albeit with wacky assumptions) can reach 2 degrees |
| 3565 | 1 | 22 | 12 | 22 | 12 | Substitute "require" with "be" | This sentence was reworded in 1010. Comment no longer relevant |
| 6871 | 1 | 22 | 13 | 22 | 17 | Suggest to base this statement on (and refer to) the assessment provided by WGI Chapter 12, which is based on a number of peer-reviewed studies and different line of evidence, rather than relying on a single study only. | Taken into account - In WG1/CH.12, Climate Sensitivity remain unchanged, though pdf of CS shown in Box 12.1, Fig.1 shown in Ch. 12 of WG1 may be different from that in AR4. Also, at this moment no such study like Meinshause's has been published based on new pdf. Therefore we keep this as is. In addition, we add after the end of line 17, p. 22 the following; 'Meinshausen (2009) also calculated |
| 3566 | 1 | 22 | 14 | 22 | 14 | Insert "the" before "probability" | Accepted - adopted suggested text |
| 6872 | 1 | 22 | 18 | 22 | 18 | Add reference to the relevant Chapters in WGI AR5 showing the past, present, and future projected evolution of GHG/aerosol concentrations: e.g., Chapters 2, 6, 11, 12. | Accepted - it should be noted that IPCC WG1 has no real insight into future evolution of concentrations, which is mainly a social science issue. Added to |
| 18131 | 1 | 22 | 2 | 22 | 6 | Reference is made to the "Copenhagen conference" in line 2 and COP 15 in line 6. For ease of reading suggest changing the reference in line 2 to COP 15 in Copenhagen (2009). | Taken into account - combined with other comment. Sentence has been |
| 6516 | 1 | 22 | 21 | | 22 | Add a conditional clause, e.g.. ", if governments want to limit warming to about 2 degrees." to make it clear. | Accepted: edited line 22: "...must be AGGRESSIVELY EXPANDED if DIFFICULT GOALS SUCH AS |
| 6873 | 1 | 22 | 24 | 22 | 24 | This should probably say "Integrated Assessment Modelling Community" rather than "Climate Modelling Community". | Accepted: edited to say "integrated assessment and energy and emissions |
| 6874 | 1 | 22 | 26 | 22 | 28 | Need to base this statement regarding the 2°C climate target on WGI AR5, see Chapter 12 WGI AR5. | Rejected - The statement will be based on what the IAM work, which we review, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3890 | 1 | 22 | 37 | 23 | 21 | This section ends with a paragraph that suggests that the Mitigation challenges and strategies problem is to use CBA to assess trade-offs, difficult though this is. This means that the section omits consideration of the problem of political processes and incentives. For example, what arrangements would incentivise a governing elite to put mitigation ahead of retaining power? To help readers understand why it is so hard to get politicians to 'do the right thing' in the light of the best available CBA the chapter needs needs to undertake a positive analysis of the actual incentives of bureaucrats and politicians. Arelated need is to explain how the efficacy of government action is limited by inadequate information. | Rejected - politics, where it is assessed scientificially, is suffused throughout the chapter--to the degree that lots of other comments urge us to pull back. We can't do a full blown positive political economy of policy choices here. |
| 15453 | 1 | 22 | 41 | | | The descrption here is not fair because it fails to mention there could also be interaction between climate change and those sustianble development issues and they are not limited to "tradoffs." Climate change can worsen some of the SD issues mentioned here by making conditions hard. For example, extreme poverty can be worsened by droughts and some other extreme weather events due to climate change. It is generally agreed that climate change can have negative impacts on efforts to prevent malaria. Hence, only stressing "trade offs" would miss an important point. This point should be mentioned even if the section is mainly about "challenges" and the authors want to focus on the aspect of challgenges. | Rejected - there's a LOT of discussion of interaction of priorities. No more needed. Text around co-benefits redone and text revised |
| 18132 | 1 | 22 | 44 | 22 | 47 | It would be good to list all 8 MDGs or say that those given are examples. | Rejected - beyond the scope of our chapter. No action needed |
| 11028 | 1 | 23 | | | | The text states: 'MDGs are unquestionably the urgent issues human beings should cope with immediately and globally. Achieving such goals along with an even broader array of human aspirations is what many governments mean by "sustainable development"…'. The first part of this is a value judgment, and could be better phrased as: 'MDGs represent an important and widely supported crystallisation of the priorities for human welfare, immediately and globally.' The second part needs to acknowledge that SD encompasses environmental goals. The following is preferred: 'Achieving such goals along with an even broader array of human aspirations including protection of the environment is what many governments mean by "sustainable development"…' | Rejected - I think our text is ok. No action needed. |
| 15255 | 1 | 23 | 11 | | | compare with 'growth' | Noted - insufficient information. No |
| 8408 | 1 | 23 | 14 | 23 | 14 | I suggest to avoid defining such kind of exercises "essential". Maybe they could be of some methodological interest, but it's hard to believe that could really be of some interest for policymakers. Different problems have different temporal and spatial scales, and it does not make much sense to assume that it is possible to address only one problem at the time, and that there is just one actor. Furthermore, one of the references quoted (Lomborg 2004) is not peer reviewed and a lot of analysis made by the author and used in such exercises have been identified as very weak, if not completely biased (i.e., Realclimate 11/8/2009: A biased economic analysis of geoengineering). The major part of the work of the Copenhagen Consensus doesn't involve much science and it is not peer reviewed. I suggest you delete this reference that only generates confusion. | Taken into account - deleted this phrase and the two cites: "...worthy—such endeavors are both essential and highly controversial (e.g., Lomborg (2004); Sachs (2004)." |
| 14813 | 1 | 23 | 14 | | | It is probably not advisable to cite authors whose writings have been roundly discredited by climate scientists. | Taken into account - combined with other comment |
| 10064 | 1 | 23 | 14 | 23 | 21 | Are there any more recent references to cite? | Taken into account - combined with |
| 7157 | 1 | 23 | 14, 21, 44 | | | Remove all unnecessary parantheses. | Accepted – copyedit to be completed |
| 15538 | 1 | 23 | 15 | | 17 | The difficulties are well illustrated in the discussion of US CBA guidelines in Dietz, S (2012). 'The Treatment of Risk and Uncertainty in the US Social Cost of Carbon for Regulatory Impact Analysis' Economics The Open-Access Open-Assessment E Journal Vol. 6, 2012-18. http://dx.doi.org/10.5018/economics-ejournal.ja.2012-18 | Rejected - text is fine--it already makes these points. No action needed |
| 14814 | 1 | 23 | 16 | | 17 | CBA is not a good example here, given its problems when applied to issues such as climate with intergenerational considerations, value-laden tradeoffs, and profound uncertainties of possibly catastrophic magnitude (a la Weitzman). | Accepted - deleted citation to "Azar" cited at line 21 and added citation also to Weitzman (2009) and to Nussbaum |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17052 | 1 | 23 | 16 | 23 | 17 | Explain why applying such techniques for making tradeoffs is extremely difficult difficult in such settings - due to unknwon discount rates, etc.? | Rejected - we already provide several examples (e.g. monetization), low probabilities, extreme impacts. We deal |
| 17053 | 1 | 23 | 18 | | | Inserting "such as equity" is unncesary. "Equity" is a laoded term in the UNFCCC context - and as previous AR's have shown, it has over a dozen definitions. Therefore, it should be avoided, unless it is made crystal clear what it refers to. Here, the conversation is about the Millenium Development Goalds and one ough to check to see if "equity" is one of them. | Rejected - the MDG is an illustration of the kinds of tradeoffs involved. And so is equity--a term we choose because it has many definitions-- an illustration. Other |
| 11406 | 1 | 23 | 18 | 23 | 19 | The reference to "important goals such as equity" should be further expanded with a more substantial and balanced discussion of the concept and the application of equity in the context of climate change policy and actions (see e.g. Martin Khor, The Equitable Sharing of Atmospheric and Development Space: Some Critical Aspects (Research Paper 33, South Centre, November 2010) | Rejected - other comments (1059) urge us to do opposite. I think we are fine here |
| 15256 | 1 | 23 | 19 | | | why is 'equity' difficult? | Taken into account - combined with |
| 3313 | 1 | 23 | 19 | 23 | 19 | After "monetized," I'd add two citations to theoretical sources challenging the coherence of CBA for climate change equity: Gardiner (2011) (cited above) and Martha Nussbaum (2000) “The Costs of Tragedy: Some Moral Limits of Cost-Benefit Analysis.” Journal of Legal Studies, 29: 1005-36 | Taken into account - combined with other comments |
| 17054 | 1 | 23 | 21 | | | This last sentence could stand to have this addition, " market damages, TO SAY NOTHING OF COUNTING EMISSIONS ACCURATELY TO BEGIN WITH." | Rejected - there are LOTS of embellishments possible. Text is fine |
| 8781 | 1 | 23 | 22 | 24 | 34 | Little consideration of the implications for (mitigation) policy of the uncertainties and difficulties of prediction of the consequences of climate change. Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) provides some pointers, the most obvious being precaution. | Rejected - we don't' have space to cover everything here. This is a very short paragraph and points to chapter 2. |
| 15257 | 1 | 23 | 23 | | | please highlight "risk management under uncertainty" (its crucial) | Rejected - that's why we have a whole section on it -- no action needed |
| 3892 | 1 | 23 | 23 | 23 | 23 | Can the authors cite an authority for asserting that the policy challenge is one of risk management under uncertainty? Perhaps it is the policy elite's key challenge, but is it decision-makers's key challenge? Is it not a greater problem that politicians want to get re-elected and that they fear that if they go very far down the mitigation path they will get thrown out of office? | Rejected - our task is the decision-maker's challenge related to mitigation - no action needed |
| 8409 | 1 | 23 | 24 | 23 | 24 | The control of emissions will impose costs on national economies, but the exact amount is uncertain.<br>I would add that the control of emissions will impose also benefits on national economies, and also their exact amount is uncertain.<br>So I suggest to write: “The control of emissions will impose either costs or benefits on national economies, but the exact amount is uncertain. | Taken into account - we have an edit much earlier in the chapter that makes that point; no need to make it again. |
| 17055 | 1 | 23 | 25 | 23 | 26 | This sentence could stand to have this addition, "to allow for flexibility, OR IF EARTH'S CLIMATE SENSITIVITY IS NOT WHAT WE THINK IT IS." | Rejected - this sentence is an illustration that is brief for clarity. Adding lots of |
| 11353 | 1 | 23 | 25 | 23 | 26 | This statement can be supported by literature (for example, Stavins (1995, Journal of Environmental Economics and Management, doi:10.1006/jeem.1995.1036)?). | Rejected - there's a LOT of literature on this topic; point here is just an illustration and then to set up this topic being |
| 8478 | 1 | 23 | 27 | | 29 | Policy design has a specific meaning an context in policy analysis that is not apparent here. See the 1987 text by Bobrow and Dryzek (Policy Analysis by Design) which speaks to the importance of values and critical theory to policy. | Rejected - Our intention for the word "design' is basic and we don't think we need a citation here to make this point. |
| 13682 | 1 | 23 | 27 | 23 | 27 | Insert after "... energy systems.": "or policy instruments are more efficient than predicted. In this context, market mechanisms have shown in the last decade that they can mobilize cheap reductions (see Michaelowa 2012)." Reference: Michaelowa, A. (2012): Manoeuvring climate finance around the pitfalls, in: Michaelowa, A. (ed.): Carbon markets or climate finance?, Routledge, Abingdon, p. 255-265 | Taken into account - added a sentence at line 27: " "... energy systems.": "or policy instruments are more efficient than predicted. In this context, the experience with market mechanisms |
| 11900 | 1 | 23 | 29 | | | Is this "Metcalf, 2009" an available peer-review reference? | Noted - yes--see reference list. No action |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14815 | 1 | 23 | 30 | | | delete "Perhaps". The potential consequences are unquestionably more uncertain. | Rejected - actually I don't think anyone really knows this--hence we are more cautious in our language. No action |
| 15258 | 1 | 23 | 31 | | | essential to factor in understanding of feedbacks in forecasts! | Noted - yes. No action needed |
| 17056 | 1 | 23 | 31 | 23 | 34 | if there is not yet a source for this proclamation, do NOT include the statement as fact. | Rejected - this is in fact exactly where the science is headed. But when we wrote the draft we didn't have WG2 |
| 4023 | 1 | 23 | 33 | 24 | 2 | the authors might wish to base the discussion on UNEP 2011, where the most recent scientific knowledge on black carbon has been assessed in a comprehensive manner. The level of uncertainty is now much lower. Clearly, mitigating black carbon emissions would very likely reduce the anthropogenic radiative forcing in spite of side effects, which have been rightly pointed out by Chen and other researhers. | Rejected - we cite this elswhere and extensively. No action needed |
| 11354 | 1 | 23 | 33 | 23 | 34 | Sea level rise and ecosystem impact mentioned after "for example" are not exactly examples of climate feedbacks. | Rejected - that's why we have the phrase "along with…" on line 32 |
| 14816 | 1 | 23 | 35 | | | "…and may also lessen uncertainty". It is not clear what this refers to. | Taken into account - edited sentence to say: "may also lessen uncertainty IN THE ASSESSMENT OF POSSIBLE |
| 14817 | 1 | 23 | 36 | | | Not clear that the para starting "Risk management…" is useful here. | Rejected - it is very useful because it is added the temporal dimension. No |
| 17411 | 1 | 23 | 38 | | | This would be a good place to refer to the potential of AFOLU mitigation strategies. | Taken into account - afolu added in |
| 10476 | 1 | 23 | 38 | | | Maybe a footnote to define short-lived and long-lived for the reader. | Taken into account - From revisions, there is now a more careful discussion of GWPs and time horizons earlier in the chapter. That should be sufficient. Also, |
| 17740 | 1 | 23 | 39 | | | give reference to the chapters when you write "elsewhere" | Accepted - at line 39: added cite to |
| 16339 | 1 | 23 | 4 | 23 | 7 | This section mentions the MDGs and refers to the recent Rio+20 agreement. My comment is that it was agreed at Rio+20 (paragraphs 245-251) that a set of "Sustainable Development Goals" will be developed. I think that this should be mentioned in WGIII report, as I think this will be an important way that nations will be delivering truly sustainable development and so mitigation strategies post 2015. The document says that the SDG's should be "action oriented, concise and easy to communicate, limited in number, aspirational, global in nature and universally applicable to all countries while taking into account different national realities, capacities and levels of development and respecting national policies and priorities. (...) Governments should drive implementation with the active involvement of all relevant stakeholders (.....) progress towards the achievement of the goals needs to be assessed and accompanied by targets and indicators (....) The document states that a working group will be set up of experts to report to the 68th session of the UN. There is a process where stakeholders will be able to input to this expert panel and to the UN. IPCC and readers of the IPCC report should be making sure that they have the right science to base the goals on. The UN will be looking for this. The SDG's are expected to be the mainstay of the post 2015 development agenda | Rejected - At this stage I don't think we need to do this. There remains lots of uncertainty about whether/how the SDGs will actually be developed and whether they will be useful. If we are writing for the year 2014 and beyond who knows if this will be consquential. But the MDGs (which we use here JUST as an illustration for tradeoffs (see comment 1059) have proven to be relevant |
| 11355 | 1 | 23 | 41 | 23 | 45 | Here the could state explicitly the importance to strike a balance between the abatement of short-lived climate forcers (e.g. black carbon) and that of long-lived climate forcers (e.g. CO2) (Berntsen, 2010, Climatic Change Letters, 10.1007/s10584-010-9941-3). | Rejected - our cites here (e.g. Ramanthan and Xu and the UNEP report) make exactly that point. No |
| 4473 | 1 | 23 | 44 | 23 | 45 | The other side of the coin is that any of the large nations or blocs (e.g., the U.S., China, the EU) can by itself cause dangerous interference with the climate if its emissions grow unchecked. Thus, each of the largest nations has some individual incentive to reduce emissions and to press for coordinated action. | Rejected - we agree and we make that point elsewhere (citing to Victor et al 2012 in Foreign Affairs). no action |
| 17057 | 1 | 23 | 44 | | | The Shindell et al. paper in Sciecne (2012) ought to be cited here. | Rejected - we cite that a lot elswhere. We don't need to cite it every time we |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12226 | 1 | 23 | 45 | 23 | 47 | The finding from Chen et al deserves an explanation. Also, a judgement of what the majority of studies find should be included. As this sentence stands now, I read that it is as likely as not that BC warms the atmosphere. Also, the snow and ice effect of BC should be mentioned to give the reader an idea of the total climate effect of mitigating BC. | Taken into account - this text is an illustration and is getting already too long and off point. Text shortened -- delete p.23 line 45 ("It should be noted…") through p.24, line 2. Replaced with: "A climate change mitigation strategy that places emphasis on short-lived climate pollutants also has implicaitons for the choice of GWPs and could favor GWPs |
| 17058 | 1 | 23 | 45 | 23 | 47 | This statement regardign BC effect on clouds is not necessarily a scientific consensus by any means and therefore it is misleading to include it. What is a scientific consensus is that sulfate aerosol is a far superior cloud condensation nucleus than BC aerosol. | Rejected - see 1087. Just because eveyone doesn't agree 100% doesn't mean we shouldn't mention this-- |
| 11356 | 1 | 23 | 45 | 23 | 47 | One could add the point here that removing sulfate aerosols may result in a short-term warming (e.g. Andreae et al., 2005, Nature, 10.1038/nature03671; Armour and Roe, 2011, Geophysical Research Letters, 10.1029/2010gl045850; Tanaka and Raddatz, 2012, Climatic Change Letters, 10.1007/s10584-011-0323-2). | Rejected - this point is addressed in WG1 and not essential for us here. No action needed |
| 10477 | 1 | 23 | 48 | | | For short-lived, cross reference Section 8.2 | Sentence has been removed. Comment |
| 8477 | 1 | 23 | 8 | | 11 | This presents sustainable development as an outcome, rather than as a process. SD may never be attainable. | Rejected - language throughout is very process and balancing and evaluation. That is process, not just outcome. No |
| 17651 | 1 | 23 | 8 | 23 | 21 | This paragraph could list some more and more recent references, e.g. more recent literature concerning low probability but high risk events. | Taken into account - combined with other comment. We have referred risk management and fat tail issues to |
| 7888 | 1 | 23 | 8 | 23 | 21 | Lomborg's work is genreally regarded as poor science and contains many obvious flaws (e.g. see the many critical comments in Nature and Science on his book "The Skeptical Environmentalist"). It comes at a great surpise that Lomborgs ill-founded "message" resurfaces in this report. In addition, we doubt that CBA is of much use in identifying justifiable climate policies. All CBAs provided so far (most notably those of Nordhaus, Tol, Weitzmann) are vulnerable to serious challenges raised in the literature (e.g. Hampicke 2011, Betz 2006, Randall 2002, Broome 1992, Ott/Baatz 2012, Baum 2009). The many problems of using CBA to clalculate "optimal" policies were already discussed in the 90s (at least in Germany, see for example Rohner/Edenhofer 1996). Rather than pointing out the importance of CBA you should refer to chapter 3 where some of its merits and drawbacks are discussed. See also comment 44. | Taken into account - combined with other comment. At end of this paragraph in addition to new cites suggested above also add crossref to IPCC WG3 chapter 3. |
| 10264 | 1 | 23 | 8 | | | Fresh reference:Routa, J., Kellomäki, S., Kilpeläinen, A., Peltola, H. and Strandman, H. 2011. Effects of forest management on the CO2 emissions of wood energy in integrated production of timber and energy biomass. GCB Bioenergy 3: 483–497. Citation from the article: "In general, forest bioenergy supply chains seem to be effective; i.e. the energy consumption was 2–3% of produced energy and the CO2 emissions are 4–7 kgCO2 eqMWhpa 1 (Wihersaari & Palosuo, 2000). This held also for this study, with the energy consumption varying in the range 2.2–2.8% of that produced in the energy supply chain." | Rejected - thank you for the cite, but it doesn't fit here at all. This is about mitigation potential of forestry programs, which belongs in the chapter that deals with that. No action needed |
| 3889 | 1 | 23 | 8 | 23 | 8 | The statement that "all" countries seek sustainable development flies in the face of the sober reality of oppressive authoritarian regimes that demonstrate, when the need arises, their willingness to kill as many of 'their' people as is necessary in order to retain power. Again there is a need to distinguish between pious statements of good intent, and the real priorities of despotic (and other) regimes. | Rejected - hence we have the phrase "in different ways" on that very same line. It depends on the objective function. This comment takes us far from our team's |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18431 | 1 | 23 | | | | Reconciling priorities and SD<br>There is again a remarkable optimism regarding the adoption of SD path by “all countries” (pag 23, paragraph 2). This is inaccurate; most societies live within short-term scenarios. Most of them have economic growth concerns, fewer might have equality concerns, but this does not mean that they are acting considering the long-run or future generations. Those are exceptions, not the rule. | Rejected - it depends on the relative weight that countries give to such varied factors. This comment relates to 1095. No action needed |
| 4251 | 1 | 23 | 1 | 23 | 2 | The threshold of $1 per day has been revised by the World Bank to $1.25 per day for the definition of absolute poverty | Accepted - Although the MDG refers to USD 1 per day as the threshold all statistics reported after 2005 considers |
| 3568 | 1 | 23 | 21 | 23 | 21 | Strange with only one reference to a really huge literature. | Taken into account - combined with other comments. see comment 1057 |
| 3567 | 1 | 23 | 8 | 23 | 8 | Replace "places" with "puts" | Accepted - text revised |
| 16072 | 1 | 23 | 23 | 24 | 18 | This section describes chapter 2, why not insist on the new body of knowledge in this chapter compared with AR4? | Rejected - because this is an introduction to WG3 and our purpose is to introduce other chapters, issues and |
| 6875 | 1 | 23 | 31 | 23 | 34 | Suggest to refer here to the relevant Chapters of WGI AR5, e.g., Chapters 11, 12, 13, 14, Annex I: Atlas of Global and Regional Climate Projections. | Accepted - at lines 33-34 cite: "(later add citation to relevant parts of IPCC WG2; SEE ALSO IPCC WG1, |
| 11583 | 1 | 23 | 36 | 24 | 2 | There is a considerable body of work on short lived climate pollutants. Its also clear what technologies are required to deal with them. This work should not be confused with the requirements and the commitments to bring down the GHG concentrations in the atmosphere. | Rejected - text is fine and accurate as is. Other edits will shorten and focus, for example see comment 1087. no action |
| 6876 | 1 | 23 | 39 | 23 | 39 | Please refer to WGI AR5 Chapters, e.g., 2, 6, and/or 8. | Taken into account - another edit above adds xref to chapter 8--thanks. No |
| 6877 | 1 | 23 | 45 | 23 | 47 | Please refer to WGI AR5 Chapter 7. | Sentence has been removed. Comment |
| 6878 | 1 | 23 | 47 | 24 | 2 | It seems crucial here to refer to WGI AR5 when discussing an assessment of atmospheric perturbation life time etc.. The atmospheric lifetimes of perturbations of different GHGs and aerosols are discussed in detail in WGI AR5 Chapters: Chapters 2, 6, and/or 8. | we have deleted this text and added other xrefs to WG1. Comment no longer relevant |
| 17696 | 1 | 23 | 8 | 24 | 18 | Why is the Precautionary principle not mentioned? | Rejected - because there are lots of things that could be mentioned; our purpose is to illustrate the tradeoffs. No |
| 17059 | 1 | 24 | 1 | 24 | 2 | this statement demands expansion and quantification. See, for example, the Guan et al study in Nature Climate Change (2012) on China's Gigaton emissions gap | text is deleted. Comment no longer relevant |
| 17061 | 1 | 24 | 10 | 24 | 14 | These examples are not "extremes" in the common understanding like cyclones, droughts, floods. Rather, these are abrupt climate changes and/or tipping points/thresholds. This is a very important difference to make. Refer to WG1 colleagues for further clarification. | Rejected - this comment is incorrect. These are "extreme climate impacts" which is our phrasing, and the pieces we |
| 14333 | 1 | 24 | 14 | 24 | 16 | This sentence suggests that geoengineering may be a "risk managment approach" that could reduce uncertainties or crudely offset impacts of climate change. Yet all recent studies emphaisze (i) the uncertainties around the potential impacts of geoengineering and (ii) the time it would take to makes geoengineering techniques work, cf for instance Williamson, P., Watson, R.T., Mace, G., Artaxo, P., Bodle, R., Galaz, V., Parker, A., Santillo, D., Vivian, C., Cooper, D., Webbe, J., Cung, A. and E. Woods (2012). Impacts of Climate-Related Geoengineering on Biological Diversity. Part I of: Geoengineering in Relation to the Convention on Biological Diversity: Technical and Regulatory Matters. Secretariat of the Convention on Biological Diversity. Montreal, Technical Series No. 66 | Rejected - this is a massive mis-statement of the literature. Almost all recent studies have, in fact, looked at risks and benefits and tried to develop some frameworks. And it is that balance that we are telegraphing here. No action needed |
| 16075 | 1 | 24 | 14 | 24 | 15 | "radical innovation" suggests that we invent from scratch new processes. In most cases, the scientific base does exist. Isn't our problem is more "development and implementation of best technology"? | Rejected - this comment doesn't apply to text cited. No action needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16073 | 1 | 24 | 14 | 24 | 18 | On Geoengineering, "a growing number of studies" is misleading. Many of these studies emphasis extra risk, and anything resembling a real life experiments is forbiddent (e.g. recent UK episodes) or at least very controversial. The paragraph should mention that risk is unknown, and that all notion of geo-engineering is (still) controversial. | Rejected - the text says exactly that and so do the pieces we cite. No further action needed |
| 7158 | 1 | 24 | 14 | | | Remove unnecessary paranthesis. | Editorial – copyedit to be completed |
| 7889 | 1 | 24 | 14 | 24 | 18 | Again, crititcal literature on geoengineering is missing (see comment 22). | Taken into account - combined with |
| 15420 | 1 | 24 | 14 | | 16 | It is dangerous and misleading to suggest geongineering is a “risk management approach” when geoengineering technologies are largely speculative, with unknown short- and long-term impacts on climate, environment and biodiversity. Reference to geoengineering as an element of a risk management approach should be DELETED. | Rejected - This is not what we say and we disagree that the effects are "unkonwn". They may be uncertain and involve balancing of risks--which is exactly what we say. Geoengineering is |
| 16076 | 1 | 24 | 15 | 24 | 15 | The sentence implies that change is mainly technology. In many cases, especially in the industrialized world, there is now a dimension of limiting uses ("la sobriété") that should be also proposed. | Rejected - this point is not relevant here--we are talking about risk management and geoegineering, not "limiting uses". |
| 14368 | 1 | 24 | 15 | | | Unfortunate to give a boost to geoengineering, given the risks. | Rejected - we are not giving a boost. We are adding it to the discussion. No |
| 14818 | 1 | 24 | 15 | | | add "…. may be able crudely to offset the impacts of some climate change while imposing other risks." | Taken into account - I like this edit, but it makes for a complicated sentence. Let's add the idea in the next sentence. line 17 to say "…technology, possible IMPACTS AND RISKS OF TESTING AND DEPLOYING |
| 15259 | 1 | 24 | 16 | 24 | 18 | fools gold? | Noted - insufficient information. No |
| 14334 | 1 | 24 | 16 | 24 | 18 | see comment to p. 14 line 28-30: The literature cited does not cover current key aspects of geoengineering governance and ist interrelation with mitigation policy. More recent literature such aspects includes e.g.:<br>- Bodle, R., with Homan, G., Schiele, S., and E. Tedsen (2012). Regulatory Framework for Climate-Related Geoengineering Relevant to the Convention on Biological Diversity. Part II of: Geoengineering in Relation to the Convention on Biological Diversity: Technical and Regulatory Matters. Secretariat of the Convention on Biological Diversity. Montreal, Technical Series No. 66;<br>- Bodle, Ralph, “International governance of geoengineering: Rationale, functions and forum”, in: William C.G. Burns and A. Strauss, (eds.), Climate Change Geoengineering: Legal, Political and Philosophical Perspectives, Cambridge: Cambridge University Press (submitted February 2011; in press);<br>- Lin A.C., International Legal Regimes & Principles Relevant to Geoengineering (in press). In: W.C.G. Burns and A. Strauss, (eds.), Climate Change Geoengineering: Legal, Political and Philosophical Perspectives. Cambridge: Cambridge University Press, Cambridge (submitted 2011, in press);<br>- Rickels, W.; Klepper, G.; Dovern, J.; Betz, G.; Brachatzek, N.; Cacean, S.; G ssow, K.; Heintzenberg J.; Hiller, S.; Hoose, C.; Leisner, T.; Oschlies, A.; Platt, U.; Proelß, A.; Renn, O.; Sch fer, S.; Z rn M. (2011): Large-Scale Intentional Interventions into the Climate System? Assessing the Climate Engineering Debate. Scoping report conducted on behalf of the German Federal Ministry of Education and Research (BMBF), Kiel Earth Institute, Kiel, available at http://www.fona.de/mediathek/pdf/Climate_Engineering_engl.pd | we cover the landscape, including with a new cross ref to chapter 6.9. |
| 11029 | 1 | 24 | 16 | | | Geoengineering needs to be represented in a balanced way if it is to be introduced here at all. Its perverse effects should be noted. For example, after Cicerone 2006, insert the words: ‘The perverse effects of geoengineering will need to be considered in policy analysis – in particular, the likelihood that ‘successful’ application of a geoengineering solution to reduce temperatures may induce complacency about emission control, and that apparent ‘success’ may distract from failure in areas such as ocean acidification.’ | our text says pretty much exactly that. And so do the things we cite. No further action needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8969 | 1 | 24 | 16 | | 18 | These studies indicate there really is no coherent "pland B" so that geoengineering is not a real option and its governance is quite speculative. | Rejected - text is balanced about risks and context -- no action needed |
| 13680 | 1 | 24 | 16 | 24 | 18 | Replace "Cicerone , 2006). Since AR 4 … Society 2009" by "(see Chapter 6.9)". | Accepted - added a cross reference to IPCC WG3, section 6.9. |
| 15421 | 1 | 24 | 16 | | | DELETE: "growing" | Rejected - bilbiometric analysis shows they are growing exponentially |
| 12227 | 1 | 24 | 18 | 24 | 18 | It might be worth to include the IPCC meeting report from the Workshop on geoengineering here. | we leave that to chapter 6. we have added xref to chapter 6.9 |
| 3064 | 1 | 24 | 18 | | | For geoengineering, also cite the Novim report http://www.arxiv.org/abs/0907.5140 (2009) | Taken into account - combined with |
| 10478 | 1 | 24 | 18 | | | Cross-reference to geoengineering section in main report. | we have done that now |
| 15422 | 1 | 24 | 18 | | | INSERT A NEW SENTENCE: However, geoengineering remains highly controversial, largely due to unknown and unintended impacts and the inability to contain effects within boundaries (i.e., geoengineering's effects will be transboundary) or to reverse unintended, negative effects of geoengineering; a global de facto moratorium on geoengineering techniques was agreed at the United Nations Convention on Biological Diversity (CBD) in 2010, preceded by a moratorium on ocean fertilization (one geoengineering technique) in 2008. (CBD decisions IX/16 C and X/33 paragraph 8w; see ETC Group, "The Geoengineering Moratorium under the UN Convention on Biological Diversity," 10 November 2010 [online] http://www.etcgroup.org/es/content/what-does-un-moratorium-geoengineering-mean) | Rejected - way too much detail. We have written 4 balanced lines and your edit proposes to more than double that text with a highly selective set of references. There is a lot of literature out there, we can't cite them all. |
| 16074 | 1 | 24 | 21 | 24 | 21 | Black carbon (soot) has recently been in the spotlight as important GHG without a global presence. | Noted - agreed, but no action needed |
| 14819 | 1 | 24 | 25 | | | Finl sentence: "As this is a global commons problem, an effective solution is possible only with international collective action." | Rejected - The suggested sentence says pretty much same thing as our sentence but with twice as many words. No action |
| 17062 | 1 | 24 | 26 | | | Rather than "unavoidable", perhaps use "essential if dangerous anthropogenic interfernece in the Earth system is to be avoided." | Rejected - I don't think we can say "essential" since there is a small chance that self-interest, low costs of abatement or tacit cooperation (a la Shelling and |
| 4862 | 1 | 24 | 28 | | 29 | {Add} Techn. development is discussed in the next section, but it should also be mentioned here: "coordination is also needed to share information about best practices {and technologies} in many areas | Rejected - we are severely space constrained. It is mentioned in next |
| 8782 | 1 | 24 | 29 | 25 | 15 | Logical tension between discussion of 'promising options for reducing emissions involve changes in behaviour' and 'without radical technology innovation deep reductions are not possible by 2050' should be clear; however, to illustrate - if changes in behaviour mean radical reduction in consumption of fossil fuels are achieved without technological change then innovation, though potentially welcome, is not essential. The history of technological innovations such as CFCs suggests that relying on technology is not a robust policy assumption. The second statement suggests a trenchant ideological position and a distinct lack of imagination. | Rejected - The CFC example in fact shows EXACTLY what we say--that changes in technology allowed (and accelerated) deep cuts in emissions. Changes in behavior may play a role; maybe not. But absent massive changes in behavior (which has not really been witnessed in most of |
| 11148 | 1 | 24 | 3 | | 8 | States that scientific uncertainties involve investments across many intellectual disciplines and activities, such as engineering and the many fields of climate science (related to understanding the risks of climate change). But apart from understanding, what about the acceptability of those risks? Risks can never be quantified and explained with 100% rationality. there's always an emotional/ethical component involved, e.g. in assumptions underlying risk assessment models. I would therefore recommend that references are included to the scientific fields that study acceptability of risk as an ethical issue. | Taken into account - combined with other comments. We talk about risk management; we are adding a cite to Nussbaum's related work; and we point to chapters 2 and 3 that deal with these issues in depth. No further action |
| 17060 | 1 | 24 | 3 | 24 | 18 | this paragraph could benefit by reference to the National Academy of Sciences 2011 report, "Informing an Effective Response to Climate Change" in which iterative risk management and adapative governance were stressed as being critical to successful response to climate change. | Taken into account - combined with other comment. in response to another comment we have added an NAS |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16077 | 1 | 24 | 37 | 24 | 40 | The two mentions of geoengineering are too much. One could be enough mentioning "as an insurance". This is an introduction, not an editorial. | Rejected - the text is balanced and ok and brief. No action needed |
| 7890 | 1 | 24 | 38 | 24 | 39 | Even modest objectives such as delinking emissions from growth (which has already occurred in some countries) are portrayed as highly difficult to reach. Under this non-neutral and perhaps even prescriptive point of view more ambitious goals are to be regarded as utopian. | Rejected - but this is difficult and that's what most of the modeling shows. And some of the countries that supposedly are delinked have, in fact, not delinked because they have outsourced |
| 17063 | 1 | 24 | 38 | 24 | 39 | One could point to the results in the U.S. from 2011: Emissions declined by 2.4% while GDP grew by 1.8%. See http://www.eia.gov/todayinenergy/detail.cfm?id=7890&src=email | Rejected - this would be a dangerous fact to use since single year estimates are notorously unreliable signals of long |
| 11030 | 1 | 24 | 39 | | | The text states: 'Delinking GHG emissions from GDP growth will probably require massive changes in technology.' The emphasis on technology should be balanced by reference to changes in patterns of human behaviour, either here or elsewhere. I suggest 'Delinking GHG emissions from GDP growth will probably require large changes in technology and significant changes in human behaviour [see, for example, ….]''. | Rejected - In the most simple matter delinking emissions from GDP will require different technologies and also different ways how we use technologies. Having a statement to emphasize this hardware-software dichotomy would be quite useful in ch.1 especially in view of |
| 17412 | 1 | 24 | 40 | | | Discussion of technology innovation would be more appropriate if complemented by discussion of innovation in practices / behavior (eg, household energy use, transport choices, land use management alternatives, etc). | Taken into account - combined with other comments |
| 4305 | 1 | 24 | 14 | 24 | 18 | change „may" to „might"; add „and to some degree systems that might be needed to govern geoengineering" because none of the mentioned authors has provided a suitable, practical and much quoted model of governance. | Taken into account - combined with other comments |
| 6880 | 1 | 24 | 16 | 24 | 18 | Ensure consistency with and reference to WGI Chapters 6 and 7 which do thoroughly assess the physical science basis of proposed geoengineering methods covered by CDR and SRM. Avoid reassessing the physical science basis component in WGIII. We suggest to also consider the cross-WG IPCC Expert Meeting Report on Geoengineering held in June 2011 (IPCC, 2012: Meeting Report of the Intergovernmental Panel on Climate Change Expert Meeting on Geoengineering [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, C. Field, V. Barros, T.F. Stocker, Q. Dahe, J. Minx, K. Mach, G.-K. Plattner, S. Schlömer, G. Hansen, M. Mastrandrea (eds.)]. IPCC Working Group III Technical Support Unit, Potsdam Institute for Climate Impact Research, Potsdam, Germany, pp. 99. ). | Rejected - we are not reassessing the physical science basis. What we are doing is pointing to the physcial science issues that relate to risk management-- and here WG3 needs to address the topic. Added cross-reference after Cicerone citation to IPCC WG1, chapter 6 |
| 3569 | 1 | 24 | 2 | 24 | 2 | "…that are particularly not well understood." replace with "…that are not always well understood." | Sentence was removed from previous edits. Comment no longer relevant |
| 3570 | 1 | 24 | 5 | 24 | 5 | "In climate these…" Replace with "In relation to climate change these…" | Accepted - adopted suggested changes |
| 6879 | 1 | 24 | 7 | 24 | 7 | Reference to WGI AR5 needed. | Taken into account - cross ref already added per previous comments. No |
| 5387 | 1 | 24 | 20 | 24 | 20 | climate issue --- should be --- climate change issue | Taken into account - combined with |
| 15715 | 1 | 24 | 20 | 24 | 34 | This section contains language that could easily be perceived as being 'Policy Prescriptive', something the IPCC should stay away from, for instance: 'Collective action is needed at many fronts', or: 'Coordination is also essential on matters of finance since many international goals seek action by countries that are unwilling or unable to pay the cost fully themselves'. Better to phrase statements where some action is 'needed' in a conditional "if.. then" manner: "if certain objectives A and B are to be met, then actions X and Y are needed'). In addition, I suggest not to use expressions like "countries that are unwilling or unable to pay...", better to more neutral wording "countries that are not in a position to pay…'. | Rejected - we don't think our text is how is policy prescriptive. While we don't phrase this as IF, THEN when you read the paragraph in totality that is exactly what it says. No action needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8410 | 1 | 24 | | 25 | | I suggest to add in this section the importance of reshaping energy subsidies. Many analysis highlights that the price signal from subsidy phase-out would provide an incentive to use energy more efficiently, and trigger switching from fossil fuels to other fuels that emit less GHGs.<br>Eliminating environmentally harmful subsidies must play a central role in national efforts to achieve a long-term transition to a truly sustainable and secure energy system. | Taken into account - combined with other comments. Subsidies are discussed earlier in the report and other edits add a phrase to underscore impact of subsidies (in response to a comment |
| 12086 | 1 | 24 | 38 | 24 | 39 | The text states that "Delinking GHG emissions from GDP growth will<br>probably require massive changes in technology." This incorrectly implies that Delinking GDP from GHG emissions has not been achieved yet anywhere with existing low carbon technologies. This text could be read by some "nontechnical" decision makers as implying that "delinking" is not technically possible yet until we have "new technical innovations". Yet "relative" Delinking of GDP from GHG emissions has been achieved in many counties including China from 1980-2000 (Please see Comment #3 above) and Absolute delinking of GDP from GHG emissions has been achieved by a few countries. These countries have achieved this using currently available technologies. Please see OECD (2011) Towards Green Growth: Monitoring Progress. OECD - the subsection on Decoupling GDP from greenhouse gas emission indicators. | Taken into account - combined with other comments |
| 6301 | 1 | 24 | 38 | 24 | 39 | "Delinking GHG emissions from GDP growth will probably require massive changes in technology." Consider adding "as well as changes in behavior." The report deals with this issue in an important way, so acknowledge it here. | Taken into account - combined with other comments |
| 3571 | 1 | 24 | 40 | 24 | 40 | "…vary in any ways…" should be "…vary in many ways…" | Accepted - text changed as suggested |
| 3572 | 1 | 24 | 41 | 24 | 41 | Replace ";" with " | Accepted - text changed as suggested |
| 18248 | 1 | 24 | 45 | 24 | 47 | To stimulate investment in appropriate technologies at the right time and place,<br>The term “appropriate technologies” could be substituted by “opportunity technologies”. This because appropriate technology can be confused with the already coined term in the sense to be appropriate with the factors´ endowment. So I propose:<br>To stimulate investment in opportunity technologies, that is at the right time and place, and to the right people, | Rejected - it could be confused, but "opportunity" is even worse--it has no obvious plain English meaning |
| 15716 | 1 | 24 | 45 | 24 | 47 | Again, policy prescriptive language: suggest to replace by "To stimulate investment in appropriate technologies at the right time and place, it will help if countries would consider the full life cycle… | Accepted - text changed as suggested |
| 17697 | 1 | 24 | 20 | 24 | 34 | Mitigating CC is providing a public good, some government will freeride | Noted - that's why we are talking about |
| 4863 | 1 | 25 | | | | 1.4.5 In some areas the mitigation and the adaptation measures are closely interlinked (e.g. urban planning, construction, certain agricultural activities, forest management).. | Noted |
| 17064 | 1 | 25 | 1 | 25 | 2 | A discussion of David et al in Science (2010): "Future CO2 Emissions and Cliamte Change from Existing Energy Infrasutrcture" is warranted here. | Taken into account - per another comment we have added the Davis et al |
| 15260 | 1 | 25 | 13 | 25 | 15 | current Intellectual Property system is a deterrent. | Noted - actually folks tend to over-state this. The mantra against IP is mostly political rhetoric (see GEA chapter 24 for |
| 11031 | 1 | 25 | 15 | | | The text states: ‘They also agree that without radical technology innovation deep reductions are not possible by 2050’ - this is again a judgment. It may be that extremely rapid and wide deployment of currently emerging technologies such as solar PV and electric vehicles, combined with behaviour change, would generate deep emission reductions – the case is not proven. I suggest ‘A combination of wide deployment of emerging technologies, and radical technology innovation will increase the likelihood of deep emission reductions by 2050 being achieved.’ | Taken into account - sentence has been removed |
| 17065 | 1 | 25 | 15 | | | Insert, "radical technology innovation, SUCH AS COST-EFFECTIVE CCS, deep reductions…" | Rejected - given all the complaints about CCS by other reviewers calling out CCS here--when we already have discussion of CCS in more detail elswhere in the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15539 | 1 | 25 | 16 | | 30 | Should also mention changes in consumption patterns. That is a potentially important margin of adjustment. | Taken into account - discussion now mentions behavior and consumption |
| 5318 | 1 | 25 | 16 | 25 | 19 | “decreasing vulnerability to energy price volatility”: If volatility of energy prices around a mean price are significantly lower than the cost of providing energy by renewable energy sources, it will still be better for consumers than to cope with some volatility than accept high costs for sure. Volatility is not per se bad! | Rejected - that is true in some settings but not others; and when you read the sentence in totality we are pointing to a wide array of factors that people cite as |
| 3036 | 1 | 25 | 16 | | 30 | This paragraph seems to imply adherence to the common misconception that rebound effects apply only or mostly to final consumers. Globally, only one-third of energy is consumed by households and for personal transportation, while two-thirds is consumed in the productive part of the economy ("embedded" energy), which provides goods and services [ref: ExxonMobil, The outlook for energy: a view to 2030, (2009) available at http://www.exxonmobil.com/Corporate/energy_o_view.aspx. ].<br>Rebound effects may be quite large in the productive part of the economy (including industrial plus commercial plus commercial transportation sectors) [ref: H.D. Saunders, "Historical evidence for rebound in 30 US sectors, and a toolkit for rebound analysts," (2011, under review) available at http://works.bepress.com/harry_saunders/9/, showing historical magnitudes of direct effects alone at around 50% in the US productive economy]. Energy use responses to efficiency gains in this productive realm are driven by producers maximizing profits, not end-use consumer behavior that is susceptible to "education." | Taken into account - this paragraph is about efficiency, with just a passing mention of rebound effects. It is about the big picture. But we'll edit to clarify that. This sentence at line 28 replaced with : "While many policy efforts focus on end-use efficiency, improvements in efficiency are relevant across the entire value chain from primary energy supplies to final users." |
| 17066 | 1 | 25 | 21 | | | Perhaps cite California rolling brown-outs from several years ago and recent blackouts in India that left something like 10% of the world' population without power. | Rejected - too much detail for here |
| 12228 | 1 | 25 | 22 | 25 | 22 | It would be useful if some examples of barriers are given. | Taken into account - edit lines 22-23: "However, energy efficiency faces barriers when it comes to implementation—FOR EXAMPLE, THE DIFFICULTY IN OBTAINING RELIABLY INFORMATION ABOUT THE COST AND PERFORMANCE OF |
| 15261 | 1 | 25 | 23 | | | see point 23 | Noted - insufficient information. No |
| 12229 | 1 | 25 | 24 | 25 | 26 | It would be useful if some examples of rebound effect are given. | Taken into account - in light of comment 1162 I think we will just keep it simple |
| 4094 | 1 | 25 | 25 | 25 | 26 | why not reference Jevons to the rebound effect? | Rejected - The relevant chapter in the main body of the report addresses this. Jevons and company are prone to |
| 6435 | 1 | 25 | 25 | 25 | 26 | Additional references for the rebound effect: Gifford, R., 2011. The dragons of inaction: psychological barriers that limit climate change mitigation and adaptation. American Psychologist 66 (4), 290-302; Druckman, A., Chitnis, M., Sorrell, S. and Jackson, T., Missing carbon reductions? Exploring rebound and backfire effects in UK households. Energy Policy 39 (6), 3572-3581; Freire-Gonzalez, J., Methods to empirically estimate direct and indirect rebound effect of energy-saving technological changes in households. Ecological Modelling 223 (1), 32-40; Ouyang, J.L., Long, E.S. and Hokao, K., Rebound effect in Chinese household energy efficiency and solution for mitigating it. Energy 35 (12), 5269-5276. | Rejected - this level of detail is too much for the introduction chapter. Rebound effects are discussed in Chapter 5. Comment has been redirected to ch 5 and ch 9 accordingly. |
| 11149 | 1 | 25 | 26 | | 30 | States that there is a need to educate consumers about the financial and environmental benefits of rational energy use and the rebound effect, which will support effective consumer decisions. However throughout the document this statement is defied directly (on p 389 lines 8-9) as well as indirectly by explaining that consumers are not rational decision-makers and/or not primarily driven by environmental benefits, e.g. P38 lines 5-8; p45 lines 37-44; paragraph 2.3.1; p73 lines 21-24; p169 lines 4-13; 3.11.1.2. I suggest that not only cross-references to these sections are added but that the statement itself is adjusted or removed. | Rejected - This level of detail is too for one paragraph here. Edits (such as in response to 1164) will address this |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17645 | 1 | 25 | 26 | 25 | 28 | "Socail benefit" is also neseccisty of education for consumers in order to decide effective choices. | Rejected - in light of edits (see 1164) this sentence was deleted |
| 4830 | 1 | 25 | 26 | 25 | 28 | The notion that consumers need to be educated about financial and environmental benefits to induce behavioural change is much too simplified. Psychological research has shown (see also the following chapters) that education alone is not sufficient to induce change. Knowledge is a necessary but not sufficient to make people change their behaviour. See for example the literature review in Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T., (2005). A review of intervention studies aimed at household energy conservation. Journal of Environmental Psychology, 25, 273-291. | see comment 1170--Sentence will be deleted. But the point here is REALLY important and will be passed along to the chapter that addresses energy efficiency |
| 17413 | 1 | 25 | 27 | | | "educate consumers" is a fairly unsophisticated representation of the opportunity for mitigation through behavior changes -- this is an area of only emerging understanding, but it has become clear that simply "educating" members of the public is not sufficient and that economic, policy and social incentives often need adjustment if large-scale behavior change is to result. This comment applies to Ch 5, p 71, ln 22-26. | Taken into account - combined with other comments |
| 15262 | 1 | 25 | 29 | | | see point 23 | Noted |
| 17067 | 1 | 25 | 29 | | | As stated, it is a weird and abrupt way to end the paragraph - and section. It would be improved if this section stated the barriers and examples of how those barriers have been overcome. | Rejected - this is implicit in all that is said earlier in the paragraph; see also |
| 7891 | 1 | 25 | 31 | 40 | | It is correct that climate policies are a triangular affair between mitigation, adaptation, and geoengineering. According to you, how the priorities are set depends on expectations ("if it is to be expected"). To make priorities dependent on the behavior of others, rather than on normative reasoning, is an ethical claim that should be debated in chapter 3. | Rejected - dependence on the behavior of others is the essence of strategic interaction. And it is core to essentially ALL research in international relations (and broadly now in cooperative theory in economics, going back to game |
| 15278 | 1 | 25 | 31 | 25 | 31 | "adaption" to be "adaptation"? | Accepted - spelling fixed |
| 11901 | 1 | 25 | 33 | 25 | 34 | "More countries…" please give examples; If possible, provide a reference. | Taken into account - edited: "…there has been a shift in emphasis to |
| 10682 | 1 | 25 | 33 | 25 | 34 | "More countries are rightly focussing on adaptation" sounds policy prescriptive | Taken into account - combined with |
| 15263 | 1 | 25 | 34 | | | but there is a danger that adaptation is at the cost of mitigation - is this a message we wish to be communicating - think of the implications! | Noted - maybe or maybe not. But if adaptation is reality shouldn't we be |
| 15423 | 1 | 25 | 34 | | 38 | DELETE: "rightly" SENTENCE SHOULD READ: "More countries have been forced to focus on adaptation." (Countries affected by climate change must focus on adaptation, but it is not a choice.) | Taken into account - combined with other comments |
| 14683 | 1 | 25 | 36 | 25 | 40 | The two references in this sentence to geoengineering sit rather uneasily without further explanation and qualification; it reads very much as though they have been added in parentheses as place holders. If reference to geoengineering is to remain in this section, then it would be important to qualify that its full implications and effectiveness as a social-policy alternative or addition to mitigation or adaptation is not known | Rejected - we have expanded the discussion in this chapter to mention the controversy on geoengineering in a balanced manner. This is an important |
| 11109 | 1 | 25 | 36 | 25 | 37 | "If it is expected that global mitigation efforts will be limited, then adaptation (and perhaps also geoengineering) will play a larger role in overall policy strategy." - "will" should be replaced by "must". My personal belief is that we are too late to mitigate climate change, so a more important task will, and must, be to adapt as much as possible. While the report reflects this approach, I think all possible means should be exploited to emphasize the need for adaptation. | Reject - "must" is an inappropriate value judgement |
| 15424 | 1 | 25 | 37 | | 40 | DELETE BOTH INSTANCES OF: "(and perhaps also prepare geoengineering)" -- one instance in line 37 and one in lines 39-40. Only a few scientists in a few countries are proposing geoengineering as a climate change response. It is premature (and radical) for the IPCC to suggest here that geoengineering will play a role, perhaps a large one, in overall policy strategy, on par with mitigation and adaptation. | Rejected - we have expanded the discussion in this chapter to mention the controversy on geoengineering in a balanced manner. This is an important |
| 17741 | 1 | 25 | 38 | | | list few adaptation measures here | Text has been rebalanced |
| 17742 | 1 | 25 | 39 | | | delete the words "and perhaps also prepare geoengineering" | Rejected - we have expanded the discussion in this chapter to mention the controversy on geoengineering in a |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8970 | 1 | 25 | 39 | | 40 | Please omit the word "should" when referring to Geoengineering. The IPCC whole cloth approach should not be an endorsement of this. | Rejected - we have expanded the discussion in this chapter to mention the controversy on geoengineering in a |
| 7356 | 1 | 25 | 40 | 25 | 47 | An international element of "adaptiation" that is relevant here is the responsibility for emissions that have caused the impacts for which adaptiation is required. Coordination on providing just compensation to affected communities is an essential part of international cooperation, as agreed under the UNFCCC and should be referred to here. | Rejected - yes, but there isn't really any science on this. So for now we are just focusing on the shift in underlying realitis and what that means for social science |
| 10480 | 1 | 25 | 41 | 25 | 47 | Repetition of 1.4.3. Suggest merge | good point; for now we will leave it in place and look at overall flow after the |
| 7892 | 1 | 25 | 43 | 25 | 44 | This sentence could be read as downplaying the responsibility of high emitting nations. It should be rephrased or made explicit that this is not the intention. | Rejected - the statement is just a fact. It is what motivates collective action and the central political challenge of the last |
| 17068 | 1 | 25 | 43 | | | "Even the biggest nations…"; again, these nations should be listed so a complete snapshot of the current situation in the world is given, while also allowing posterity to read this report and assess what each nation has done, what impact it has had, etc. | Rejected - not needed; other figures offer that information, and our point here is a larger one about strategy. |
| 13681 | 1 | 25 | 44 | 25 | 44 | Replace "most" by "a significant share of". Reason: Many adaptation options are global, such as research on drought-resistant crops or early warning systems for large-scale meteorological diturbances such as El Nino. | Rejected - we don't agree |
| 4864 | 1 | 25 | 46 | | 47 | The outcomes of the recent political negotiations on adaptation related cooperation contradict to this statement: "The need for (and difficulty of) achieving international collective action is less daunting". | Rejected the statement is correct. The international negotiations on this topic have been dealing with just a very small |
| 7160 | 1 | 25 | 47 | | | Use the expression "international collective mitigative action", rather than "international collective action". Add the word "mitigative" to describe the kind of action that is needed. | Taken into account - edited line 47: "...is PERHAPS less daunting THAN |
| 7161 | 1 | 25 | 49 | 26 | 3 | The two sentences contained within these four lines (the first beginning with 'In general' and the second beginning with 'That insight') express what might be considered conventional wisdom. But I for one am not comfortable with them or the sentiment they express, principally because I find that they extend a false hope or false sense of optimism that somehow mature ecomomies are less sensitive to the weather than less developed economies. Yet currently, the US (an archetype for a mature economy) is suffering one of the worst droughts and heat spells in recored history. If these conditions persist for the next year or two (which is no longer a remote possibility) and crop production in the US falls by 1/3 to 1/2, it seems to me that the maturity of the economy is no guarantee that the US won't suffer as much or more than any less mature (or agrarian) economy. Especially if one considers that in the US most people have never really had to deal with hunger and famine, whereas many of the less mature economies have (at least to some level). I personally am no longer convinced that mature economies are less sensitive to shocks produced by the weather than any other economy, especially when allowing for how humans may react when sufficiently stressed and feeling misled by (and angry at) their political leaders. But countries encompassing large areas or more climatic regions may have more buffering capacity (and larger areas under cultivation) than smaller countries. But if the weather induced damage is sufficiently wide spread no economy is going to fare very well. I would recommend that these two sentences of the text be rewritten to empahsize that the climate situation is pressing (but clearly not hopeless, of course). But please do not give the impression that there are some ecomonies (meaning societies) that are more likely to suffer than others. In the long run (and maybe less than 1/2 century) all economies are going to suffer. And the situation is likely to become progressively worse with each passing year. | Rejected - but they are correct--pretty much all the impacts work shows that the impacts on people (and as a fraction of economic output) are higher for societies that depend more on the "outdoors" for livelihood. Thus lower income places (where dependence on agriuclture is high) are quite vulnerabilithy. And lower incomre usually narrows options. That result has been known for 30 years, was confirmed in the MINK studies among a zillion others, and is highly robust |
| 9252 | 1 | 25 | 5 | 25 | 29 | Mention could be made of the cross-technology ability to bank green energy, eg using excess solar, wind or hydro to pump compressed air underground for later use, instead of peak-supply fossil fuel plant. Also of the comination of biofuels and CCS, to take CO2 out of the atmosphere. | Rejected - This level of detail is too much here |
| 3573 | 1 | 25 | 10 | 25 | 10 | Replace "creating" with "creation" | Accepted - text changed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12087 | 1 | 25 | 14 | 25 | 15 | This statement "They also agree that without radical technology innovation deep reductions are not possible by 2050 (IEA, 2010b)" is incorrect. There is a wealth of economic/technical "deep cuts" literature since the mid 1990s which shows that deep cuts to greenhouse gas emissions can be achieved with existing low carbon technologies by 2050.[See Comment #1 above] A full list of this literature can be provided if interested. Also, in the last 5 years, there is a new literature showing how nation's can meet 100% of their electricity needs with combinations of energy efficiency and renewable energy. Please see Elliston B, Diesendorf M, MacGill I, 2012, 'Simulations of Scenarios with 100% Renewable Electricity in the Australian National Electricity Market'. Energy Policy 45:606-613. http://www.ies.unsw.edu.au/docs/diesendorf-simulations.pdf This paper provides an overview of the literature here - 15 studies for different countries, regions of the world and also global studies on how nations, regions and the world can meet 80-100% of its energy needs through renewable energy. | Sentence has been deleted in the revisions. |
| 12089 | 1 | 25 | 16 | 25 | 20 | Energy efficiency/energy conservation AND demand management strategies AND technologies are important because they can be implemented quickly between now and 2020. And the IEA's Energy and Green Growth report states that energy efficiency measures will achieve the majority of GHG mitigation by 2020. Gert Jan Kramer and Martin Haigh (2009) No quick switch to low carbon energy. Nature 462, 568-569 found that "Energy efficiency is the only strategy that has a chance ofenabling the achievement of greenhouse gas stabilization at 450ppm. This is because historically,<br>- It takes 30 years to span the 1000-fold growth needed to get from low carbon energy supply pilot-plant scale up to 1-2% of the world's total primary energy supply -- a sustained growth rate of 26% pa.<br>- After this, historically the deployment rises more linearly to its ultimate share in the energy mix, which depends on direct economic competitiveness at scale.<br>As the authors explained<br>"Our best chance of beating these deployment laws requires efforts on multiple fronts…One implication of the deployment laws is that more action is required on the demand side to increase efficiency and curtail consumption. The good news is that demand-side solutions are subject to different laws. In principle, everyone in the developed world could use less energy tomorrow." | Taken into account - see 1164 and 1170. Gert Jan Kramer and Martin Haigh (2009) is quite different from RCP 2.6. There is no description as 'Energy efficiency is the only strategy that has a chance of enabling the achievement of GHG stabilization at 450ppm'. Therefore, we will keep the text as is. |
| 12088 | 1 | 25 | 25 | 25 | 26 | The text currently states that "Efficiency improvements that<br>lower service costs may directly or indirectly induce additional demand (rebound effect) for energy services, thus partly offset the efficiency gains (Sorrell et al., 2009; Lee and Wagner, 2012".....This should be qualified with a statement that "this risk of negative rebound effects can be significantly reduced through the implementation of effective policies....and reference the IPCC AR5 WGIII policy chapter" Please see European Commission (2011) Addressing Rebound Effects. EU Commission at http://ec.europa.eu/environment/eussd/pdf/rebound_effect_report.pdf | Taken into account - combined with other comments |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5319 | 1 | 25 | 26 | 25 | 30 | "There is need to educate consumers about the financial and environmental benefits of rational energy use and the rebound effect, which will support effective consumer choices." Here and in other chapters, the authors seem to make the assumption that consumers are systematically bounded rational and poorly informed. There may, however, be considerable hidden consumers switching cost, which are ignored. For example the new energy saving bulbs partially have a different light spectrum, which some consumers seem to find disturbing. Such preferences are not just irrational. There are also other environmental external costs through such bulbs, such as the emissions of quicksilver. Three comments about the rebound effect. 1) Rebound means that some new more energy efficient technology will be used more extensively than the old, less efficient technology . In this sense, some rebound is even socially optimal, because the high use rate may outweigh the social cost of additional use. (See the excellen book by Franz Wirl: "The economics of energy conservation programs," Kluwer, 1997 and articles cited in there.<br>2) Empirically observed rebound effects are often larger than optimal due to ill-defined incentives. Command and control, such as the EU-directive on light bulbs, induces a higher rebound rate than optimal regulation through prices would induce. So the rebound is not the consumers' fault in the first place, but the regulators' ill defined rules. This complex is actually well understood by energy economists. (See also Wirl, 1997).<br>3) To avoid rebound by education is an illusion (and probably highly costly) | Taken into account - combined with other comments |
| 3575 | 1 | 25 | 28 | 25 | 29 | Delete last sentence (repetition from line 22) | Taken into account - in response to other comments we have done that and |
| 4252 | 1 | 25 | 28 | | | The rebound effect is unlikely to be affected much by education - surely a better approach is likely to be a carbon tax or similar mechanism | Taken into account - combined with other comments |
| 3287 | 1 | 25 | 3 | 25 | 4 | Add reference to chapter 13, International Cooperation, at the end of the sentence. | Accepted - added xref |
| 11584 | 1 | 25 | 3 | 25 | 4 | The word finance should be added | Accepted - edited to say: "…international cooperation, FINANCE, |
| 3574 | 1 | 25 | 23 | 25 | 23 | Replace "The same time…" with "At the same time …" | Accepted - Thanks! Text updated |
| 4253 | 1 | 25 | | | | There should be discussion of policies which combine both mitigation and adaptation e.g. Land use policies which can reduce the adverse impacts of climate change and greenhouse gas emissions or housing policies which combine both perspectives | Rejected - This is beyond the scope of our chapter. The urban planning chapter does this |
| 14820 | 1 | 25 | | | | It is not at all clear that "Interactions bteween mitigation and adaptation" qualifies as one of the six "particularly notable challenges" worth including in sec 1.4. The notion of "balance" between the two is somewhat flawed, as the balance is actually occuring among the multitudinous objectives considered by policy makers (and choices made by consumers and citizens). | Taken into account - change section heading for 1.4.5 to "Rising Attention to Adaptation" |
| 10479 | 1 | 25 | | | | Reference to WG II | Taken into account - will add cross |
| 15096 | 1 | 25 | 31 | 25 | 31 | Change:¨ Interactions between mitigation and ADAPTATION¨ | Taken into account - combined with other comments. Title is changed |
| 11585 | 1 | 25 | 32 | 26 | 6 | This section needs to recognise that the heavy burden of adaptation is being forced on the vulnerable and poor countries who have not contributed to the climate change problem. These are the countries which are required to undertake mitigation actions and provide adaptation support. | Taken into account - combined with other comments. |
| 12090 | 1 | 25 | 32 | 25 | 40 | This paragraph and entire sub-section completely ignores mitigation and adaptation synergies. Please see IPCC AR4 WGIII Adaptation and Mitigation synergies for the Forestry Sector at http://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch9s9-5-2.html More examples of mitigation/adaptation synergies can be provided. | Taken into consideration -we will consider rephrasing |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12091 | 1 | 25 | 32 | 25 | 40 | This paragraph and entire sub-section suggests that it is ok for nations to focus less on mitigation whilst focusing more on adaptation or vica versa. This ignores the fact that there is a scientific literature showing that there is a) a limitation to adaptation strategies for the worst case long term climate change scenarios for many countries [[Please see IPCC AR4 WGII on "Limits to Adaptation at http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch17s17-4-2.html" and b) therefore mitigation is essential to avoid these worst case climate change scenario's which risk pushing the socio-enviro-economic systems past points which they can adapt c) Finally, it is worth noting that developing countries will bear a high percentage of negative impacts from climate change. Developing countries have a relative lack of adaptive capacity and financial and other resources to apply all cost effective adaptation measures. See World Bank (2009 World Development Report. World Bank at http://siteresources.worldbank.org/INTWDRS/Resources/477365-1327504426766/8389626-1327510418796/Overview.pdfTherefore, based on these scientific and economic facts, and given the evidence in the literature [see Comment 1] significant mitigation is feasible technically and economically,.....the text could legitimately find that there is significant scientific and economic evidence to support nations choosing to prioritise both mitigation and adaptation simultaneously. This appears to a more scientifically sound approach rather than urging nations to choose either focus on mitigation or adaptation, as the current text appears to be implying. | Rejected - we don't say this at all. We say that adaptation is rising in importance. And we talk about some of the macro issues. The stuff about relative impacts on developing countries gets us even further afield. |
| 15097 | 1 | 25 | 37 | 25 | 37 | Eliminate:( AND PERHAPS ALSO GEOENGINEERING) | Rejected - we have expanded the discussion in this chapter to mention the controversy on geoengineering in a |
| 4306 | 1 | 25 | 37 | 25 | 40 | delete text on geoengineering in brackets (line 37 and line 39/40) or mark it as „highly contested“ | Rejected - we have expanded the discussion in this chapter to mention the controversy on geoengineering in a |
| 15098 | 1 | 25 | 39 | 25 | 40 | Eliminate: ( AND PERHAPS ALSO PREPARE GEOENGINEERING) | Rejected - we have expanded the discussion in this chapter to mention the controversy on geoengineering in a |
| 17698 | 1 | 25 | 16 | 25 | 30 | Business case for Energy efficiency can be related to Energy Security | Rejected - too vague |
| 17699 | 1 | 25 | 48 | 26 | 6 | Even if it will be addressed later the tradeoff between adaptation and mitigation should be explained. Also the fact that the countries that will need to adapt more are the least responsible for CC. | Taken into account - Discussion on co-benefits has been beefed up but a detailed assessment of the topic is |
| 17743 | 1 | 26 | | | | There should be a FAQ "What is climate change adaptation" | Taken into account - we will consider this |
| 10836 | 1 | 26 | | | | I am not sure of the definition of mitigation. It is very broad. The way it is worded, world war, global recisions, etc, all seem to qualify as mitigation? I would have thought of mitigation as more of a deliberate act to reduce emissions. Consider changing | Taken into account - Replace 'occurs when any activity that results in' with 'is an activity with the purpose to reduce'. |
| 9927 | 1 | 26 | | | | What's the implication of uncertainty in the report? Because uncertainties can be found not only in mitigation costs, technological change and cliamte change but also in modeling and analyzing. To make it clear, please make it clear what uncertainty is in AR5. | Rejected - we have addressed this extensively throughout, and chapters 2 and 3 do that as well. No action needed |
| 7893 | 1 | 26 | 1 | 26 | 3 | The stage model seems to re-emerge here ("mature"), see comment 28. | Rejected - see our responses to your many other comments on the stage |
| 17069 | 1 | 26 | 1 | | | "… those that are least responsible for emissions" ; island states? much of Africa? ; again, these nations should be listed so a complete snapshot of the current situation in the world is given, while also allowing posterity to read this report and assess what each nation has done, what impact it has had, etc. | Rejected - we are making a macro point here--adding lots of country names will make it harder to read and understand |
| 13196 | 1 | 26 | 12 | 26 | 15 | IPCC has always been very cautious not to retrict its analysis to anthropenic climate change and has always stressed the difference between the meaning of climate change, when used in an IPCC report oas opposed to the meaning in the UNFCCC framework where the climate change is the anthropgenic climate change only. This sentence should be deleted or rewritten to avoid contradiction with the WG I approach. | Accepted - definition will be revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18415 | 1 | 26 | 16 | | | Is a population policy that aims to reduce population growth and reduce emissions also mitigation? In that case you have to quote Chinas effort to control population. Emissions reduction from economic crisis? “any activity that results in emissions of greenhouse gases (GHG) in the atmosphere at levels lower than would otherwise occur”. This is misleading. Please use definition from AR4 until an assessment report changes the definition. | Rejected - we don't need to quote china in a FAQ. No action needed |
| 5760 | 1 | 26 | 21 | 26 | 24 | Please rephrase, e. g. "Anthropogenic GHGs mostly come from (…). A substantial fraction also … ." | Rejected - text is ok |
| 17070 | 1 | 26 | 23 | 26 | 24 | This should reference WG1 #'s and be quantified, such as "While msot GHG come from FF conversion (~60%), a substantial fraction also comes from other activities like agriculture (~20%), industrial processes (XX%) and municipal waste (~XX%)." | Taken into consideration - we were asked to write FAQs that were very short and simple. We will considering |
| 12192 | 1 | 26 | 5 | | 6 | The term “more recently” is a) very vague and b) not correct. It is not correct with regard to 2 aspects: 1. already in the first decade there was a scientific and political debate on the trade-offs of between adaptation and mitigation and what the best policy strategy would be. 2. It is unclear what exactly you mean with “policy strategies”, but if you refer to the global level, the debate is an “older” rather than a “recent” one. Discourse on 'strategies' on adaptation started at least at the beginning of the second decade of UN climate negotiations leading to the Marrakesh Accords. | Rejected - edit at 1230 may be sufficient |
| 7357 | 1 | 26 | 5 | 26 | 6 | The international climate negotiations have always included an element focused on adaptation, including for example the "share of proceeds" agreement for the CDM under the Kyoto Protocol. It is true that the focus has increased significantly in the last five years but the "twenty years" characterisation is an overstatement and does not adequately reflect the detail of UNFCCC negotiations. | Rejected - edit at 1230 may be sufficient |
| 12516 | 1 | 26 | 6 | | | Change “contemplate” to “progress” -- work in adaptation has long since gone beyond “contemplation” | Accepted - edit to line 6: "…more recently begun EXTENSIVE |
| 12230 | 1 | 26 | 9 | 26 | 24 | While the two FAQs included are important, more work should be considered in order to add FAQs on e.g. What do we need to do in order to meet the 2 deg target?, what is the difference between emissions reported to UNFCCC and emissions estimated form life cycle analysis or those including trade?, etc. etc. | Noted. |
| 4040 | 1 | 26 | 3 | 26 | 6 | Perhaps the debate or case for links between adaptation and mitigation should be more centred on the valued outcome. Both mitigation and adaptation are means to an end, the end being reducing losses to what is valued. Instead, the sentence (and indeed the whole section 1.4.5) seems to be framed in terms of adapation and mitigation as ends in themselves. However, for AR5, this framing of the probem should be updated to reflect the fact that we have now moved on from such framing (see Lynch, A. H.; Tryhorn, L.; & Abramson, R. (2008). Working at the Boundary: Facilitating Interdisciplinarity in Climate Change Adaptation Research. Bulletin of the American Meteorological Society, 89(2): 169-179). | Rejected - the extra cite is not needed here. The overall tone in the report is about goals--not mitigation and adaptation for their own sake. |
| 11110 | 1 | 26 | | | | I don't think this FAQ is necessary. It does not say anything, and terms and definitions are usually parts of reports under the heading "Glossary". However, a compendium on climate change, including mitigation and adaptation, has been missing from the webpage of IPCC (many other organizations maintain such a website, or parts of their website is dedicated to climate change or its several aspects) - why IPCC could not develop and maintain such a website, based on its reports e.g., which could then be THE official scientific webpage of climate change for anyone in the world? | Noted. |
| 6881 | 1 | 26 | 12 | 26 | 15 | The UNFCCC definition of climate change differs from the IPCC definition of climate change! The IPCC definition includes both natural and anthropogenic causes of climate change. Thus this FAQ, in our view, will be very misleading if it's meant to explain what in IPCC is meant with climate change mitigation, but starting off with a non-IPCC definition for climate change. | Noted. |
| 7708 | 1 | 26 | 9 | | | Only two FAQ in Chapter 1? For exmaple, the significance of Kyoto Protocol from the scientific and technological view point would be frequently asked by the general public. | Noted. |
| 13257 | 1 | 26 | 23 | 26 | 24 | Add deforestation in the following sentence: "While most GHGs come from fossil fuel conversion, a substantial part also come from other activities like agriculture, deforestation, industrial processes and municipal waste." | Taken into account - replace sentence at 23-24 with commentor's suggested sentence |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18134 | 1 | 26 | 23 | 26 | 24 | Deforestation as another source of emissions should be included here. | Taken into account - combined with |
| 16666 | 1 | 27 | | | | The chapter "makes arguments." This sounds prescriptive to me. | Taken into account - combined with |
| 15425 | 1 | 27 | 8 | | 10 | Geoengineering cannot claim “reducing economic loses due to productivity shocks” when geoengineering is largely speculative and its impacts are unknown; adverse impacts on the climate and economy, at least the climate and economy in some parts of the world, are as likely. | Rejected - in fact, in emergency mode this is exactly what people think geoengineering will do. Text ok. |
| 16915 | 1 | 3 | | 4 | | Six interesting points, unfortunate that the main chapter then quickly dives into “six major changes” (in section 1.2.1); this could be confusing for readers. I think there could be additions to either list. Regarding the “six arguments” in Exec Sum could consider a seventh, an observation along the following lines:<br>This Fifth Assessment – and the more recent literature it draws upon – has been compiled during a period of unprecedented transition in global affairs spanning economics, geopolitics, international energy markets and the climate change negotiations themselves. This makes it exceptionally difficult to make robust predictions. The most obvious evidence from these trends lead to a pessimistic assessment of the prospects for rapid progress in tackling climate change, but in a time of major global transition, surprises leading to a rapid turnaround in the global trend of emissions cannot be ruled out. | Rejected -- The essential parts of the suggested 7th pointed are already covered. |
| 9379 | 1 | 3 | | 4 | | Even though a broad approach on diverse contributors to mitigation might be necessary to reach the goals, something more needs to be said about the role of governments, because they are still the most powerful institutions in terms of drafting laws and implementing regulations. | Rejected - text is balanced |
| 4141 | 1 | 3 | 1 | 4 | 22 | Please do not use probabilistic qualifiers ("is is likely", "it is very likely", "it is certain") with statements that you cannot underpin with data. I assume that you used these terms in a more colloqial sense but there is the risk to create confusion with regard to the IPCC calibrated uncertainty language. | Taken into account - text revised to use probalistic qualifiers more precisely |
| 7438 | 1 | 3 | 1 | 26 | 21 | This is a general comment on the whole report. At times it reads like a PhD thesis. It tries to cover every angle of ‘sustainable development’ and in my opinion gives far too many references. | Noted |
| 7439 | 1 | 3 | 1 | 26 | 21 | There is a distinct bias against so-called ‘traditional biomass’, which is defined as biomass, both processed and unprocessed used for cooking and heating by households in developing countries. It assumes that these households cook indoors with ‘green’ biomass on inefficient stoves. | Rejected - text is balanced in treatment of traditional biomass |
| 7440 | 1 | 3 | 1 | 26 | 21 | Their number has been put at 2.7 billion and is forecast to grow to 2.8 billion by 2020. Yet the only solution offered is to wean them away from biomass with electricity and/or liquid and gaseous fossil fuels. | Rejected - outside scope of this chapter |
| 7441 | 1 | 3 | 1 | 26 | 21 | Many households cook outside and about 10% cook with charcoal, which is a smokeless fuel with an energy value higher than most coals! Incidentally, nothing is said about people cooking with coal, which is more polluting than most biomass. | Rejected - too detailed for the purpose of this chapter |
| 7442 | 1 | 3 | 1 | 26 | 21 | There are simple and cheap ways to reduce indoor air pollution: namely, better ventilation, using dry biomass, improved stoves with chimneys, improved kitchen practices etc. | Rejected - outside scope of this chapter |
| 7443 | 1 | 3 | 1 | 26 | 21 | The paper also assumes that collecting fuelwood and residues places an undue burden on women and children, when they could be undertaking more productive tasks or going to school. | Rejected - outside scope of this chapter |
| 7444 | 1 | 3 | 1 | 26 | 21 | . However, these collectors also sell fuelwood and charcoal. An estimated 30 million people are employed in its production transport and trade. | Rejected - outside scope of this chapter |
| 7445 | 1 | 3 | 1 | 26 | 21 | It helps with poverty alleviation and promoting other forms of energy in its place, may increase poverty and accelerate deforestation to grow subsistence and cash crops. | Rejected - outside scope of this chapter |
| 7446 | 1 | 3 | 1 | 26 | 21 | The various chapters are full of acronyms. Each acronym is usually defined only once, and some not at all. In my opinion, acronyms should be constantly spelled out, otherwise readers like myself will be mystified as to what is being said. | Taken into account - will be checked in final edits |
| 2325 | 1 | 3 | 1 | 3 | 12 | In the discussion of the market-based approaches, the signed commitment declaration called "Corporate Sustainability Forum Joint Commitment for Climate Transparency and Disclosure in Rio+20" would be recent remarkable step in mitigation of GHGs. More details<br>http://www.unglobalcompact.org/docs/issues_doc/Environment/climate/Joint_Commitment_Statement.pdf | Rejected - Our purpose is to discuss macro trends |
| 4868 | 1 | 3 | 10 | | | "United Nations Framework Conventional on Climate Change | Taken into account - text revised |
| 4587 | 1 | 3 | 18 | 3 | 18 | Given that "capabilities" is a technical term, I would not use it here; why not use again "policies"? | Taken into accont - text revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4588 | 1 | 3 | 21 | 3 | 21 | "understanding" rather than "information" | Rejected - text is fine |
| 8470 | 1 | 3 | 21 | | 22 | Public opinion influences design, but design, politics and media also play a significant role in affecting or shaping the framing or content of public opinion (see for example the work of Doris Graber, Rosalee Clawson or Jonathon Morris) | Noted |
| 3604 | 1 | 3 | 22 | 3 | 22 | Please specify or give examples for "events in the world" . | Rejected - the paragraph already discusses the economic recession. No |
| 4589 | 1 | 3 | 24 | 3 | 24 | "diplomatic outcomes"; do you mean there is a gap between the scale of the mitigation challenge and the "diplomatic outcomes" actually obtained; please, clarify | Noted - that's exactly what we mean. |
| 15551 | 1 | 3 | 24-26 | | | The global economic set-back "beginning around 2008" is not (as far as I am aware) formally classifiable as a "worldwide" recession. In the OECD, perhaps, yes. If I am wrong, and it is in fact, formally classifiable as a "worldwide recession", I suggest the insertion of the words "largely concentrated in industrialised countries" after the word "recession" and before the word"beginning" | Rejected - worldwide is ok. Discussion on post 2008 global economic situation not core theme of Ch.1 |
| 4590 | 1 | 3 | 27 | 3 | 27 | arguments about what. Please, clarify | Noted |
| 14782 | 1 | 3 | 27 | 4 | 22 | The choice of these six arguments as the most important to highlight in this ES is not at all clear. It is also not clear how they related to the remainder of the chapter, which should presumably probide the substantiation for these arguments. (It is also not clear how these related to the six main messages presented in 1.2.1.1 - 1.2.1.6) Many other possibilities for key arguments come to mind, which are perhaps better supported by the text. For example the chapter could elaborate and highlight statements relating to the following points<br>-- "the scale of the mitigaiton challenge has grown enormously since 2007" and discussion of why the level of ambition thus far has been so low.<br>-- "large new supplies of unconventional resources", which seems to be dominating near (medium?) term trends in energy use around the world. | Noted - We map the rest of the text pretty closely on the arguments. And the first of the proposed alternative arguments is, in fact, what we say. The second is incorrect--the flood of unconventional resources is still pretty isolated. |
| 7857 | 1 | 3 | 27 | 4 | 22 | What is the claim that is to be substantiated by the six arguments, or are just matters of facts stated? All six "arguments" are well known and rather trivial. What is the point of stating them? | Noted |
| 7831 | 1 | 3 | 27 | | | The sentence might better read: The present chapter identifies six conclusions. | Taken into account - text revised |
| 6811 | 1 | 3 | 28 | | 29 | this sentence has the wrong oder and emphasis: 'Those include population, the structure of the economy, behaviour, and the state of energy technology.' Infact, fossil energy systems are to blame for 75% of the anhropogenic atmospheric emissions - and should be listed here first, and named, not 'state of energy technology' but 'fossil fel combustion'. | Noted - our language here is meant to map directly on the Kaya/IPAT kind of analysis--that's why we use it that way. |
| 16242 | 1 | 3 | 28 | 3 | 29 | Replace "energy technology" with "technology" to avoid impression of a narrow energy supply perspective. | Accepted - text revised |
| 15525 | 1 | 3 | 29 | | 30 | Should add 'patterns of consumption.' | Accepted - text added |
| 4591 | 1 | 3 | 29 | 3 | 29 | individual or societal behavior? | Accepted - text added |
| 15552 | 1 | 3 | 29 | | | Insert the words "investment decisions" between the word "behaviour" and the words "and the state of…[etc]" | Accepted - text added |
| 12506 | 1 | 3 | 29 | | | Add after "technology" -- "and induced effects, e.g. anthropogenic land use conversion, forest, peat and other land emissions in changing climatic conditions." The following sentence refers to the choice of fuels and the efficiency of the energy system, but does not address land-based emissions that are also a consequence of the four factors affecting GHG emission levels. | Accepted - text added |
| 13672 | 1 | 3 | 29 | 3 | 29 | Add after …"technology": "and availability of energy resources". A country with high renewable energy resources has a different mitigation potential than a country where such resources are absent. | Accepted - text added |
| 17398 | 1 | 3 | 29 | | | "the state of energy technology" is likely too narrow as it excludes other important technologies / practices in the land use sector. | Taken into account - combined with other comments |
| 2326 | 1 | 3 | 29 | | | the term "behaviour" is unclear. It should be social behaviour or Individual behaviour or Institutional behaviour. | Taken into account - combined with |
| 4011 | 1 | 3 | 30 | | | suggested wording: "the choice of production and consumption patterns as well as fuels and the overall efficiency of the energy system" | Taken into account - combined with other comments |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14777 | 1 | 3 | 30 | | 33 | "In nearly all countries… " This statement is a retrospective statement that pertains to countries and a time period during which there were minimal or zero deliberate attempts at achieving emission reductions. If this conclusion were applied to the future period, it follows that suggest that the most plausible route to lowered emissions would be economic decline. Is this the intended message? It is reinforced by the statement "In *addition*, for *some* countries it is *likely* that...", which suggests that actual deliberate measures to induce mitigation are secondary to economic decline as a mitigation policy. | Taken into account - text revised to clarify. Deleted "in addition, for some countries" in line 32 |
| 6812 | 1 | 3 | 31 | | 33 | This is non-sequitur, makes little sense. There is absolut no evidence that 'market based policies' have been successsful in lowering GHG emission - but there is evidence to the contrary. Also, what does 'the state of the economy' have to do with 'polciies'? It is of course a truism that in a fossil fuel economy a lowering of industrial output will lower emissions, but this is not what is likely meant here. Also important to refer to the Rebound Effect, or Jevons Paradox, when calling for efficiency improvements - these can only have the desired effect when combined with renewable energy based energy systems replacement and sufficiency (lifestyle based consumption pattern) improvements. | Taken into account - The state of the economy has a lot to do with emission policy potentials, and the experience with market based politics is mixed. But text has been revised to clarify meaning |
| 11016 | 1 | 3 | 32 | | | The text states: 'In addition, for some countries it is likely that there is a large role for regulatory and market policies focused on controlling emissions. [1.3; high agreement, robust evidence]'. Comment: This is a judgment, but I would substitute "for most countries" in place of " for some countries" and insert "a mix of" after "large role for". | Taken into account - combined with other comments |
| 4592 | 1 | 3 | 35 | 3 | 35 | there are other national priorities which are more common and more realistic such as economics growth, poverty alleviation, millenium goals, military power; sustainbale development often does not go beyond the rhetoric for diplomatic consumption | Noted |
| 12507 | 1 | 3 | 35 | | | Add after "green growth," -- "terms of trade." The draft extensively documents the impact that trade has on emissions and rightly focuses on emerging study and documentation of consumption-based life-cycle emissions analysis. | Taken into account - text revised |
| 11107 | 1 | 3 | 35 | 3 | 37 | The mere fact that governments have to address different but related policies at the same time does not automatically guarantee<br>"that actual progress in controlling emissions is larger than it may seem when analysts focus just on policies that g overnments have identified as "climate change. | Noted - we agree with this point, but our point here is slightly different, which is to emphasize that the total mitigation effort is hard to observe accurately. |
| 13673 | 1 | 3 | 37 | 3 | 37 | Add "-related" after "climate change"". | Accepted - word added |
| 4866 | 1 | 3 | 4 | | | {Add} "adopt climate {change} mitigation | Accepted - word added |
| 2327 | 1 | 3 | 4 | | | "National governments" would be national governments with simple "n"?? | Accepted - text revised |
| 7832 | 1 | 3 | 40 | 3 | 41 | the following language is sugegsted: … improvements to climate mitigation programs need to address these broader national priorities. | Rejected - we can't make that value judgement. |
| 9185 | 1 | 3 | 40 | 3 | 40 | replace "mitigation" by "mitigation and adaptation" (or "mitigation and adaptation and SRM") | Accepted: text revised to say "mitigation and adaptation as well as other possible |
| 13358 | 1 | 3 | 42 | | | This understates the situation somewhat. All relevant scientific assessments agree that the 2 degrees C goal cannot be achieved given the current trajectory of aggregated global emissions, even given variations in modelled sensitivities. I suggest the word 'likely' be replaced by 'clear'. | Taken into account - text revised to conform to IPCC standard definitions |
| 14778 | 1 | 3 | 42 | | 43 | "It is likely that the current trajectory…" This is a statement that embeds an unstated long-term extrapolation of our present emission path, without which it is not possible to make a statement about long-term temperature rise. What is actually implied is a statement about the likely temperature rise if we do not increase the level of mitigation ambition beyond what has been evidenced so far. This should be made claer, otherwise this statement is easily misinterpretted to mean that we have already committed the climate to a likely chance of exceeding 2C, which is incorrect. | Taken into account - paragraph text revised for clarity |
| 17793 | 1 | 3 | 42 | 46 | | This is probably the most important statement - however it would be nice to add a sentence on the consequences for the assessment itself | Noted |

# Expert Review Comments on the IPCC WGIII AR5 First Order Draft – Chapter X

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17400 | 1 | 3 | 42 | | | Recommend moving this 'argument' to be the first argument mentioned as it seems to be of much greater significance than then others. | Rejected - the order of our arguments is ok for now. |
| 16961 | 1 | 3 | 42 | | | Is the term "likely" used consistently throughout the WG3 report? … and across WG reports? You might consider a different word given the use of "likely" in quantifiable uncertainty terms elsewhere | Taken into account - text revised to conform to IPCC standard definitions |
| 4869 | 1 | 3 | 43 | | | in order to avoid the negative accent: "more aggressive goals >> more ambitious goals | Rejected - "aggressive" is what we |
| 4593 | 1 | 3 | 44 | 3 | 46 | It the two degrees Celsisus target is unlikely to be met, why single out the 1.5 degree target, especially in an Introduction? This whole sentence seems to be superfluous | Noted - 1.5 is a reality in diplomacy. It needs to be discussed even if it is |
| 14779 | 1 | 3 | 44 | | 46 | "It is extremely unlikely…" This statement seems wholly unjustified given the evidence presented. Is this a statement about the science, claiming that no future emissino path can be described that keeps warming below 1.5C? Is it a statement about the availability of technologies to enable such a path? Is it a statement about the economic viability of acheiving such a path? Is it a statement about the political plausibility of implementing measures necessary for such a path? This categorical statement is extremely ill-defined, and should either be heavily qualified or eliminated. | Rejected - This is a statement about the plausible achievability of this path. But qualifying phrase has been revised to conform to IPCC standard definitions |
| 8702 | 1 | 3 | 44 | | | This is an extremely important and potentially controversial statement. Please add all appropriate qualifying conditions under which it is true. For example, do you mean it is politically infeasible? Certainly, it is not physically infeasible. Also, compared to the previous statement regarding meeting a 2 degrees target, which is only 0.5 degrees higher, the statements are too dramatically different for such a small temperature difference. The careful reader will likely be puzzled. | Noted - qualifying phrase has been revised to conform to IPCC standard definitions. But it should be noted that 0.5 degrees difference between the two targets is not a small difference in reality. |
| 13359 | 1 | 3 | 45 | | | I suggest adding 'given current mitigation efforts' to this sentence. | Rejected - our statement is actually stronger--not just current mitigation |
| 15526 | 1 | 3 | 47 | 4 | 2 | Should also mention the demand side - energy efficiency and changes in consumption patterns are also important. | Taken into account - we address this elsewhere. |
| 15553 | 1 | 3 | 48 | | | Insert the words "capable of substantially mitigating emissions" between the word "trajectories" and the words "bit it is…[etc.]" | Accepted - text revised |
| 17681 | 1 | 3 | 48 | 3 | 48 | the word "here" seems to be there | Accepted - text revised |
| 4009 | 1 | 3 | 5 | | | suggested wording: "Those policies have been local, national and international as well as sectoral in scope" | Taken into account - combined with |
| 4010 | 1 | 3 | 6 | | | suggested wording: "market-based approaches such as emission trading systems along with regulation and voluntary initiatives" | Accepted - text revised |
| 4867 | 1 | 3 | 6 | | 7 | {Add} "market-based approaches such as emission trading systems{, energy or carbon taxes} along with regulation; they encompass many diverse “green growth”{, eco-efficiency} strategies | Taken into account - combined with other comments |
| 7829 | 1 | 3 | 6 | | | It is suggested to speak of "regulatory approaches" instead of "regulation". | Taken into account - combined with |
| 4585 | 1 | 3 | 7 | 3 | 7 | add "and voluntary measures" after mitigation | Taken into account - combined with |
| 7830 | 1 | 3 | 7 | | | It is suggested to substitute "nations" by "countries" as the latter is the more apprpopriate term usually in the IPCC context.. | Accepted - text revised |
| 4586 | 1 | 3 | 8 | 3 | 8 | "economic" unduly restricts welfare; welfare may include happiness | Accepted - text revised |
| 6860 | 1 | 3 | 13 | 3 | 14 | WGIII, II or I or SYR? Please Clarify. | Taken into account - citation in text |
| 6861 | 1 | 3 | 42 | 3 | 46 | The topic of climate targets (and climate change commitments, allowable emissions etc.) is thoroughly assessed in the WGI AR5 contribution. We strongly suggest to ensure consistency in the underlying assessment with the careful assessment provided in WGI AR5, primarily Chapter 12. Reference to Chapter 12 needs to be added. As a general comment, we strongly suggest to avoid reassessing topics concerning the physical science basis in order to reduce duplication and inconsistencies between the WGIII and WGI contributions to AR5. | Taken into account - This is a topic that requires an analysis of the physical and the socioeconomic basis. But if necessary, the outcome of WG1 will be reflected in social science (including economics) literatures, which will be |
| 2928 | 1 | 3 | 11 | | | delete "also" which is not necessary | Accepted - text revised |
| 2927 | 1 | 3 | 4 | | | "have seen active efforts" to be replaced by "have seen relatively active efforts" in order to be more nuanced | Accepted - text revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3893 | 1 | 3 | 27 | 4 | 22 | The six arguments referred to in the executive summary appear to be based on the premise that governments can force their citizens to incur the proposed costs, without losing office in the process. No evidence is put forward in support of the proposition that what is being advocated is politically feasible. An analytical problem here is the absence in the chapter of a positive theory of state and bureaucratic action. Yet disappointing policy outcomes are likely when there is no mature and well-developed understanding of current incentive structures. On a more encouraging note, there is less reason to be pessimistic about voluntary, spontaneous responses to the issues. A great many citizens and organisations will be more motivated to consider the future than the corrupt and venal administrations that are so prevalent according to Transparency International, and others. Would not the chapter be better organised if it distinguished between mitigation approaches that depend on government force and mitigation processes that make use of voluntary initiatives? Any implicit notion that if governments fail, all is lost must be resisted. | Rejected - this goes beyond what we can say as scientists, even if we have a political economy theory of action in mind. |
| 15080 | 1 | 3 | 10 | 3 | 10 | It is incorrent the name of UNFCCC not is Conventional is Convention | Accepted - text revised |
| 13654 | 1 | 3 | 27 | 3 | 30 | Factors affecting cc mitigation said to be population, structure of the economy, behaviour, and state of energy technology. This draws from the Kaya identity approach (Sathe Jayant et al), which is flawed in that it considers population as the main driver of emissions. However data shows otherwise (Sattherwaite etc al.) | Noted - elsewhere in the chapter we make it clear that economic drivers and technoogical drivers are more important. Following team discussion, this section |
| 15081 | 1 | 3 | 28 | 3 | 29 | I propose to include in the factor the governments will and the availability of financial resources at national and international level in order to solve the main sources od GHG emissions, mainly in developing countries. | Taken into account - we already include this. |
| 13655 | 1 | 3 | 42 | 3 | 43 | Emphasis on emission trajectories which are subject to higher uncertainties (are counterfactual) than more robust indicators of temperature increase such as carbon budgets (cumulative emissions) (Allen et al., Meinshausen et al.) | Taken into account - Emission trajectory also implies levels of cumulative emissions. Text added. |
| 15079 | 1 | 3 | 5 | 3 | 9 | I propose delete this part or improve ¨ They have included market-based approaches such as emission trading systems along with regulation; they encompass many diverse “green growth” strategies that nations have adopted with the goal of promoting human economic welfare and jobs while also cutting an array of environmental impacts including emissions of carbon dioxide (CO2) and other greenhouse gases (GHGs). Because market-based approaches neither is the best example nor the main lines in cutting GHG emissions, and ¨green growth¨ is very controvertible and didn´t reach consensus in High Level Meeting of Rio+20 and I propose to omit here and in all text | Rejected - Our language is broad here and points to lots of different strategies. |
| 17680 | 1 | 3 | 42 | 3 | 43 | The term "likely" migth suggest the evidence is not "robust". I line 44 for robust evidence the term extremely is used. | Taken into account - qualifying phrases revised to conform to IPCC standard |
| 17693 | 1 | 3 | x | 33 | y | Usage of words that can be hard to understand for the non native english speaker,prone, parse, germane, halving, Reapeted words in the same sentence | Noted |
| 4024 | 1 | 31 | 30 | 31 | 43 | the correct reference is: Shindell, D., J.C.I. Kuylenstierna, E. Vignati, R. van Dingenen, M. Amann, Z. Klimont, S.C. Anenberg, N. Muller, G. Janssens-Maenhout, F. Raes, J. Schwartz, G. Faluvegi, L. Pozzoli, K. Kupiainen, L. Höglund-Isaksson, L. Emberson, D. Streets, V. Ramanathan, K. Hicks, Kim Oanh N. T., G. Milly, M. Williams, V. Demkine, and D. Fowler. Simultaneously mitigating near-term climate change and improving human health and food security. Science, 13 January 2012: Vol. 335 no. 6065 pp. 183-189 DOI: 10.1126/science.1210026. | Taken into account - citation added |
| 7159 | 1 | 325 | 33 | | | The parenthetical expression, '(and a lot more likely)' is a bit confusing. I suggest "with some change in climate inevitable, 'and significant change looking increasingly likely,' " . | Rejected - text seems fine |

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| 18255 | 1 | 4 | | | | 3. Adaptation to climate change impacts<br>“In that context it is very likely that adaptation to climate change should be viewed as a complement to mitigation policies, not a substitute.”<br>Yes adaptation and mitigation are complemented each other, but both are related with development (“economic development is perhaps the best hope for adaptation to climate change”, Economics of adaptation to climate change: Synthesis Report, World Bank, 2010). Then innovation policies could be either specific, or attending both, or even overlapping adaptation and mitigation policies and actions. | Taken into account - cite to World Bank report |
| 9380 | 1 | 4 | | | | A seventh significant change can be seen in the grown emphasis on ethical issues; climate change is discussed in terms of "justice", "the most vulnerable persons", "environmental rights", "sustainability" etc. | Rejected - langauge recalibrated a bit, but mostly this is not a topic for our |
| 14357 | 1 | 4 | 1 | | | Cryptic. What technologies? Sounds like a plea for geoengineering. If this is the case, be explicit. | Rejected - This is a discussion on deep cuts, therefore geoengineering is out of |
| 8703 | 1 | 4 | 1 | | | I think you mean "climate change targets" not "trajectories" in this sentence. | Rejected - "climate change trajectories" phrase not found in text. Insufficient |
| 14781 | 1 | 4 | 16 | | 22 | It is not at all evident that "sohpisticated techniques" have in fact yet been developed that have been usefully applied to assessing geoengineering. | Taken into account - following team discussion, text revised for clarity. Geoengineering is not the only, nor most |
| 7858 | 1 | 4 | 16 | 4 | 19 | What are the "more sophisticated techniques" you mention? At least in chapter two only conventional economic wisdom can be found. | Noted - In this context, the words mean such as CCS, BECS (bio with CCS), Hydrogen etc. and not including |
| 14330 | 1 | 4 | 18 | 4 | 19 | The text refers to research on risk management strategies and mentions "emergency geoengineering" as one policy response. The brackets at the end of this sentence to refer chapter 2. However, chapter 2 does not mention geoengieering. There is no in-depth research or literature on risk managment specifically of of geoengineering. Thus mentioning geoengineering as one example before the brackets appears slightly misleading. | Accepted - chapter 2 is about tail risks and management. Team will liase with ch 2 to consider whether/how geoengineering is useful for managing tail risks and to discuss including the |
| 15417 | 1 | 4 | 18 | | 19 | DELETE: "and emergency geoengineering [chapter 2; low agreement, medium evidence]". It is not clear what "emergency geoengineering" means, though the phrase implies that there is another category of geoengineering that is for non-emergency purposes. Geoengineering itself is neither mitigation nor adaptation according to IPCC definitions of both concepts in AR4. (IPCC, 2007:84 and IPCC, 2007:76). This point was also discussed in the Joint Expert Meeting on geoengineering held in Lima in June 2011, and there was NO agreement among workshop participants to define geoengineering as either mitigation or adaptation, although some participants proposed that the definitions of mitigation and adaptation could be revised to accommodate geoengineering techniques. The definitions of adaptation and mitigation do NOT accommodate geoengineering, but it should not be implied, therefore, that geoengineering can be considered another (equally valid), "third" option.<br>Geoengineering is highly controversial and speculative and this should be made clear in AR5, at the first mention of geoengineering. | Taken into account - 'emergency geoengineering' phrase changed to 'possible deployment of geoengineering technologies as a last resort in case the dangers of extreme climate change appear quickly' |
| 4594 | 1 | 4 | 19 | 4 | 19 | why limit to geo-engineering and not simply to technology to be more general? | Noted - because there is a special role |
| 15418 | 1 | 4 | 19 | | 21 | DELETE: "In that context it is very likely that adaptation to climate change should be viewed as a complement to mitigation policies, not a substitute [1.4; high agreement, limited evidence]." REPLACE WITH: Adaptation to climate change is an unavoidable and necessary measure for countries affected by climate change, but should never be seen as a substitute for mitigation. Adaptation always has and always will play a larger role in the overall policy strategy of developing countries than mitigation has played or will play. | Rejected - text is ok as is; proposed revision has language "always and always will play a larger role" that may not be true, in fact. |
| 15554 | 1 | 4 | 2 | | | Insert new third sentence to this para (after the one ending "….excessive emphasis") as follows: "On the other hand, there is a recognised linkage between path dependency and technology choices, particularly in the cases of (e.g.) large-scale infrastructure and building stock" | Accepted - sentence added but paragraph has been revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15419 | 1 | 4 | 21 | | 22 | DELETE: "There is rising scholarly attention to the role of adaptation in light of the GHGs already loaded into the atmosphere and likely emitted in the future." The "scholarly attention" would need to be referenced along with noting the level of agreement for the assertion (that scholarly attention to adaptation is rising). If the implication is that focus is shifting to adaptation because of failures to mitigate, this is a dangerous message to send to Northern countries that should retain or concentrate focus on emissions reductions. If the implication is that the "scholarly attention" to adaptation includes attention to geoengineering, this is flawed, as there is no justification for considering geoeningineering a form of adaptation. | Rejected - We don't need to cite in the executive summary. And the confidence statements we put after each paragraph apply to the whole paragraph; we don't need them for every sentence. |
| 16963 | 1 | 4 | 24 | | | WG3 is charged with "assessing scientific research", but this report is framed in terms of 6 somewhat arbitrary arguments. Is this really the most objective way to present the state of science as it relates to mitigation? | Rejected - The arguments are neither arbitrary nor unscientific. |
| 15274 | 1 | 4 | 24 | 4 | 24 | "Working Group 3" to be "Working Group III", keep consistence. | Editorial – copyedit to be completed |
| 4595 | 1 | 4 | 25 | 4 | 25 | add "and their cumulative impacts" | Accepted - text revised |
| 4596 | 1 | 4 | 26 | 4 | 27 | delete last sentence of this paragraph (see rationale on next line) | Taken into account - combined with |
| 2240 | 1 | 4 | 26 | 4 | 26 | There is no energy balance at any place on the the earth's surface and there is no overall "energy balance". Every geologiust knows that the earth's energy fluctuates over every time scale | Rejected - the reference here is to planetary balance. |
| 4597 | 1 | 4 | 28 | 4 | 28 | add "after this one" "- the fifth IPCC comprehensive assessment-" | Rejected - text is ok. |
| 4850 | 1 | 4 | 28 | | 37 | This text is common for all the AR5 | no action needed, insufficient information |
| 2328 | 1 | 4 | 28 | 4 | 37 | In this paragraph, "such assessments" is used repeatedly. It would be better to note at least one place the specific name of assessment. Otherwise, readers may be confused. | Taken into account - combined with other comments |
| 8704 | 1 | 4 | 32 | | | the important word "consistent" is not defined here - please state what is meant | Taken into account - text revised |
| 15238 | 1 | 4 | 35 | 4 | 36 | Good! | Noted |
| 15528 | 1 | 4 | 35 | | | Could also mention World Bank (2012). 'Inclusive Green Growth: The Pathway to Sustainable Development' World Bank, Washington DC. | Accepted - cite added to text where we talk about "green growth". But text has |
| 7859 | 1 | 4 | 35 | 4 | 37 | What is ment by "neutral language"? Please be more precise. Are you referring to value-neutral language? This claerly is not the case. Throughout the chapter we see many implicit assumptions which are value-laden or even prescriptive. Questions of viability, for instance, are never completely neutral. To address the challenge of anthropogenic climate change value judgments and judgments of different courses of actions are inevtiable, but they must be made explicit as well as comprehensible. | Taken into account - paragraph has been deleted |
| 16964 | 1 | 4 | 36 | | | This report is MANDATED to be policy-relevant, not INTENDED. The language should be strengthened to cement the fact that IPCC reports are - by intergovernmental decision - to be objective and not policy-presriptive | Taken into account - paragraph has been deleted |
| 4598 | 1 | 4 | 38 | 4 | 39 | delete the entire line after "This chapter" and continue with the next line "focuses first on the main messages.." | Accepted - text revised |
| 13674 | 1 | 4 | 4 | 4 | 4 | Add sentence "However, some policies such as market mechanisms and emission taxes have shown their ability to mitigate greenhouse gas emissions under widely varying circumstances". See evidence in Chapters 15 and 13. | Rejected - sentence is not really needed. In Chapter 15, there are descriptions that other policies are effective as well. |
| 14783 | 1 | 4 | 41 | | 42 | "… raising questions about the viability…2 degrees" Again, without elaboration and explanation about whether this is a scientific, technological, economic, or political assessement, this statement is easily misinterpretted. | Taken into account - we will consider this |
| 6808 | 1 | 4 | 42 | | | There is sufficient evidence that 2 degrees are too high, and that 450 ppm carry a massive risk of overshooting that target. http://pubs.giss.nasa.gov/abs/ha00410c.html, many other sources | Rejected - outside scope of this chapter. This is to be treated in WGI |
| 17643 | 1 | 4 | 43 | 4 | 45 | Is this sentence added the norm "adaptation"? (In section 1.4, "adaptation" was introduced, and was mentioned the intractions between mitigation and adaptation.) | Rejected - text is ok. Here we discuss about conceptual issues. Mitigation is a |
| 18009 | 1 | 4 | 43 | 4 | 43 | “green economy” is one of the key concept in the introduction. In order to introduce this concept in a comprehensive way, the recent international consensus regarding this concept, namely the language agreed in Rio+20 need to be reflected. | Rejected - We cite the concept and some of the literature and explain. This is a mitigation report and not an |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11391 | 1 | 4 | 43 | 5 | 10 | The separated references to sustainable development and green growth creates the impression that these are two different concepts. However, as pointed out above in the general comments, the multilateral consensus coming out of Rio+20 is that green growth (as part of the concept of green economy) is simply among the tools that can be used to achieve sustainable development, rather than a replacement concept for sustainable development itself. In this regard, all references to green growth should be deleted or at least be indicated as “green growth in the context of sustainable development” | Taken into account - text revised |
| 15240 | 1 | 4 | 47 | | | mention of nuclear may be contentious? | Noted - Whether it is contentious or not is not the issue in IPCC. We address |
| 4870 | 1 | 4 | 5 | | | [Del] consistent use of the term: "participate in climate [change] policy | Accepted - text revised |
| 12508 | 1 | 4 | 6 | | | Add after “including” -- “subnational governments and” The role of municipalities and other subnational entities is well covered in the draft and deserves recognition here in the summary. | Taken into account - combined with other comments |
| 4871 | 1 | 4 | 7 | | | {Add} "different environmental, {social,} business and | Accepted - text revised |
| 15527 | 1 | 4 | 9 | | 15 | Should also add 'economic growth.' | Rejected - text is ok as is. |
| 8471 | 1 | 4 | 9 | | 15 | Uncertainty is important, but so is complexity and variability as part of that equation. Simply focusing on uncertainty implies that a greater degree of certainty can be generated (through science, for example) and that may not be true. It may be helpful to refer to climate change as a "wicked problem" (See the recent work of Val Brown) and in particular the interaction effects that occur between policies and policy instruments across domains (work in eco-health, for example, helps illustrate this) | Taken into account - text expanded and revised to include complexity, but not variability |
| 14780 | 1 | 4 | 9 | | 15 | This fifth main argument about uncertainty unhelpfully confounds and equates many different types of uncertainty, all of which are relevant to some extent, but this statement de-emphasizes the fundamental, profound *downside* risk associated with disruption of the climate system. Other types of uncertainty (such as in future economic growth rates, technological progress, policy effectiveness) are certainly relevant, but in an important way they are secondary to the uncertainty associated with the magnitude of the potential climate damages. Neglecting this point leads to an attenuation of the meaning of a "robust," "adaptive" strategy, underemphasizing the necessity for a precautionary response. | Rejected - different types of uncertainty should be illustrated but disentangling the many kinds of uncertainty here in the executive summary isn't really hepful (and the illustration of climate uncertainties being more important isn't always true). Note that chapter 2 does this in detail |
| 16962 | 1 | 4 | 9 | 4 | 15 | In this discussion of uncertainties, no mention is given to one of the biggest uncertainties of all - actually measuring the emissions themselves. As the recent Guan et al (2012) paper showed in Nature Climate Change, emissions ucnertainties in China can be on the order of 1 Gt(!) | Taken into account - Text added to address all main sources of uncertainty, not only in the emissions. For efficient and effective mitigation policies the |
| 18419 | 1 | 4 | | | | The idea that the mitigation challenge has grown enormously since 2007 should be stressed in the introduction (pag 4 last paragraph). | Rejected - team discussed this; stressing this point is not necessary |
| 8842 | 1 | 4 | 25 | 4 | 25 | It currently defines Mitigation as "the effort to control the fundamental sources of climate change". Perhaps it should be emphasised that the primary focus of mitigation is to control the fundamental anthropogenic sources of climate change, with geo-engineering of naturall climate drivers a last resort (which is not to say that there shouldn't be geo-engineering research in preparation). | Taken into account - text edited to clarify meaning of 'mitigation' |
| 15084 | 1 | 4 | 26 | 4 | 26 | To add in line 26 : ….notably the emission of GHG AND pollutants that can affect the planet’s energy balance | Rejected - sentence ok as is |
| 6299 | 1 | 4 | 35 | 4 | 35 | What is meant by "neutral" language? Re-word, avoiding "value neutral" but perhaps "non-partisan." | Taken into account - combined with other comments. Text has been revised |
| 4245 | 1 | 4 | 14 | 4 | 15 | There should be mention of co-benefits of mitigation strategies at this point particularly health co-benefits. See for example Haines A, McMichael AJ, Smith KR, Roberts I, Woodcock J, Markandya A, Armstrong BG, Campbell-Lendrum D, Dangour AD, Davies M, Bruce N, Tonne C, Barrett M, Wilkinson P. Public Health benefits of strategies to reduce greenhouse gas emissions: overview and implications for policy makers. Lancet 2009; 374:2104-14. Also the WHO series of papers on health in the green economy http://www.who.int/hia/green_economy/en/ | Taken into account - Discussion on co-benefits has been beefed up but a detailed assessment of the topic is addressed elsewhere in the report. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15082 | 1 | 4 | 19 | 4 | 21 | Not is real the asseveration ¨ In that context it is very likely that adaptation to climate change should be viewed as a complement to mitigation policies, not a substitute¨. The adaptation policies not can be seen as a complement of mitigation policies, each with their personality and objectives, in many developing countries the adaptation is the main way and measures because their GHG emissions are very low | Noted - no action needed |
| 15083 | 1 | 4 | 21 | 4 | 22 | To add in : ¨There is rising scholarly attention to the role of adaptation in light of the GHGs already loaded into the atmosphere and likely emitted in the future AND THE CLIMATE CHANGES THAT IS OCCURRING AND THOSE PROGNOSTICATED | Rejected - no changes needed-- proposed changes here don't add further meaning to exisiting sentence |
| 17682 | 1 | 4 | 1 | 4 | 2 | If no specific set of technologies is outlined a technology can be removed it there are no technical or economic capabilities to implement it | Noted - insufficient information. No action needed |
| 17683 | 1 | 4 | 25 | 4 | 26 | The planets energy balance? Maybe it could be more specific regarding the green house effect of GHGs because action is towards reducing them not sending energy into space | Noted - no action needed |
| 7002 | 1 | 4 of 33 | 25 | 4 of 33 | 26 | Add "and enhancing GHG sinks also", after "to control the fundamental sources of climate change". | Accepted - text revised |
| 7003 | 1 | 4 of 33 | 29 | 4 of 33 | 29 | Add "man-induced", besides "global climate change". | Taken into account - text has been |
| 7004 | 1 | 4 of 33 | 36 | 4 of 33 | 37 | The last phrase in this paragraph has been included systematically in PCC Assessments since the first one, but the results have been worsening day after day and year after year, and thast is also policy relevant!!!! Maybe it's time to find another way for obtaining appropriate results with another phrase or another steps more effective. | Taken into account - sentence has been deleted |
| 6813 | 1 | 5 | | | | Changes since AR 4: should one not also mention, above all, that emissions and GHG concentrations are growing unabatedly, and that the natural global carbon mechanism shows serious signs of getting out of control - reference ice melt rates and discovery of large and sustained methane streams from thawing permafrost areas? Much of this section isn't really very well focused on the topic at hand, stretches are even superfluous. This seems a bit incongruous with what is daid ion pages 14 and 15. | Rejected - text needs to stay focused on what we actually do in chapter 1. other revisions will address this point somewhat |
| 12216 | 1 | 5 | 10 | 6 | 39 | The focus of this section is on development in developing countries. While appreciating that, please consider to include efforts done to mitigate climate change also in the developed world. Both initiatives that developed countries have taken in order to assist developing countries (e.g. REDD+) and initiatives to mitigate national emissions in developed countries, e.g. in Europe. | Rejected - there is extensive discussion of this in the main text. No further action needed. Text will be added in next section on green growth in response to |
| 2241 | 1 | 5 | 10 | 5 | 19 | Sustainable development is impossible. There are only two directions, forward and backward. The climate and everythingh in it evolves and we should try totake advantage of its course. To try and stop is leads to disaster. | Noted - no action needed |
| 8472 | 1 | 5 | 10 | | 19 | Important to note the difficulties of implementation, and the often-ignored gap between strategy, planning, policy and then implementation. It is typically assumed (see Wildavsky 1973) that implementation is an automatic step - this is often not true, and is impact by both political and bureaucratic structures. It is also important to note that equity issues also include social, health and political equity at the individual levels, all of which factor into climate change "policy" | Noted - the main text addresses this adequately. No action required |
| 18010 | 1 | 5 | 10 | 5 | 10 | “green economy” is one of the key concept in the introduction. In order to introduce this concept in a comprehensive way, the recent international consensus regarding this concept, namely the language agreed in Rio+20 need to be reflected. | Taken into account - combined with other comments that suggest using sustainable development or green |
| 17401 | 1 | 5 | 10 | | | It's not clear to me that "green growth" is a term that is of comparable importance and longevity as "sustainable development" -- perhaps consider de-emphasizing its prominence in the document. | Taken into account - combined with other comments |
| 17646 | 1 | 5 | 10 | 9 | 11 | After reading subsections 1.2.1.1 and 1.2.1.2 are well, the reader might get the impression that since the publication of AR4, only developing and emerging countries have taken strong action against climate change while the industrialized world only has a deep financial crisis on its track record since AR4. An overview section on policies within industrialized countries might mend to this issue. | Taken into account - text has been revised to include paragraph on industrialized countries' actions |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4012 | 1 | 5 | 11 | 5 | 19 | suggested wording: "Since the paradigme of sustainable development was advanced through international processes such as the Brundtland report (World Commission on Environment and Development, 1987) it gradually has been accepted and popularized as a framework to harmonize economic development and environmental protection . This approach, which emphasizes the integration of selected policy goals, is particularly important for climate change as it intersects with many development and environmental goals—including challenges of establishing fairness between country regional groupings and generations of peoples. In many respects, climate change is becoming the key environmental challenge of sustainable development (see chapter 4)." | Taken into account - there are lots of comments that point in all different directions on the language here. Other comments and responses will address this topic. |
| 9107 | 1 | 5 | 11 | 5 | 13 | I think that the generalization only applies when production-based inventories are concerned. There is a lot of evidence that with production-based perspective cities may cause more emissions as well. | Noted -- No further action needed |
| 4873 | 1 | 5 | 13 | | 14 | [Del] "as one of basic [principles] approaches | Taken into account - text has been revised so suggested change is no |
| 15239 | 1 | 5 | 14 | 5 | 15 | together with achieving social equity (e.g. see UNESCO) | Rejected - suggested change is not necessary. No further action needed |
| 4600 | 1 | 5 | 15 | | 15 | I would add as a reference:(…; Agenda-21, 1992) since the latter is the first major international policy document in which the exprtession Sustainble Development appears | Rejected - statement may not really be true. No furthre action needed |
| 4874 | 1 | 5 | 17 | | | {Add} "economic{, social} and environmental goals | Accepted - but paragraph has been |
| 16965 | 1 | 5 | 17 | | | Introducing terms like "fairness", which have many definitions and are (by definition) subjectively interpreted, would steer this report away from its mandate to remain objective and not cast value judgements. | Rejected - The report needs to reflect the literature. There is a huge literature on justice and fairness, and this is a big issue for lots of countries so the chapter |
| 6442 | 1 | 5 | 18 | 5 | 19 | "Fossil fuels resources are...cost-competitve with other energy forms." This statement needs to be qualified in terms of the economic framework in which it is made. For example, the externalities associated with fossil fuel combustion are not fully paid for by the fossil fuel industry or use (despite the existence of various emissions trading schemes). Fossil fuels are only cost competitive today because they do not pay their way for the environmental damage caused. | Taken into account - the quoted sentence is not found anywhere in the chapter text, but reference added to chapter 3 that discusses externalities in more details |
| 17685 | 1 | 5 | 18 | 5 | 18 | aspects instead of respects… | Rejected - respects is the correct word |
| 4599 | 1 | 5 | 2 | | 2 | add at the end of the line "as well as in the science related…" | Rejected - suggested change is not necessary. No further action needed |
| 12509 | 1 | 5 | 20 | | | Add after "including" -- "sovereignty, domestic order, and international relations especially terms of trade and security,..,." | Taken into account - suggested changes are too complicated. Other edits will fix |
| 13360 | 1 | 5 | 22 | | | It is an overstatement to suggest that the goals and interests framed by developing countries are 'paramount'... in other words, 'more important than all others' goals and interests'. While the future growth in emissions from major emerging emitters is highly significant, the actions of developed countries in both reducing domestic consumption and emissions and providing effective funding to assist in mitigation and adaptation remain powerful dialogic influences shaping developing country actions, goals and interests. I suggest replacing 'paramount' with 'critical'. | Accepted change- but paragraph has been revised |
| 16966 | 1 | 5 | 23 | | | Here, and elsewhere, it could be quite beneficial to list the actual countries the text is referring to. Not only does it give a complete snapshot of the current situation in the world, but it will allow posterity to read this report and assess what each nation has done, what impact it has had, etc. | Taken into account - combined with other comments |
| 7861 | 1 | 5 | 24 | 5 | 25 | What do you mean by "necessary industrialization and urbanization in a traditional growth pattern"? Are you suggesting that conventional growth patterns are inevitable or desirable? If so, this is problematic for at least two reasons: first, there are well know possibilities to create properity without conventional growth; second, you would be implicitly suggesting that the main cause of rising GHG emissions - conventional growth - can/should be addressed to a limited extend only. See comment 25. | Taken into account - paragraph has been rewritten |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16889 | 1 | 5 | 28 | | 35 | Policies that try to do too many things or meet multiple objectives frequently don't do anything well -- multiple objectives raise cost and decrease effectiveness. (Sorry, I don't have much to cite here, so probably not that helpful.) | Rejected - topic of "policy effectiveness" is beyond scope of the chapter. |
| 16967 | 1 | 5 | 29 | | | This should be CHANGES IN extreme weather events (extreme weather events would happen without climate change - it is how their magnitude, frequency and location change with a changing cliamte that is of most interest) | Accepted change- but paragraph has been revised |
| 4013 | 1 | 5 | 30 | 5 | 31 | suggested wording: "Mindful of these impacts, these countries have acknowledged that climate change should be acoounted for prominently in sustainable development strategies." | Accepted change- but paragraph has been revised |
| 13361 | 1 | 5 | 31 | | | It is more accurate to claim that 'many of these countries have acknowledged that climate change is 'an increasingly important component of sustainable development'. | Taken into account - combined with other comments |
| 18011 | 1 | 5 | 31 | 5 | 35 | “green economy” is one of the key concept in the introduction. In order to introduce this concept in a comprehensive way, the recent international consensus regarding this concept, namely the language agreed in Rio+20 need to be reflected. | Taken into account - combined with other comments |
| 16968 | 1 | 5 | 31 | | | Where is it cited that climate change is THE important component to sustainable development. This probvlem presents itself elsewhere and can be fixed simply by replacing THE with AN. | Taken into account - combined with other comments |
| 8705 | 1 | 5 | 31 | | | do you mean "most" important component? | Taken into account - combined with |
| 11392 | 1 | 5 | 31 | 5 | 35 | The reference to green growth here should be “in the context of sustainable development” so as to link it to the multilateral consensus from Rio+20. | Taken into account - combined with other comments |
| 6814 | 1 | 5 | 33 | | | The use of unconventional sources is a sign that the peak is behind us, not ahead. I would quote the IEA's Chief Economist on that who consistely asserts since 2009, that the 'peak' - ie sustained conventional supplies - occurred in 2006. The fact that the world economy is now fossicking for remnant, risky, dangerous and increasingly expensive fossil sources should be cause for alarm, not complacency (as here implied). | Rejected - discussion and statements (ahead, behind,…) on "peak" is beyond scope of chapter. |
| 9108 | 1 | 5 | 33 | 5 | 43 | I'd like to ad that cities may also be promoters of consumption intensive lifestyles leading to high GHG loads. This seems evident and a bigger problem than it is often credited if kept in mind that cities generate 90% of global economy. | Rejected - we talk about cities elswhere. no action needed |
| 13362 | 1 | 5 | 36 | | | This opening sentence overstates current realities and does not clarify what 'this approach' is. I suggest 'Many developing countries have made considerable efforts to address both sustainable development and climate change. Their collective efforts include all major mitigation measures...etc' | Taken into account - combined with other comments |
| 11715 | 1 | 5 | 36 | 5 | 37 | Efforts are not only for developing countries. [Developing countries] shoud be amended to [Developed and developing countries]. | Taken into account - paragraph has been revised |
| 6455 | 1 | 5 | 36 | 6 | 2 | Make it shorter. To delete the sentence after "For example". | Taken into account - section has been |
| 16890 | 1 | 5 | 36 | | 47 | There is a common myth that lowering emissions from the BAU pathway halts growth -- it is untrue. Please make sure people understand this. | Noted - comment is very general; team will address this generaly |
| 17402 | 1 | 5 | 36 | 5 | 40 | Strongly recommend adding agriculture to this set of mitigation arenas, both related to GHG reduction and C sequestration. | Taken into account - section has been revised |
| 7862 | 1 | 5 | 36 | 5 | 36 | On which concept of Susatainbable Development relies this statement? In addition, the following lines are very China-friendly. We should not downplay Chinese efforts to mitigate GHG emissions (especially with respect to inaction by some developed countries), but the message in this paragraph is one-sided given rapidly rising emissions and other enviromental problems in China. | Taken into account - section has been revised |
| 10062 | 1 | 5 | 36 | 6 | 2 | This passage is mainly about China's effort to maintain sustainable development. Currently, China's four big cities have implemented vehicle purchase restriction. This kind of policy instrument is unique, convincing and has seldom been used in western countries. I suggest adding a piece of text describing this effort. | Rejected - this level of detail is not included in the exectuive summary. Such policies are discussed in some |
| 16969 | 1 | 5 | 36 | | | Claiming that developing nations have "made great efforts" is a bit of a subjective statement, particualrly with emissions trends and projections do not necessarily support "great efforts" by some people's interpretation. | Taken into account - text has been revised. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2329 | 1 | 5 | 37 | 6 | 15 | Their efforts cover all major mitigation measures- here, the term "all" so optimistic. It cannot be noted that all major mitigation measures have been adapted in all developing countries equally. The critical economic argument here is how BRICS examples comparable with generalization of developing countries. These are common mistakes in this high level assessment report or policy report. Here, I would like to quote the WHITE PAPER (5 September 2011) of Bloomberg" However, developing world officials and non-governmental organisations are accusing developed parties of failing to deliver on their pledges. And that only a small proportion of the promised funds are 'new and additional', with the rest diverted from other aid budgets or previously announced –according to a report by the Institute of Policy Studies, endorsed by Pakistan, Bangladesh and Solomon Islands. In addition to the financial implications, a failure to deliver the $30bn could exacerbate the resentments between developed and developing parties, which have already hindered progress towards a new global climate agreement" Citation:- www.bnef.com/WhitePapers/download/47 | Rejected - these are poltical arguments beyond scope of our chapter. Bloomberg's White Paper is not relevant for the IPCC report. |
| 8706 | 1 | 5 | 39 | | | This sub-section should probably discuss the debates over economic growth, and whether growth is sustainable in the long run. | Rejected - the debate over economic growth is not central to this chapter. Economic growth is discussed in section |
| 11716 | 1 | 5 | 40 | 6 | 2 | Many countries are playing leading role so that it is not natural to cite the example of only China. [For example, China has……(Xie, 2009; Guo, 2011; Ye, 2011)] should be deleted. | Taken into account - India was also an example. Added examples from |
| 11890 | 1 | 5 | 40 | 5 | 45 | Provide a refence for this statement. | Accepted - references added |
| 16970 | 1 | 5 | 40 | 5 | 45 | It might be worth stating how uncertain the economic and emissions data coming out of China are. Again, see the Guan et al. (2012) paper in Nature Climate Change as an example. With so many people and disparate sources, it is inevitable that the economic and emissions data would be alden with uncertainties, but explainging what they are, how they arise, and even how they might be reduced would be a huge benefit. | Rejected - generally countries with fast changes in the economy (e.g. REF in early 90s and China in 2000s) have larger uncertainties in compiling complete statistics. The discussion on |
| 3061 | 1 | 5 | 42 | 5 | 43 | Energy intensity values are meaningless because the values of GDP used are affected by inflation and variations in exchange rates. The increase in the yuan exchange rate and inflation in China make meaningless the advertised reductions of energy intensity. | Rejected - These variations are well known and the measures are still useful. The issue of exchange rate is not |
| 15275 | 1 | 5 | 42 | 5 | 44 | The report described the energy/carbon intensity target of China, should we mention "eleventh five year plan" and "twelfth five year plan" of China?, instead of just tell readers the range of the year. Because it is very useful to mention this by telling pelple China has its specific phase plan. | Rejected - This level of detail is not appropriate for this chapter. No action needed. |
| 4014 | 1 | 5 | 45 | | | should be "policy targets" not "policy goals". | Rejected - text is fine. No action needed |
| 6443 | 1 | 5 | 46 | 5 | 46 | The word 'dramatically' should be replaced with potentially, since CCS has never been demonstrated on a full-scale electric power plant. Similarly the next sentence should begin "Possible applications include…" | Taken into account - however, unable to find the word 'dramatically' anywhere in the text. Unable to locate for suggested |
| 16971 | 1 | 5 | 46 | | | The statistics on China's INSTALLED wind capacity can be a bit misleading because there are vast amounts of capacity that is not grid-connected and, therefore, does not produce any useable zero-carbon energy (yet). This speaks to larger issues of industrial policy that the report may not want to delve into, but it might be worth highlighting this aspect. | Noted - this is an important point, but we address it elswhere (and really needs to be addressed in the chapter on electricity/industry). As the comment |
| 16972 | 1 | 5 | 47 | 6 | 2 | Is this statement still true, post-Fukushima? | Taken into account - Statement is correct. We have not seen a significant retraction globally in nuclear |
| 4872 | 1 | 5 | 7 | | | [Del] "within which [governments] various actors have tried | Accepted - text revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12082 | 1 | 5 | 40 | 6 | 50 | The current text about China's climate change mitigation refer to efforts from the last few years and commitments for the next 5-10 years. I recommend noting also that China achieved significant decoupling of GDP from energy usage and greenhouse gas emissions from 1980-2000. Very few people are aware of that between 1980 and 2000 GDP grew over 6 fold whilst energy use only grew 2 fold in China. Please see Figure 3b and discussion in Levine, M. Zhou, N., Price, L. (2009) The Greening of the Middle Kingdom: The Story of Energy Efficiency in China. Lawrence Berkeley National Laboratories and US DOE. http://china.lbl.gov/sites/china.lbl.gov/files/LBNL-2413E.Story_of_EE_in_China.pdf | Rejected - this is too much focus on China, especially as other comments suggest we be less China-centric. |
| 7860 | 1 | 5 | 1 | | | Neither throughout nor at the end of section 1.2 did we find any explicit message. Is the key message that the 2° goal is not viable any more? Please be more explicit. | Rejected - The message seems clear enough based on other comments |
| 15085 | 1 | 5 | 2 | 5 | 3 | I propose to change: ¨Since AR4 there have been many developments in the world economy, emissions and policies related to climate change¨ by ¨Since AR4 there have been many CHANGES in the world economy AND SOCIETIES, COUNTRY emissions and policies related to climate change¨ | Rejected - proposed text is too complicated. No action needed |
| 15086 | 1 | 5 | 6 | 5 | 7 | I propose to include:¨ First, there have been large changes in the economic, SOCIAL, ENVIRONMENTAL and political context within which governments have tried to address the climate issue¨. Because the governments have taken different measures in order to preservate the communities, natural resources, among many others. | Rejected - proposed text is too complicated. No action needed |
| 12080 | 1 | 5 | 8 | 5 | 9 | General Comment - In both IPCC AR4 WGII Mitigation Report and again here in this draft there is a failure to recognise the fact that now many governments and research bodies have developed important economic/technical/policy studies on how to achieve, for nation X, deep cuts to GHG emissions by 2020 and 2050. These detailed "deep cuts by 2050" studies for each nation did not exist before 2000. The fact that these dtailed studies exist is very important as these studies provide national governments with studies relevant to their specific nation's conditions and stage of development. Such "national deep cut" studies/models compliment the IPCC WGIII Mitigation report work, and provide national government's with evidence to justify adopting the IPCC's recommended 2050 GHG targets. A sample of just some of the many "deep cut" studies includes; Interlaboratory Working Group (2000) Scenarios for a Clean Energy Future for the USA, Oak Ridge National Laboratory, Berkeley, CA, Lawrence Berkeley Laboratories, CA and National Renewable Energy Laboratory, CO. Department of Trade and Industry (2003) Our Energy Future – Creating a Low Carbon Economy, Energy White Paper, UK Department of Trade and Industry, Version 11.Saddler, H., Diesendorf, M. and Denniss, R. (2004) A Clean Energy Future for Australia: Energy Strategies, WWF, Canberra. National Institute for Environmental Studies (2005) Japan: Low Carbon Society Scenarios toward 2050, National Institute for Environmental Studies, Japan . Department of Trade and Industry (2007) Meeting the Energy Challenge: A White Paper on Energy, Department of Trade and Industry, UK. von Weizsäcker, E., Hargroves, K., Smith, M., Desha, C. and Stasinopoulos, P. (2009) Factor Five: Transforming the Global Economy through 80% Improvements Improvements in Resource Productivity, Earthscan, London. More such "deep cut" studies can be provided, if interested. | Taken into account - This is a good point. Examples of emission programs in other countries added. But to clarify, IPCC did not make this recommendation. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12081 | 1 | 5 | 8 | 5 | 9 | General Comment - Since the last IPCC AR4 WGIII Mitigation Report, there is one more key fact that "has been learnt" - namely that the co-benefits of action on climate change are significant (greater oil independance, reduced exposure to oil price rises, air pollution reductions, energy/water efficiency nexus opportunities, materials/energy efficiency nexus opportunities, healthier populations from active sustainable transport, biodiversity improvements, soil productivity improvements, national security co-benefits and poverty reduction co-benefits etc) . When these co-benefits are included in economic cost/benefit analysis it significantly reduces the overall net cost of action on climate change mitigation. This economic fact justifies andmotivates greater policy integration across government department's to enable a more integrated approach for action on climate change mitigation. Once these co-benefits are taken into account, then this strengthes the economic case for government's adopting a integrated "green growth" policy approach to climate change mitigation policy reform. see OECD (2012) Environmental Outlook to 2050: The Consequences of Inaction. OECD athttp://www.oecd.org/env/environmentalindicatorsmodellingandoutlooks/oecdenvironmentaloutlookto2050theconsequencesofinaction.htm and Smith, M. Hargroves, K. Desha, C (2010) Cents and Sustainability. Securing Our Common Future through Decoupling Economic Growth from Environmental Pressures. Earthscan.London. | Taken into account - This is a good point and we will add co-benefits into our discussion of the scale of the mitigation challenge |
| 3362 | 1 | 5 | | | | This section choses to rely on "green growth" for framing, a fair choice. However, a broad discourse is criticial of this concept, perceiving "green growth" as a greenwashing of "economic growth", camouflaging large scale projects with regressive distributive properties, which are in many cases still environmental harmful because of their scale, even if efficiency gains are substantial. Such discourses might reasonably reflected in the text. | Taken into account - combined with other comments |
| 4851 | 1 | 5 | | | | 1.2.1.1 This text is too "political": (i) important references to the efforts and positions of the developing countries, however, it is unclear why there is no word on the relevant activities and problems of the developed countries; (ii) it is also missing as a key message that all the good efforts taken together are not enough to achieve global s.d. and halt the global ghg-emissions. | Taken into account - other comments address this in other places of the text |
| 4250 | 1 | 5 | | | | I think that the increased recognition of climate change co-benefits including to health is an additional development since AR4 and should be added at this stage to the other 6 climate change mitigation strategies | Taken into account - we added more explicit discussion of co-benefits |
| 18421 | 1 | 5 | | 6 | | Sustainable development and green growth (pag 5 y 6) | Taken into account - combined with |
| 18422 | 1 | 5 | | 6 | | Again, an exaggerated optimism regarding the SD agenda in emerging countries and the “great efforts” they have done on SD and climate change (pag 5 last paragraph). Especially India, China and Brazil. BRICS meeting is anything else than rhetorical (pag 6 paragraph 3) | Taken into account - we will review text carefully after redraft to ensure balance and accuracy |
| 11017 | 1 | 5 | 10 | | | The title of the section is ‘Sustainable development and green growth’.<br>Comment: This presumes a consensus about growth as a goal. However, this is increasingly questioned. I suggest that the words ‘Sustainable development and a green economy’ are substituted.<br>Section 1.2.1.1 should also acknowledge the growing trend among developed countries to question whether ongoing economic growth is a desirable goal for developed countries. A suggested insertion, at the end of section 1.2.1.1, is: ‘There is also a nascent movement among some in developed countries to question the desirability and feasibility of ongoing economic growth for developed countries, if sufficient ‘space’ is to be provided for developing countries to raise their living standards.’ Ref: Schneider, F., Kallis, G., & Martínez-Alier, J. (2010). Crisis or opportunity? Economic degrowth for social equity and ecological sustainability. Introduction to this special issue. Journal of Cleaner Production, 18(6), 511-518 http://www.cemus.uu.se/dokument/msd2010-2011/article%20for%2024th.pdf. | Taken into account - there are lots of comments that point in different directions. Text has been revised to reflect multiplicity of goals and discussion on green growth is shortened. Suggested insertion was not added. |
| 17647 | 1 | 5 | 10 | | | This section lists several examples of sustainable development policies, yet these examples contain mostly absolute numbers that are of limited value if one does not know the initial levels or is given the relative change (e.g. p. 6, line 9 onwards: these numbers contain limited information without a relative comparison) | Noted - these examples are intended to be illustrations, not detailed treatment. No further action needed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15087 | 1 | 5 | 11 | 5 | 11 | I propose change: ¨Addressing climate change has become IN ONE OF THE MOST important component of sustainable development. | Taken into account - text has been revised |
| 15088 | 1 | 5 | 14 | 5 | 14 | To add: ¨ …..principles to harmonize economic AND SOCIAL development and environment protection¨ | Taken into account - combined with |
| 13248 | 1 | 5 | 14 | 5 | 14 | Sustainable development includes social equity, so I suggest to state: "(…) principles to harmonize economic development, social equity and environmental protection." | Taken into account - combined with other comments |
| 6300 | 1 | 5 | 14 | 5 | 14 | Add social development here. The Brundtland report supported the notion of sustainable development as including social, environmental and economic… | Taken into account - combined with other comments |
| 15089 | 1 | 5 | 17 | 5 | 17 | To add: ¨ …..economic, SOCIAL and environmental goals¨. Because for example the fight against the poverty and hunger are social aspects, and sustainable development includes the three aspects. | Taken into account - combined with other comments |
| 8218 | 1 | 5 | 17 | 5 | 17 | Authors should include “social goal” as well, along with “economic and environmental goals”. Sustainable development encompasses the three pillars: environmental, economic and social dimensions. | Taken into account - combined with other comments |
| 15090 | 1 | 5 | 18 | 5 | 19 | To change: ¨……climate change is becoming IN ONE OF THE MOST key environmental challenge of sustainable development AT THE PRESENT AND IN THE FUTURE ¨. Because the anthropic overexploitation and degradation of natural resources is in this moment the most important environmental challenge. | Taken into account - combined with other comments |
| 15091 | 1 | 5 | 20 | 5 | 21 | To include: ¨Governments have many different goals, including economic development, ENVIRONMENTAL PROTECTION, poverty alleviation and living standard improvement.¨ | Taken into account - combined with other comments |
| 15092 | 1 | 5 | 22 | 5 | 24 | To change in the following form: ¨Of paramount importance are the goals and interests framed in DEVELOPED COUNTRIES, MAIN CONTRIBUTORS TO THE ACTUAL SITUATION, AND IN developing countries, especially the emerging economies, whose economies are expanding rapidly. ¨ | Rejected - suggested text is too complicated |
| 15093 | 1 | 5 | 30 | 5 | 32 | To change: ¨Mindful of these impacts, these countries have acknowledged that climate change should be tackled as ONE important component of sustainable development—such as through “green growth” strategies | Taken into account - combined with other comments. Overall, the section |
| 8219 | 1 | 5 | 30 | 5 | 30 | “mindful of these impacts, these countries have acknowledge that climate change should be tackled as the important component of sustainable development – such as “green growth”..<br>Comments: Some references on this for different country context would be helpful | Taken into account - combined with other comments, we will beef this up a bit. Overall, the section has been revised |
| 4246 | 1 | 5 | 33 | 5 | 33 | Not just health care improvement but more broadly health improvement since many determinants of health lie outside the healthcare system | Taken into account - combined with other comments, we are beefing up |
| 5383 | 1 | 5 | 34 | 5 | 34 | adapt to climate impacts --- should be -- adapt to climate change impact | Accepted - text changed, but overall section has been revised |
| 15094 | 1 | 5 | 36 | 5 | 37 | Add: ¨ Through this approach, developing countries have made great efforts on sustainable development and addressing climate change WITHOUT COUNT IN MANY TIMES WITH THE ALL NECESARRY FINANCIAL RESOURCES AND TECHNOLOGIES ¨ | Rejected - suggested text is too compliated; also, combined with other comments |
| 10975 | 1 | 5 | 36 | 6 | 2 | It is stated that only developing countries tried hard in mitigation; however, developed countries also contributed to take measures to global warming through CDM. Therefore, the paragraph around here should be amended. | Taken into account - paragraph added in section 1.2.1.1 discussing efforts by industrialized countries, though |
| 4359 | 1 | 5 | 45 | 6 | 2 | presenting all low carbon energy sources, such as hydro-power or nuclear power, as sustainable is questionable | Noted - there is a wide range of reviews; our text reflects that |
| 11348 | 1 | 5 | | 6 | | It might make sense to introduce the situations surrounding developed countries (not just developing countries). If it is discussed elsewhere in the report, that can be cited. | Taken into account - paragraph added in section 1.2.1.1 discussing efforts by industrialized countries. Combined with |

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| 3886 | 1 | 5 | 20 | 5 | 35 | This section is written as if all countries are either democracies or governed by benevolent despots. However, according to a report by the Economist Intelligence unit (http://graphics.eiu.com/PDF/Democracy_Index_2010_web.pdf) around a 3rd of the world's countries are led by authoritarian regimes. As is all too evident some of them commonly put things like the maintenance of power, subjegation of women and/or the elimination of rival tribes ahead of professed goals whose main purpose might be to impress the democratic world. Should not the text distinguish more clearly between what regimes profess to do and what they actually do? Formally what is needed is a positive theory of the exercise of state power. (For literature on this see Buchanan, Tulloch and Mancur Olsen) | Rejected - this takes us somewhat beyond our mandated. |
| 17684 | 1 | 5 | 11 | 5 | 11 | "has becomed the important component" for "the most important" unless al the others are in the same | Taken into account - combined with |
| 17686 | 1 | 5 | 33 | 5 | 33 | these countries have acknowledged "in greater or lesser extent" that climate change… | Taken into account - section has been |
| 17687 | 1 | 5 | 36 | 5 | 36 | Probably the BRICS but not all developing countries have made "a great" effort on sustainable development | Taken into account - section has been |
| 7005 | 1 | 5 of 33 | 21 | 5 of 33 | 21 | Add "in equity conditions" after the word "improvement". | Rejected - edit is not needed |
| 7006 | 1 | 5 of 33 | 38 | 5 of 33 | 38 | Add "and renewable" after "low carbon". | Rejected - edit is not needed |
| 7007 | 1 | 5 of 33 | 41 | 5 of 33 | 41 | Add "renewables," after "advance", and before "green". | Rejected - edit is not needed |
| 16053 | 1 | 6 | 12 | 6 | 19 | This paragraph paints a too rosy picture of BRICS, a group which has recently decreased its carbon efficiency and been very reluctant on international negociations. Their important political role is to be recongnized with more balance | Taken into account - combined with other comments. Text has been revised, discussion on BRICS has been removed |
| 6457 | 1 | 6 | 12 | 6 | 28 | Redundent. To delete these two paragraphs. | Taken into account - the paragraphs have been shortened and revised |
| 16891 | 1 | 6 | 12 | | 19 | This demonstrates the myth -- if we only lower CO2 emissions by halting use of energy, this could indeed cap growth -- but in fact there are many technologies that are only somewhat more expensive. Economic and energy system modeling demonstrates that growth is only slightly reduced but does not in fact reverse. See Bossetti and Frankel. | Taken into account - the paragraph has been removed |
| 10416 | 1 | 6 | 12 | 6 | 19 | This has to be enumerate rather than wordy. Targets envisoned should be provided | Noted - comment not pertinent in this |
| 4602 | 1 | 6 | 13 | 6 | 13 | "this area"; which one are you talking about? Energy technologies? Please, clarify. | This paragraph has been removed. Comment is no longer relevant. |
| 16975 | 1 | 6 | 16 | | | It might be worth expanding how "sustainable and inclusive growth" differs from "cappin development" | This paragraph has been removed. Comment is no longer relevant. |
| 4603 | 1 | 6 | 19 | 6 | 19 | I would use Rio+20 as a reference as well | The paragraph has been removed. Comment is no longer relevant |
| 16054 | 1 | 6 | 20 | 6 | 28 | This paragraph paints a too rosy picture of two nations that have a blurred record for deforestation. Could the paragraph quote a "best case" country that have at least stopped cutting its forests? | Taken into account - there are countries that have made a lot of progress, and in the industrialized world there is net growth. But to caution that an overall situation is difficult to assess, added sentence "It remains difficult, however, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8709 | 1 | 6 | 20 | 6 | 28 | The Amazon is the region of the Brazil with the largest number of protected areas. Over a third of its territory falls into one protection regime, whether in the form of conservation units, indigenous lands, either in military areas. Between 2003 and 2009, 70 federal conservation units were created with a total area of 26.4 million hectares. In all, the country has with 310 of these areas, the equivalent of 76.5 million hectares (Brazilian Ministry of Environment http://www.mma.gov.br/). This fact is one of the reasons to explain the decrease in deforestation by the constitution of a blocking barrier formed by the conservation unities.<br>Another strong reason to the deforestation decrease is related to economic strategies adopted by the government with the intent of discourage the agriculture in illegal areas. Among the main agreements signed is the Soy Moratorium, which prohibits the export of soybeans produced in illegal areas, and the pact with the loggers, which determines that the private sector does not buy timber from deforested areas.<br>However, the deforestation problem in Amazon is strongly related to social problems, where people don't have options to deal with the absence of development and are driven to use the land in the wrong way. In this sense, the success implementation of the Nagoya protocol can take this region to a different overview by the appreciation of the natural products of the forest instead the substitution of natural vegetation by monocultures. | Taken into account - this is a helpful comment, but action item is unclear. This paragraph was removed in latest edit |
| 16976 | 1 | 6 | 20 | 6 | 28 | As Indoensia accoutns for some 25% of the global GHG emissions from LULUCF, it's a glaring omission not to say something about what they are doing (or not doing) with respect to mitigation of their LULUCF emissions | The last few sentences of the paragraph have been removed. Comment is no |
| 9462 | 1 | 6 | 23 | | 25 | It remains inconclusive whether this reduction in deforestation was due to prices or policies. For more see - Assunção, J., e Gandour, C. C., & Rocha, R. (2012). Deforestation Slowdown in the Legal Amazon: Prices or Policies? Rio de Janeiro, Brazil: Climate Policy Initiative. | Accepted - added text "It remains difficult to disentangle the role of policies from other factors that affect incentives |
| 7863 | 1 | 6 | 23 | 6 | 25 | Clear-cutting of rain forests is not simply forestry; this is a euphemism and an example of the non-neutral language. | Rejected - we think the language is ok here; we clearly signal the variety of |
| 16892 | 1 | 6 | 29 | | 39 | Low carbon emitting energy technologies will likely remain more costly than conventional techs for the foreseeable future. The question is how can developing countries justify paying the premium in the face of other development needs. There really is not a big tradeoff here, but it looks like it at first glance, especially if one does not really understand how trade, especially emissions trading, fits into this picture. | Taken into account - This is an important point, i.e. whether changing accounting system can encourage the realization of low carbon development or not. This may lead to the shrinkage of international trade itself. Paragraph has been revised. The discussion on |
| 11717 | 1 | 6 | 3 | | | With regard to No.2, [other] is not needed. | Rejected - text is fine. No action needed |
| 6456 | 1 | 6 | 3 | 6 | 11 | Make it shorter. To delete the sentence after "For example". | Taken into account - combined with other comments, the paragraph has |
| 16977 | 1 | 6 | 30 | 6 | 32 | You must insert SOME between OF and DEVELOPING, as the 2012 PBL-NEAA report, "Trends in Global CO2 Emissions" clearly showed that per capita emissions in China, Iran and South Africa are on par with those of developed EU nations | Accepted - text inserted |
| 11018 | 1 | 6 | 32 | | | "Low carbon technologies available today are not sufficient to offset the emission increase driven by the economy growth." This is unclear and should be replaced by "Low carbon technologies available today by themselves are unlikely to be sufficient to offset the emissions increase driven by economic growth, but other emissions drivers besides technological progress need to be taken into account." | Taken into account - sentence replaced with:" Current investment in low carbon technologies is insufficient to offset the emissions increases associated with projected economic growth in both |
| 11019 | 1 | 6 | 32 | | | 'Low carbon technologies available today are not sufficient to offset the emission increase driven by the economy growth'. This is unclear and should be replaced by "Low carbon technologies available today by themselves are unlikely to be sufficient to offset the emissions increase driven by economic growth, but other emissions drivers besides technological progress need to be taken into account." | Taken into account - combined with other comment |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13363 | 1 | 6 | 32 | | | This sentence is potentially inaccurate. It confuses policy intent and constructed capacity with technological capabilities. 'The range of low carbon technologies available today' refers ambiguously to what has been installed to date, and to the technical abilities of existing technologies. It is correct if the former and incorrect if the latter, as a smorgasbord of low carbon technologies could provide for all needs (with a range of economic caveats). I suggest 'Current investment in low carbon technologies is insufficient to offset the emissions increases associated with projected economic growth in both developed and developing countries'. | Taken into account - combined with other comment |
| 14784 | 1 | 6 | 32 | | 33 | "Low carbon technologies available today… growth" sounds like a statement about technologies, when it is fact a statement about costs and affordability. | Taken into account - combined with other comment |
| 7864 | 1 | 6 | 32 | 6 | 33 | In our opinion, the claim that "low carbon technologies available today are not sufficient to offset the emission increase […]" is false (e.g. SRU 2011, Jacobson/Archer 2012). In any case, rather than portraying this as a well-known fact you should discuss the evidence supporting and challenging your claim and link this with the discussion in chapter 6. | Taken into account - combined with other comment |
| 16978 | 1 | 6 | 32 | 6 | 33 | The statement about low carbon technologies avaialble today not being sufficient to offset the emissions increase driven by economoci growth seems odd. Certainly, solar, wind and nuclear are sufficient zero-carbon technologies - it's economics more than anytihng that precludes these from advancign faster than economic growth, no? | Taken into account - combined with other comment |
| 16979 | 1 | 6 | 33 | 6 | 39 | In a world with sovereign boundaries and international trade, the idea of "traded carbon" is inevitable. Counting physical emissions within a given nation's boundaries is challenging enough, framing such a large piece of this report around 1 or two recent studies - while an interesting academic exercise - does not seem to be a valuable, practical contribution to the policy-relevant discussion currently given all the uncertainties in accounting. | Taken into account - In fact, the Waxman-Markey bill in the US envisioned doing just that. And there are varied studies by WTO lawyers looking at legal feasiblity of this. France is making moves in this diretion; ditto EU more generally. This is important. See, for example, the next comment |
| 16055 | 1 | 6 | 34 | 6 | 39 | It is very helpful to recognize the role of indirect emissions. Can it be noted that it is not yet discussed in the international negociation? | Rejected - our job is to stick to the science here, so we won't make this |
| 7865 | 1 | 6 | 34 | 6 | 39 | Embodied emissions clearly is an important topic, especially for developing countries. We whish to ask, though, how the problem of embodied emsissions can be integrated into negotiations given the complexities of world trade. There is a realitic fear/possibility that this will only exaggerate disagreement and hamper successful negotiations. | Rejected - how this should be done is not our task, but see responses to comments at line 366 |
| 17729 | 1 | 6 | 37 | | | the phrase "much improved technology" in the sentence "Without much improved technology, accounting systems and other arrangements the international economy system doesn't yet support and encourage the realization of low carbon development" does not make sense | The sentence has been removed. Comment is no longer relevant |
| 14785 | 1 | 6 | 37 | | 39 | "Without much improved…" make the inability to shift to low carbon development paths appear to be the result of inadequate technologies or accounting systems, which are not the ultimate reasons. It would be much more helpful if this chapter actually discussed the reasons that mitigation has not been undertaken at a scale consistent with climate goals. | Noted - much of that discussion is in the realm of political choices and not the subject of scientific analysis. No action needed |
| 3363 | 1 | 6 | 4 | 6 | 7 | "driven by sustainable development strategies that emphasize the interconnection of many different policy goals such as energy and food security, local pollution control and climate change. For example, Brazil is one of the leading countries of bio-ethanol production." Does this example imply, that Brazil consciously designed a bioethanol policy to balance all these policy goals? Given the contention, the various calculation done on this issue, and the uncertainty of outcomes as induced by present and future Brazilian bioethanol it is a courageous move to take Brazilian ethanol as an example. Just to scrap on the surface of the discussion, here is an interesting study on the climate effects, and the interaction with livestock markets, of Brazilian bioethanol: Lapola, D. M. et al., Indirect land-use changes can overcome carbon savings from biofuels in Brazil. PNAS 107 (8), 3388 (2010). | Taken into account - No, the sentence means just what it says and does not imply anything. The example of Brazil in this paragraph was removed during editing. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4604 | 1 | 6 | 40 | 9 | 11 | Section 1.2.1.2 is a very good introductory section | thank you |
| 2242 | 1 | 6 | 40 | 11 | 16 | The SRES Scenarios need to be completely changed to take into account this material | Rejected - No reference to SRES is made in text. In AR5 in Ch.6 the new RCP scemarios are discussed and compared with present emissions. |
| 7866 | 1 | 6 | 40 | 9 | 11 | What is the the purpose of the descriptive anaylsis of the crisis? This section can be read as a complete affirmation of traditional GDP growth (see comment 25). | Rejected - Comment refers to motivation and not to text. No action needed. |
| 11268 | 1 | 6 | 41 | 6 | 42 | China, India, etc. are named explicitly everywhere in the report. Why do not say that the crisis started in poorly regulated financial speculation in the USA (“subprime crisis”). As matter of fact, Mexico and Turkey are also members of the OCDE. | Rejected - we have some discussion of the origins, but much detail and opinion on that matter is beyond scope of this |
| 3887 | 1 | 6 | 41 | 6 | 42 | The emphasis this sentence/citation puts on poorly-regulated financial speculation as a cause does not seem to be a mainstream view. The US federal inquiry into the causes might be a more authoritative source to cite (there is a link here http://www.nytimes.com/2011/01/26/business/economy/26inquiry.html). Note that the Wikipedia discussion of the causes here (http://en.wikipedia.org/wiki/2007%E2%80%932012_global_financial_crisis) identifies the bursting of the US housing bubble and the lack of provenance of the pervasive CDOs as major issues, and does not refer to financial speculation. Note too the central role in US housing finance by Fannie Mae and Freddie Mac. | Taken into account - phrase on the cause of the financial crisis has been removed |
| 4875 | 1 | 6 | 42 | | | {Add} [Del] "concentrated in [the] {some} OECD countries | Taken into account - combined with |
| 4876 | 1 | 6 | 44 | | | {Add} "largest financial institutions in the US, {Western} Europe | Taken into account - combined with |
| 4601 | 1 | 6 | 6 | 6 | 6 | I am not sure I would use bio-ethanol as the leading example of sustainble development policy in an introduction as bio-ethanol is controversial in some ways it is produced (e.g. corn but not sugar canes nor cellulose) | Taken into account - combined with other comments |
| 16973 | 1 | 6 | 6 | | | The statement on Brazil's bio-ethanol production needs to be expanded because there are many ways in which bio-ethanol production could NOT be sustainably developed. If Brazil is doing it in a sustainable way, it deserves to be elabvaorated upon just how they are achieving that so other nations can follow suit if desired. | Taken into account - combined with other comments |
| 16974 | 1 | 6 | 8 | 6 | 11 | When was this Solar Initiative in India launched? What has been committed in terms of resources and has anything been achieved yet? | Taken into account - Sentence has been added at the end of paragraph to include |
| 18423 | 1 | 6 | | | | There are inaccurate generalization regarding developing countries and climate mitigation, for example regarding carbon sinks (pag 6 par 4).<br>Problem with the concept of energy intensity (pag 5 last paragraph) and with Brazilian data regarding deforestation rates (pag 6 paragraph 4). □ | Taken into account - combined with other comments. No action needed |
| 3958 | 1 | 6 | 3 | 6 | 11 | Information about India is missing so it may be included."In India, thermal power plants constitute 65% of the installed capacity, hydroelectric about 21% and rest being a combination of wind, small hydro, bio-mass, waste-to-electricity, and nuclear. Moreover, India is rich in biomass and has a potential of 16,881MW (agro-residues and plantations), 5000MW (bagasse cogeneration) and 2700MW (energy recovery from waste). Biomass power generation in India is an industry that attracts investments of over Rs 600 crores every year, generating more than 5000 million units of electricity and yearly employment of more than 10 million man-days in the rural areas.This traditional biomass fuel – fuel wood, crop waste and animal dung is a potential raw material for the application of biomass technologies for the recovery of cleaner fuel, fertilizers and electricity with significantly lower pollution. During 2011, some 45000 small scale biogas plants were installed. Cumulatively, India has installed 4.44 million small scale biogas plants. " | Rejected - this is way too much detail for our chapter |
| 15095 | 1 | 6 | 37 | 6 | 39 | Add: ¨Without much improved technology, accounting systems,FIANCIAL ASISTANCE FOR DEVELOPING COUNTRIES, and other arrangements the international economy system doesn’t yet support and encourage the realization of low carbon development. | this paragraph has been revised. The discussion on accounting has been removed. |
| 4360 | 1 | 6 | 6 | 6 | 6 | same comment for bio-ethanol | Taken into account - combined with |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4852 | 1 | 6 | | | | 1.2.1.2 It is a fair, however, a too detailed economic analysis of the world macroecon. situation in terms of its relevance for the changing c.c. policies. Concerning the implications (pages 8-9), an essential one is not mentioned, namely the drop of the ghg-emissions due the decrease of econ. growth rate in many developed countries. | Noted - our assessment is balanced |
| 15524 | 1 | 6 | 40 | | | The macroeconomic narrative makes sense to me but covers some potentially controversial topics. There are, for example, differing views on the relative importance of financial system factors (such as poor regulation) and of saving behaviour (e.g. excessively low saving rates in rhe USA, excessively high ones in China). I would suggest shortening this section substantially and keeping away from discussing the causes of the macroeconomic crisis. This is not the place to try to fashion a consensus view of those causes. | the first three paragraphs in this section have been condensed and causes of the crisis have been removed. |
| 15468 | 1 | 6 | 40 | | | It should be mention that the 2007 Finanical Crisis caused a significant decrease in emission rates in the first couple of years, due to a major decline in economic activity in many countries (as shown in Fig 1.1). This would highlight the importance of global economic activity on emissions from the current mix of energy sources. Although it is briefly mention in section 1.3.1, it should be also mention in the earlier section | Taken into account - we mention this already in this section but have expanded it a bit. |
| 13249 | 1 | 6 | 43 | 6 | 43 | "The crisis spread rapidly in the fall of 2008 (…)". The reference to a season is biased according to the (northern or southern) hemisphere. It should be better to reference a month. | Rejected - 'fall' is fine |
| 4090 | 1 | 6 | 43 | 6 | 43 | Delete reference to Sornette & Woodward - too obvious a fact, large body of literature. | Rejected - reference is fine as is |
| 17688 | 1 | 6 | 33 | 6 | 34 | low carbon technologies are not sufficient? In what way? New energy sistems arnt influenced so much by the technological locl in | Taken into account - combined with other comments |
| 7008 | 1 | 6 of 33 | 32 | 6 of 33 | 32-33 | Add "if BAU development is considered to be the only alternative; a very different outcome would be attained in the case that more efficient final use technologies could be accessible to those countries", before the period. | Rejected - suggestion is too complicated - no action needed |
| 7009 | 1 | 6 of 33 | 39 | 6 of 33 | 39 | Add "or zero" before "carbon development". | Rejected - edit is not necessary. no |
| 3687 | 1 | 7 | | | | Page seven figure needs explanation | Taken into account - explanation seems sufficient, but we will recheck with final |
| 17730 | 1 | 7 | | | | If possible, include the the data for 2011. By the time this report is published, latest data in this figure 1.1 will be four years old; this will make it consistent with the sentence in line 23 - "….since then..." Also include South African data in this figure. | Figure will be revised to show available data for world regions. |
| 16984 | 1 | 7 | | | | This is a really valuable and interesting figure. Mexico should be included. Perhaps use the Major Economies Forum (MEF) nations (which account for some 75-80% of global GHG emissions) as a guide for this framing. | Figure has been redone. Countries are now grouped so comment is no longer |
| 9109 | 1 | 7 | 11 | 7 | 12 | To my knowledge assessments exist where cities in general seem to cause higher GHG loads than the rest of the country on per capita basis, e.g. Heinonen and Junnila (2011c). | Rejected - this work is misleading because it needs to control for income and trade; too much depth for our |
| 16983 | 1 | 7 | 12 | 7 | 14 | This statement / theme ought to be connected back to the earlier discussion/framing on transboundary carbon emissions (incurred via trade) - if that framework persists. This rgowth in trade has facilitated poverty alleviation, economic growth and an increased standard of living in many developing economies. | Rejected - we have the right balance here. No action needed |
| 9110 | 1 | 7 | 14 | 7 | 16 | I don't understand the sentence. If this refers to cities having lower per capita footprints, the comment above apply. | Rejected - we don't see the relevance of the comment to the text. No action |
| 15241 | 1 | 7 | 16 | | | Euro area is large compared with, for example, the UK, is is a fair comparison? | Rejected - figure has been redone. Countries are now grouped so comment |
| 15529 | 1 | 7 | 16 | | | No African or Middle Eastern country mentioned? | Rejected - figure has been redone. Countries are now grouped so comment |
| 14786 | 1 | 7 | 19 | | 20 | Some scholars would argue that it is premature to claim that growth has been decoupled (as is indeed acknowledge in the parenthetical statement at line 23). | Rejected - this is about macroeconomic growth patterns. Such details is outside the scope of this chapter. No action |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 11393 | 1 | 7 | 19 | 7 | 26 | There is currently no consensus among economists about the decoupling of growth rates between developed and developing countries. The theory of decoupling should not be extended. The unprecedented acceleration of growth in the developing world in the new millennium in comparison with developed economies is due not so much to improvements in underlying fundamentals as to exceptionally favourable global economic conditions, shaped mainly by unsustainable policies in advanced economies. The only developing economy which has had a major impact on global conditions, notably on commodity prices, is China. However, growth in China has been driven first by a rapid expansion of exports to developed economies and more recently, after the global crisis, by an investment boom, neither of which is replicable or sustainable over the longer term. To maintain a rapid growth, export-led Asian economies need to reduce their dependence on foreign markets. For Latin American and African commodity exporters, gaining greater autonomy and achieving rapid and stable growth depend on their success in reducing reliance on capital flows and commodity earnings – the two key determinants of their growth which are largely beyond national control. See for example Yilmaz Akyuz, The Staggering Rise of the South? (Research Paper 44, South Centre, March 2012) | Rejected - this is about macroeconomic growth patterns. Such details is outside the scope of this chapter. No action needed. |
| 9111 | 1 | 7 | 20 | 7 | 28 | There is also evidence that the spatial form affects all other consumption choices and thus the emissions on a much wider scale than often taken into account. | Rejected - This level of detail is outside the scope for this chapter |
| 14787 | 1 | 7 | 27 | | 28 | "especially in LDCs" is not necessary | Rejected - other comments suggest the opposite. no action needed |
| 3306 | 1 | 7 | 3 | 7 | 3 | I don't understand this sentence. Is there a missing noun? | Accepted - text has been revised |
| 16056 | 1 | 7 | 3 | 7 | 10 | "Developping countries were generally not affected" is an euphemism | Rejected - At the time of this writing, develping countries ARE being affected, |
| 16057 | 1 | 7 | 3 | 9 | 11 | two pages of development on the economic crisis is too much. Page 8 until page 9 line 11 is more relevant to show shipting patterns of the internation economy. | Taken into account - this section has be revised to be more concise |
| 7144 | 1 | 7 | 3 | | 4 | The sentence seems to have an extra word, 'with', near the end of the sentence. | Taken into account - combined with |
| 16980 | 1 | 7 | 3 | 7 | 4 | Incomplete sentence | Taken into account - combined with |
| 16981 | 1 | 7 | 5 | 7 | 9 | If this is true, it definitely needs a citation | Taken into account - text has been revised and shortened. Eliminated need |
| 16893 | 1 | 7 | 9 | | | Suggest the following changes -- delete "small, open and export oriented" and at end of sentence add "closely linked through trade with countries which were more directly impacted by the financial crisis." Trade helps countries grow and develop -- it is not helpful to developing countries or to climate policy to suggest that trade is a bad thing. | Rejected - Trade also exposes countries to the fortunes of their trading partners. The text here does not suggest that trade is a bad thing but points to the |
| 16982 | 1 | 7 | 9 | 7 | 10 | This statement ought to be quantified - has the recession led to a significant and persistent delcine in FDI and ODA? | Rejected - we think the language is ok here |
| 18424 | 1 | 7 | | 9 | | World macroeconomic situation<br>There is very positive vision of the role of developing countries in the 2008 financial crisis and its aftermath (pag 7, 2 y 3 paragraph).<br>Saying that technological innovation “has shifted” to large emergent economies is an exaggeration (pag 9 1 paragraph) | Accepted - the sentence has been revised and no longer says specifically a shift to emerging economies but more generally "has accelerated shifts in the global landscape for innovation" with a cite |
| 5384 | 1 | 7 | 16 | 7 | 16 | This figure should include: South Africa (as BRICS country) and also should include example from Africa and Example from Gulf oil rich countries….. | Rejected - figure has been redone. Countries are now grouped so comment |
| 4247 | 1 | 7 | 28 | 7 | 29 | Where climate change mitigations have been linked to... | Accepted - word added |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12083 | 1 | 7 | 3 | 7 | 4 | The current text is not entirely correct where it says that "The financial crisis ended a seven-year period of substantial expansion of the global economy and with it a period of steadily rising and volatile with material and resource prices." Since the GFC started in late 2008, after a fall in material and resource commodity prices in 2009, resource commodity prices have continued to rise in 2010, 2011 and 2012. In 10 years, from 2001-2011, commodity price rises have eliminated the entire resource commodity price falls from the previous 100 years. Please see "Exhibit 6" in McKinsey Global Institute (2012) The Resource Revolution - Full Report. McKinsey Global Institute. pp30 at http://www.mckinsey.com/insights/mgi/research/natural_resources/resource_revolution | Taken into account - sentence has been revised |
| 3545 | 1 | 7 | 4 | 7 | 4 | 'volatile with material…' - delete "with" | Accepted - sentence has been revised |
| 3688 | 1 | 8 | | | | Page 8, the source of bullet points statement (whose statements are these?) | Noted - these are our assessments |
| 10461 | 1 | 8 | | | | Not clear exactly what "energy" relates to since oil is decoupled. The web site graph gives only "fuel (energy) index". Which specific oil commodity is "oil"? May need a footnote to the caption to explain. But oil and energy are basically the same curve. Why have oil at all? Also put "Agr. Raw.mat." in full. | Taken into account - this figure to be redrawn and simplified in parallel with SOD |
| 15531 | 1 | 8 | 12 | | 13 | Asian countries' policies with respect to building up foreign exchange reserves were also important. If global imbalances are to be discussed, they should not be ignored. But perhaps the whole issue could be put aside. | Taken into account - the discussion has largely been put aside. |
| 11394 | 1 | 8 | 12 | 8 | 12 | Perhaps another reference could be found in addition to the Lamy speech. Furthermore, additional references and discussion should also be provided for the argument that such a shift to emerging economies might also not take place given the extent to which they have still not decoupled from developed economies. | the paragraph is revised and the sentence has been removed. Comment is no longer relevant. |
| 15530 | 1 | 8 | 13 | | 14 | This is an example of a potentially controversial statement that is not necessary in this context. For a different view, see Bowen, A, and K Mayhew (2008). 'Globalisation, import prices and inflation: How reliable are the 'tailwinds'?' Bank of England Quarterly Bulletin, Q3, London. | the paragraph is revised and the sentence has been removed. Comment is no longer relevant. |
| 16988 | 1 | 8 | 13 | 8 | 17 | Citations are needed | the paragraph is revised and the sentence has been removed. Comment |
| 4466 | 1 | 8 | 17 | 8 | 19 | This sentence seems out of place and is incomplete. There were several causes of the financial crash other than "lax regulation," and the rest of the paragraph pertains to the current macroeconomic situation, not that which prevailed prior to the crash. | the paragraph is revised and the sentence has been removed. Comment is no longer relevant. |
| 16989 | 1 | 8 | 19 | | | we didn't know the bust was going to be "inevitable", so suggest dropping the term. | good point but the paragraph is revised and the sentence has been removed. |
| 2330 | 1 | 8 | 19 | 8 | 21 | Obviously,it is clear the connection between financial crisis and extreme weather. But in report like IPCC, it should be elaborated logically this double exposure on countries rather than just one sentence. | Rejected - The commenter may have misunderstood the text as we do not say |
| 4467 | 1 | 8 | 24 | 8 | 27 | It is premature to assert that "the momentum in global economic growth has shifted to the BRICS". They have been doing well in recent years, but future growth is notoriously difficult to predict. "Momentum" is not a concept that applies to economic growth. | Taken into account - text is revised |
| 11395 | 1 | 8 | 24 | 8 | 27 | There should also be a discussion here to highlight the possibility that such shift in momentum of grlobal economic growth, and hence a shift in future responsibility for global emissions, might not take place as expected or forecast due to the impacts of the current and future economic crisis as well as the potential impacts of climate change on emerging economies' growth and development. | Taken into account - text is revised to provide more clarity |
| 18408 | 1 | 8 | 25 | | 25 | Are the BRIC´S guilty?. Emissions are growing without BRIC´s?, bullet is not clear. There also no statements about the finally results of the Kyoto Protocol. | Taken into account - other edits to this line will address this point to provide |
| 9783 | 1 | 8 | 28 | 8 | 30 | Embedded emissions should be stressed throughout the report; when reduction targets are discussed for international agreements, the point of consumption of the final good should be taken into consideration when setting country-specific reduction targets; there is a whole body of literature on virtual emissions and national footprints that could be considered here. | Taken into account - we address embedded emissions a lot |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16894 | 1 | 8 | 28 | | 30 | Suggest adding additional sentence at end of this bullet point: "Consumption of imported goods is driving emissions growth in countries which have gained more share of global manufacturing." | Accepted - added phrase "suggesting the need for additional or complementary accounting systems that reflect the ultimate consumption of manufacturing goods that cause emissions rather than just the geographical place where |
| 3307 | 1 | 8 | 31 | 9 | 2 | This bullet point is unintelligible. | Taken into account - paragraph has |
| 7145 | 1 | 8 | 31 | | 33 | The direction in the 'shift in priorities' is not clear. The sentence might make more sense if the clause read: 'among them has been a shift,at least within the countries where economic growth remains sluggish, away from adopting climate policies on the own.' | Taken into account - paragraph has been revised for clarity |
| 16985 | 1 | 8 | 5 | 8 | 6 | "a wave of anxiety driven by public debt threatens the world economy" deseres a citation | paragraph has been removed. Comment |
| 16986 | 1 | 8 | 6 | | | "Several highly indebted OECD countries in Europe…"; again, these nations should be listed so a complete snapshot of the current situation in the world is given, while also allowing posterity to read this report and assess what each nation has done, what impact it has had, etc. | Rejected - This level of detail is beyond the scope of the chapter. No action needed |
| 8404 | 1 | 8 | 8 | 8 | | It is worth noting that the economic crisis doesn't concern energy companies, the revenues and profits of biggest fossil-energy companies in the last years have been enormous, and often increasing substantially from the previous years.<br>See http://money.cnn.com/magazines/fortune/global500/2011/full_list/ | Rejected - no scientific evidence/publication provided to support changes suggested by the reviewer. No action needed |
| 8473 | 1 | 8 | 9 | | 21 | It may be helpful to note here that comparative advantage does often translate into significant disparities at the population and individual level, which may exacerbate the impacts of climate variability | Rejected - This is a good point but is too much detail here |
| 17403 | 1 | 8 | 9 | 8 | 12 | This point may not be relevant for food production for a number of reasons such as finite amount of arable / grazeable land (and fishable waters) and the large inefficiency of further clearing of tropical forests for food production. Consider including a footnote for this caveat. | Rejected - this point is not correct. No action needed |
| 16987 | 1 | 8 | 9 | 8 | 11 | Many economists would argue that this is not what has driven the shift in productivity so much as cheap labor and booming markets in emerging economies. | Rejected - there are mixed views on this. This paragraph has largely been revised. |
| 12084 | 1 | 8 | 3 | 8 | 4 | The current text simply says "Governments responded to the crisis in many different ways, often with fiscal stimulus packages as well as support to ailing banks." It is relevant for the IPCC to note very briefly in one sentance that "many national and state government's focused significant percentages of their "stimulus packages" on initiatives which were designed to simultaneously achieve climate change mitigation whilst creating jobs and boosting the economy. This is because many climate change mitigation strategies have a relatively good economic multiplier." This futher evidences the fact that there has been an historic shift amongst decision makers globally to now view climate change mitigation as an activity that stimulates the economy. Please see OECD (2011). Towards Green Growth. OECD, Paris, France. Please see HSBC Global Research (2009) Building a green recovery Governments allocate USD470bn and Counting. HSBC Global Research at http://www.hsbc.com/1/PA_esf-ca-app-content/content/assets/sustainability/090522_green_recovery.pdf | Rejected - there are mixed views on this, and other comments suggest we shorten this section. So no edits will be taken on this point, but we will add the OECD green growth citation elsewhere. |
| 8220 | 1 | 8 | 9 | 8 | 12 | While talking about the impact of financial crisis, particularly in the OECD countries, the author states that, "The net effect of these crises has further shifted production, investment and technology to emerging economies—a phenomenon that is consistent with the expectation that in a globalized world economy capital resources will shift to emerging economies that can make most productive use of investment (Lamy, 2011)."<br>Comment: I wonder if there are other references that may be cited. The current reference (Lamy 2011) is a talk given in the 2011 Panglaykim Memorial Lecture on "Harnessing Global Diversity" at the Centre for Strategic and International Studies in Jakarta on 14 June 2011. | Accepted - added reference to Zhu (2011) "Emerging Challenges" in Finance & Development |
| 17690 | 1 | 8 | 28 | 8 | 30 | The qotation marks are wrong. The consecuences of embeded emissions can be briefly pointed out "that dificult the measure of GHG emissions between manufacturing and cosuming countries". | Taken into account - other edits address embedded emissions, which is really important. Combined with other |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17689 | 1 | 8 | 4 | 8 | 4 | ailing banks or failing | Rejected - word is ok. No action needed |
| 18417 | 1 | 9 | | 10 | | In some parts, like page 9 and 10, the language is a bit confusing; I think it is to avoid clear and strong assessments regarding delicate issues, such as emission growth in emergent countries.<br>Executive summary<br>It is quite optimistic regarding the political responses to climate change in the last two decades. In absolute terms it is accurate, but it fails to acknowledge the growing scientific evidence in relation to the magnitude of the threat. | Taken into account - other comments address this |
| 2331 | 1 | 9 | | 10 | | In Rio+20, public lobbying through environmental civil movements highlighted the demand of elimination of fossil fuel subsidies. (http://www.un.org/apps/news/story.asp?NewsID=42289). Governments have responsibility to move towards green energy alternatives. Still, fossil fuel companies hold considerable lobby power inside governments in developed and developing countreis. , it can be observed that solar powered devices using as emergency roadside telephones, car parking machines, railroad crossing signs and high way machines. This discussion would be an important factor in this section. □ | Noted - text is ok. No action needed |
| 17731 | 1 | 9 | 1 | | | the word "this" should be "these" | paragraph is revised. This sentence has been removed; comment no longer |
| 15532 | 1 | 9 | 1 | | 2 | Also, general technical progress that enhances energy efficiency is likely to be slowed. See Bowen, A, e t al (2009): 'The implications of the economic slowdown for greenhouse gas emissions and targets,' CCCEP Policy Paper, LSE, October. | Accepted - added sentence: "Economic slowdown may also reduce the rate of technological progres that contributes to addressing climate change, such as in |
| 4877 | 1 | 9 | 1 | | | {Cor} "in {this} these historically industrialized countries | paragraph is revised. This sentence has been removed; comment no longer |
| 7867 | 1 | 9 | 10 | 9 | 11 | The juristdiction - in any meaning of the word - does not set policies. | this sentence has been removed; |
| 16993 | 1 | 9 | 11 | | | A 6th (or more appropriately, perhaps a new 4th) bullet might be warranted that discusses the salient point that there has been a decline and subsequent stabilization (or further decline) in emissions of most OECD nations over the past ~10 years. What are the lessons to be learned there? Are there transferable actions? | Rejected - Space limitations do not allow to discuss in detail underlying mechanisms/implications of all short- |
| 8707 | 1 | 9 | 11 | | | Again, this sub-section ends without discussing the doubts on the part of many economists as to whether or not economic growth will return to OECD countries in the next 10-20 years. Yet, all the IAM model results in Chapter 6 assume steady and unlimited economic growth world-wide. This potential conflict in assumptions should be discussed up-front here in Chapter 1. | Rejected - text is balanced enough |
| 17405 | 1 | 9 | 12 | | | It's not at all clear why this section would be restricted only to energy systems. Consider expanding to include AFOLU issues or adding a separate sub-section on this topic. | Taken into consideration - discussion on AFOLU is needed and will be added |
| 4878 | 1 | 9 | 13 | | | {Add} "The {primary purpose of energy systems is to provide affordable energy services {to meet basic human needs, moreover, these fuel economic and social development. | Reject - The existing text is fine. No action needed |
| 15242 | 1 | 9 | 14 | | | this notion of 'development' needs to be broken down - what is 'progress' for example? | Taken into account - the paragraph is revised to be more clear |
| 16994 | 1 | 9 | 16 | | | The parentheses should also note that "regulatory" costs can be substantial (EIS, etc.) | Rejected - this point is correct, but if we address it we will need to qualify the statement a lot and that will make for an |
| 7868 | 1 | 9 | 19 | 9 | 20 | In econmoic theory there is no freedom of choice whether or not to include externalities. The wording of this line suggests such a choice. | Taken into account - the sentence has been revised to reflect the commenter's |
| 16995 | 1 | 9 | 20 | | | Expand final sentence with, "… and in most(?) cases around the world, they are not." [Are there examples of where they are that can be cited?] | Rejected - this point is correct, but if we address it we will need to qualify the statement a lot and that will make for an |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3878 | 1 | 9 | 21 | 9 | 22 | "Following a decade of price stability at low levels, since 2004 energy prices have been high and volatile (see Figure 1.2)". Please, note that energy prices are missed in Figure 1.2.. | Rejected - Energy prices are included in the figure. The line follows the "oil" line and so may be harder to see. No action |
| 3546 | 1 | 9 | 24 | 26 | 24 | Unbalanced parantesis in most references | Editorial - copyedit to be completed prior |
| 16996 | 1 | 9 | 24 | 9 | 27 | These are cryptic statements deserving of expansion | Taken into account - sentence has been |
| 7146 | 1 | 9 | 24 & 26 | | | Remove extra '(' parenthesis. | Editorial - copyedit to be completed prior |
| 5458 | 1 | 9 | 27 | 9 | 32 | Discussion of peak oil with differing opinions- no indication of consensus is provided here and would be helpful | Rejected - Discussion of peak oil is beyond scope of chapter 1. A simple reference to GEA chapter 7 will suffice |
| 8474 | 1 | 9 | 28 | | 30 | Important to note that "peak water" is also a factor, particularly in areas not often considered in this light, including Alberta, Canada | Rejected - The suggestion inclusion of "peak water" is beyond scope of chapter |
| 18250 | 1 | 9 | 3 | 9 | 8 | shifting) to these emerging economies… . (See also chapters 5 and 16)". | Noted - cross reference is already in the text. No action needed |
| 18251 | 1 | 9 | 3 | 9 | 8 | All along Chapter 1 the concept is technological innovation, but in Chapter 5 is used technological change, and in chapter 16 is used technology development and transfer, as well Transfer and diffusion. So a definition is needed to grasp the interrelationship between Science, Technology, Innovation and Diffusion and then using the concepts properly in the whole text. | Rejected - beyond the scope of this chapter. Other chapters deal with this. Chapter 1 is an overview |
| 18252 | 1 | 9 | 3 | 9 | 8 | Another aspect is that innovation is not only technological but also non-technological ( organization, marketing, services). | Rejected - this is a good point but other chapters that deal directly with |
| 18014 | 1 | 9 | 3 | 9 | 8 | is there evidence to show that " technological innovation…has shifted( and is shifting ) to these emerging economies". | Taken into account - the sentence has been removed and the paragraph |
| 16992 | 1 | 9 | 3 | 9 | 8 | This bullet is not substantiated in the preceding discussion and should be deleted | Taken into account - combined with |
| 11396 | 1 | 9 | 3 | 9 | 8 | More basis should be provided for the assertion that "technological innovation … has shifted (and is shifting) to these emerging economies" considering that there continues to be many barriers and difficulties that are in place which prevent full and effective technology transfer to developing countries. | Taken into account - combined with other comments |
| 18410 | 1 | 9 | 30 | | 30 | Concerns about availability of resources, not scarcity. Resources are not scarce by definition. Within technical properties of resource there is no consideration for scarcity. | Noted - unclear on suggested action. No further action needed |
| 11020 | 1 | 9 | 31 | | | In regard to peak oil, suggest add the following reference:<br>Murray, J., & King, D. (2012). Oil's tipping point passed. Nature, 481, 433-435 | Rejected - the existing cite is fine. A discussion on any "peak" theory is outside the scope of this chapter -- no |
| 8405 | 1 | 9 | 33 | 9 | 33 | I suggest to add that it is a fact that from 2005 onwards, conventional crude-oil production has not risen to match increasing demand. Production is now 'inelastic', unable to respond to rising demand, and this is leading to wild price swings (See Murray J., King D., 2012, Oil's tipping point has passed. Nature, 481-433).<br>This is an important change since AR4, because production of crude oil increased along with demand from 1988 to 2005. | Rejected - the existing cite is fine. A discussion on any "peak" theory is outside the scope of this chapter -- no action needed |
| 13364 | 1 | 9 | 33 | | | The term 'inadequate investment' seems strange choice of words in the context of this report. Perhaps 'low investment' would be better. | Accepted - wording changed to "low investment" |
| 4605 | 1 | 9 | 33 | 9 | 33 | After "unit": "and is more efficient than coal" | Rejected - text is fine as existing. No |
| 4015 | 1 | 9 | 33 | | | suggested wording: "fossil resource and uranium endowment" | Rejected - suggested text is too |
| 7869 | 1 | 9 | 33 | 9 | 35 | This sentence seems to suggest that much more conventionl (and unconventional) fossil fuels should be exploited. It, again, indicates the affirmation of traditional growth patterns, see comment 25. | Rejected - We do not agree with the commenter's suggested implication of the text. We think the text is fine. No |
| 16997 | 1 | 9 | 33 | 9 | 35 | Is this global or region-specific? Also need a citation | Rejected - this is a global statement thus |
| 14788 | 1 | 9 | 4 | | 8 | "The largest…" This is overstated and should be put in context of the generaly global distribution of technological innovatoin capacity, which still resides overwhelmingly in the North, with pockets in the South being limited and constrainted to certain technological domains. | Rejected - no scientific evidence/publication provided to support changes suggested by the reviewer |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16990 | 1 | 9 | 4 | | | "The largest emerging economies"; again, these nations should be listed so a complete snapshot of the current situation in the world is given, while also allowing posterity to read this report and assess what each nation has done, what impact it has had, etc. | Rejected - this is too much detail for the chapter |
| 17732 | 1 | 9 | 40 | | | This sentence is too long | Accepted - sentence has been |
| 4879 | 1 | 9 | 41 | | | "high energy intensity (~ of the extraction?) | Rejected - no, of the fuel itself. We think this is clear enough in the text. No action |
| 7147 | 1 | 9 | 41 | | | Remove both parentheses. | Editorial - copyedit to be completed prior |
| 2572 | 1 | 9 | 45 | 9 | 46 | I would expect that a large number of contrasting views would have a large number of references | Accepted - additional references added |
| 2573 | 1 | 9 | 47 | 10 | 8 | Very important the mention to the infrastructure lock-in by the use of shale gas, World Energy Outlook 2011 | Rejected - this is too much detail for |
| 16991 | 1 | 9 | 5 | | | "innovation and deployment of new technologies" - worth noting that many "effective systems" are also very controversial internationally in terms of tariffs, dumping, etc. | Rejected - this is too much detail for here. |
| 17404 | 1 | 9 | 9 | 9 | 11 | This is an important point, but it is phrased unclearly. Can the implications be more clearly articulated? | Taken into account - paragraph has |
| 18249 | 1 | 9 | 3 | 9 | 8 | “Fourth, technological innovation that is an essential part of cutting emissions has shifted (and is | Noted - unclear on suggested action. No further action needed |
| 18409 | 1 | 9 | 13 | | 20 | Paragraph says nothing new, space may be saved. | Rejected - we think text is ok. No action |
| 4248 | 1 | 9 | 33 | 9 | 34 | Has there really been inadequate investment in exploration and extraction capacity for conventional sources of gas and oil? Isn't the increased exploitation of unconventional sources an indicator that these are more productive in conventional terms than conventional sources? Surely the main lack of investments is in low carbon sources of energy? | Taken into account - combined with other comments. The word "inadequate" was changed to "low" per another comment |
| 5315 | 1 | 9 | 33 | 9 | 35 | The authors talk about inadequate investment in exploration and extraction capacity. At the same time they talk about unexpected surges in demand. Ex post, investment may not have been inadequate. But what is the benchmark for adequate? From a global warming perspective, the too low investment into oil exploration may be considered positive since it slows down CO2 emissions. The point in global warming is not carbon scarcity but (compared to the social cost) its oversupply. I therefore do not understand the concerns about underinvestment in fossil fuel extraction and exploration. | Taken into account - combined with other comments. The word "inadequate" was changed to "low" per another comment |
| 3445 | 1 | 9 | 37 | | | It should mentioned as well, among the new supplies from unconventional: tight gas and tight oil | Rejected - our text is ok. It is trying to signal the broad issues only |
| 8221 | 1 | 9 | 3 | 9 | 4 | Distinction must be made between innovation and deployment – I think there are more deployment and technology transfers than innovation in the emerging economies. Some clarification may be helpful. Have there been any studies that evaluate how technological innovations and the possibility of large new supplies from unconventional resources (e.g., oil sands, shale oil, extra-heavy oil, deep gas, coal bed methane (CBM), shale gas, gas hydrates) will affect the emission and environment. | Taken into account - the first sentence in that paragraph has been revised. Further differentiation, as suggested by commenter, would be beyond the space allocation of the chapter. |
| 4091 | 1 | 9 | 44 | 9 | 44 | unconventional oil and gas. | Rejected - this is a good point that gas be included. Per other comments, this sentence has been shortened and the portion of the sentence referred to by this |
| 17691 | 1 | 9 | 47 | 9 | 47 | Why use "warming gases" instead of GHG? | Noted - to avoid repetition. No action |
| 7010 | 1 | 9 of 33 | 20 | 9 of 33 | 21 | Add "But whatever the costs are, the current world energy system is unsustainable because it's based mainly on fossil fuels, which are finite and pollute the environment", after the final period in line 20. | Rejected - we can't scientifically make that judgement here. It is probably true and that is the spirit of the whole ipcc |

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| 11578 | 1 | o | | | | In general what the chapter captures are the BRICs and the developed countrie(OECD and North America).The rest of the countries, the world, are not dealt with. It is to be noted that there are different categories of developing countries who all have the aspiration of improving the lives of their citizenry and develop. As they develop, they will emit GHGs.They need to be supported to move along green trajectories. Currently they are struggling in their efforts to sustainably develop and address the adverse effects of climate change. They are however doing a lot of work that is contributing to the objectives of the UNFCCC that can be provided as examples in this chapter such as work on energy conservation and efficiency improvements in industry, increasing the widespread use of renewables,development of low carbon energy sources and afforestation etc | Accepted, some more discussion on LDCs added; new categories agreed by DTG will address LDCs (and other categories of countries) systematically |
| 12191 | 1 | Page 25 | Line 32ff | | | You say that there has been a shift in emphasis from mitigation to adaptation and that more countries are rightly focusing on adaptation? Why? What are the arguments, indicators and information you base this statement on? Has there really been a shift? At the global or at national levels (the latter would imply that there had been a focus on mitiation before)? And why do countries “rightly” focus on adaptation? | Taken into account - context is accurate. See response to 1177 |
| 14521 | 2 | | | | | | Noted.<br>Commenting files will be amended |
| 3319 | 2 | | | | | I find it odd that the chapter does not include the policy directive of expanding public education around risk and uncertainly in climate change. Especially given the last sections of the chapter which focus on public perceptions and openness to climate policies, the issue of what people in general think and feel becomes crucial. These are affected by education in the broadest sense, and governments or NGOs looking to deal with risk and uncertainty bias should consider education as a deep response to the problem, indeed, as an adaptive response. | Informational deficits are one barrier to public action on CC mitigation, as the chapter now acknowledges in the introduction to Section 2.2, and a widely known one, but by no means the only impediment. Section 2.2 therefore focuses more on two other barriers to |
| 4114 | 2 | | | | | Who is the audience and what can this audience learn from this chapter? Large parts of the chapter address 'the decision-maker', an apparently uniform entity. Climate change as a global collective action problem involves a large group of heterogenous decision-makers. What is the nature of uncertainty arising from social systems (e.g. politics) and how do they relate to the natural system uncertainties (e.g. climate sensitivity)? It could be useful to frame your discussion from a political decision-making perspective because that would move many targeted end-users centre stage. | Accepted. In our view the realms of natural system and social system uncertainties are not nested. This chapter is more focused on the latter. In this regard a new table (Table 2.1) develops a taxonomy of different types of |
| 4115 | 2 | | | | | There are gaps and inconsistencies between chapter 2 and other framing chapters and between framing chapters and subsequent chapters. As the first of all chapters (after the Introduction), chapter 2 is encouraged to play a pro-active role in mainstreaming its framing into the remainder of the report and seek support from the TSU for doing so. | Table 2.1 provides a link to the other framing chapters |
| 4116 | 2 | | | | | It would be useful to prioritize more and carve out key insights. Some sections seem almost encyclopedic, some sections are skin, not all pieces of information seem relevant. | Sect. 2.1 now provides more key insights. Other sections will address this |
| 4117 | 2 | | | | | It might be useful to add a discussion on insurance. Which types of risk are insurable and what types are not, and what happens if people become insurable, how does that alter behavior, on the individual level and on the level of the group? | The SOD will incorporate material on insurance and how insurance can affect behavior |
| 4118 | 2 | | | | | When is uncertainty a reason to wait and learn, and when is it a reason to act and learn later? You assess this question but it would be helpful to parsen your answers more clearly because they seem very important. Perhaps you could even provide case-specific answers related to the risks that matter on the UNFCCC level. | We highlighted the effects of climate and technology response uncertainty in the section on IAMs. However in the SOD we will also mention it in the introduction and the summary. We will |
| 4120 | 2 | | | | | Please review chapter 4 section 4.7.1. If you feel that this section contains redundant and/or inconsistent duplications of chapter 2 discussions, please advice chapter 4 authors on how to revise their section. | Done. |
| 4128 | 2 | | | | | It would be useful to highlight the relation of your chapter to the AR4. What has happened since? How was uncertainty treated in the AR4 (if at all) and how do you extend on this assessment? | We will highlight this in the introduction. |

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| 4133 | 2 | | | | | Please review chapter 3 section 3.11.1.4 on "Human ability to understand climate change" and, if needed, discuss this section with its authors. | We have reviewed Sect. 3.11.1.4 and discussed this section with some co- |
| 8915 | 2 | | | | | risk and uncertainty' are often used as one entity that is followed by a verb in singular. Uncertainty is an inherent part of risk, but the two concepts are still distinct. There is more to risk than uncertainty and there are uncertain situations that do not entail risk. | Thank you for this comment. Throughout the chapter, and in the Glossary, we are clarifying the distinction between risk and uncertainty. At the same time, "risk and uncertainty" is often treated in the literature as a single issue (because the two concepts, while different, are closely related). It is in this sense, as a single |
| 8917 | 2 | | | | | One main argument in the chapter is that people are myopic, that is, focus on short-term consequences and overly discount delayed future outcomes (e.g., element ' Risk perception and behavioral responses ...' of the framework on page 5 and page 8; Sections 2.2.3, 2.2.4.1, 2.2.4.2). It is true that this is a reliable finding, but mainly in the domain of financial and health risks. In the domain of environmental risks, it has been found that people do not discount long-term future environmental consequences (Böhm & Pfister, 2005; Gattig & Hendrickx, 2007). Thus, it might be that climate change consequences are much less discounted or that the discount rate varies substantially depending on the domain that is affected (finance, health natural environment, etc.).<br>Böhm, G., & Pfister, H.-R. (2005). Consequences, morality, and time in environmental risk evaluation. Journal of Risk Research, 8, 461-479.<br>Gattig, A., & Hendrickx, L. (2007). Judgmental discounting and environmental risk perception. Journal of Social Issues, 63, 21-39. | Thank you for the two references. It may well be that time delay does not play as much of a role in fairly general, nonpersonal environmental decisions of the kind used in the Boehm & Pfister paper, where subjective perceptions of temporal distance of the adverse consequences were significantly different but still very similar(from 1.96 to 2.92 on a scale from 1 to 7. And even there, greater perceived distance WAS correlated with less perceived risk and less tendency to help. Other studies, triggered in part by the Gattig & Hendricks paper did find evidence that both American and Chinese respondents discount future environmental accounts very similarly to financial outcomes and also far more than normative economic discount rates would suggest (Hardisty, D. H., & Weber, E.U. (2009). |
| 8140 | 2 | | | | | How is the content of this table selected? Or is it comprehensive? Source? | The Table is reviewing all existing literature covering climate change analysis using IAMs in a stochastic |
| 8139 | 2 | | | | | How is the content of this figure selected? Or is it comprehensive? Source? | The Figure 2.4 is a product of the Uncertainty Guidance group a whole |
| 8142 | 2 | | | | | In this section the complexity of the whole issue is addressed in a suitable way. However it stays quite alone. | Thank you for the first sentence in the comment. I do not understand the |
| 9789 | 2 | | | | | Research on decision-making in organizations has revealed, that the different levels individual, group, organization and external stakeholders have to be considered. Klein, K.J. & Kozlowski, S.W.J. 2000a, "From Micro to Meso: Critical Steps in Conceptualizing and Conducting Multilevel Research", Organizational Research Methods, Vol. 3, No. 3, pp. 211-236. Structure the levels of decision-making correspondingly or at least address this issue. | Thanks, to be taken into consideration by SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14821 | 2 | | | | | The chapter presents a great amount of important information. It would, however, much more illuminating and useful if be organized and structured in a more systematic framework. Specifically, the chapter currently reviews a range of different types of climate-related decisions, types of uncertainty, and types of tools. It should go on to provide guidance as to which types of decisions reflect which types of uncertainty and are thus amenable to which tools. To be more explicit...<br><br>The types of uncertainty should be distinguished by their key features. Some types of uncertaintly are of fundamental importance and define the very nature of the climate problem: the deep epistemological uncertainties within the natural system and the enormous downside risk associated with climate change is this kind of uncertainty. We have no probability density functions or damage functions that can be employed with any confidence. We have no historical precedent, no capacity to do experiments with a "test planet earth". Another type of uncertainty is that associated with, say, the rate at which cost of a given technological option will decline, or its efficiency will improve. It has fairly well-defined bounds and reasonable historical precedent to make justifiable estimates of probability densities. One can imagine a fairly neatly charted spectrum of types of uncertainty, from the most profound and poorly characterized, to the mere techno-economic and well-bounded and confidently characterized. The types of uncertainties discussed in the chapter could be placed on this spectrum. Another type of uncertainty has to do with human volition: our own (unpredictable) choices will determine certain outcomes.<br><br>Similarly, the tools should be distinguished by type, and placed on a corresponding spectrum, ranging from tools approrpiate for the most profound and poorly characterized types of uncertainty to those appopriate for more manageable and well-characterized types. CBA and E(U) Theory are appropriate for well-characterized uncertainties. SEJ and RDM, on the other hand, are more suitable for situations of profound uncertainty, when there is not sufficient information to use tools that rely on a probability density function. Scenario analysis would be most suitable for issues where uncertainty is determined by human volition, such as the choices of future development paths.<br><br>And finally, the chapter could help the policy maker by explicitly discussion which kind of decisions entail which kinds or uncertainty, and are thus amenable to which tools. For example, the choice of a global climate goal (e.g., 1.5C? 2C? more than 2C?) cannot be determined by doing a CBA or E(U) optimization. It involves uncertainties that are ill-characterized and profound. It also involves value decisions (relating to treatment of other individuals and generations who may pay the cost of our decisions, and the worth of non-monetizable values), and is intrinsicially a process relying on democratic involvement. SEJ and participatory process could provide the process by which an objective is determined, and the objective is used subsequently in CEA processes to identify the most efficient path. A choice between different regulatory optoins for meeting this goal could then be amenable to a constrained CBA or E(U), accounting for uncertainties in, say, techno-economic parameters. (This process has been identified by climate policy analyists as being far more viable than CBA or E(U) for identifying a cliamte goal). | We will elaborate on the link between precaution, RDM and CEA more carefully. However to our understanding the literature on decision-making under deep uncertainty does provide only little guidance how to decide under multiple sources of deep uncertainty. In that sense we regard it as premature to develop an iconic figure of the type the reviewer suggests. Instead we will be very explicit on the research needs along those lines. |
| 14833 | 2 | | | | | The observation "an important exception..." is not particularly compelling given the caveats (no catastrophic/threshold damage, no cobenefits), which renders the observation virtually irrelevant. The exception should probably be removed, and the primary conclusino should be elaborated further. | Text has been edited accordingly |

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| 11490 | 2 | | | | | The charge that local decision makers tend to be "myopic" appears throughout the text. This should be reexamined on two grounds: first, that decisions based on short-term considerations rather than long-term possibilities are often entirely rational. Second, that it is extremely difficult for policy makers to consider the complex challenges and numerous factors faced by individuals who are forced to adapt to climate change. One can argue that the models employed by policy analysts often contain simplifed heuristics and hyperopia (the approximate opposite of myopia), by which critical context-specific factors affecting adaptation are obscured. | These are all excellent points and this and other comments by you are a good reminder to be cognizant of unintended connotations of expressions like "myopia" or "myopic". The term is used to contrast observed behavior from the rational-economic assumptions about human goals and processing ability currently used in the models on which policy prescriptions are based. The arguments you provide for why such behavior is observed are, of course |
| 11521 | 2 | | | | | This chapter is much improved from the previous draft in terms of clarity and order. However, it is still lacking the incorporation of indigenous perspectives on/reactions to climate change. Such perspectives could be added to the chapter through specific examples, and also through acknowledgement of pluralistic perspectives on risk and uncertainty, as well as interpretation of scientific knowledge. | We are well aware of this deficiency and are working on correcting it, by additional efforts of existing chapter authors and by adding expertise on such |
| 11518 | 2 | | | | | This figure lacks a caption and is not discussed in the text itself. It is confusing and unnecessarily dichotomizes between natural and social systems. If it is not critical to the chapter, it should be removed. | It is removed. |
| 15740 | 2 | | | | | General remark on Chapter 2:<br>In my opinion, this chapter is misplaced in the Assessment Report. It does not address the relevant questions: How should uncertainties affect our policy motives and decisions? (See my general remarks on the WGIII Draft.) Instead, section 2.1 deals with something like the psychology of behavior under risk. This is of minor interest, unless there are hypotheses about how it affects the questions whether and what should be done about climate change (the topic of the Assessment Report). Section 2.3 is a description of different evaluation methods of uncertain events. It is kind of incomplete textbook with critical remarks. Almost no applied study on climate change issues is summarized or even mentioned! (For example, section 2.3.2 discusses the Cost-Benefit Analysis method, but no such study on climate change is referred to.) Neither are the methods tentatively applied by discussing a relevant question of climate policy. If the AR contains such general treatment in WGIII it should also have a physics textbook in WGI – I think both are / would be misplaced in the AR. Similar holds for section 2.4. The exception is section 2.4.4 which is very interesting to read, addressing some real issues of mitigation policies under uncertainty. | We believe the psychology of decision-making as it relates to risk perception and behavior (Sect. 2.2) is central to developing climate change policies in combination with decision tools for improving behavior (Sect. 2.3). The SOD will clarify why it is important to have descriptive and normative analyses for developing climate change policies. |
| 18442 | 2 | | | | | view,it is the decisions made which are short term for expedience. | Comment is unclear - no response |
| 18447 | 2 | | | | | and behaviour responses, common mistakes made by decision makers in climate policy issues. | While it is clear that fat tail events are problematic to intuitively deal with, the mathematics of extreme events can be helpful in designing rational responses |
| 18449 | 2 | | | | | need for an elaborate conclusion basing on the content analysis. | While it is clear that fat tail events are problematic to intuitively deal with, the mathematics of extreme events can be helpful in designing rational responses for a system-2-decision maker. We will highlight this aspect more clearly. For |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15456 | 2 | | | | | Sociological and anthropological perspective are missing. There has been quite an explosion of theoretical work on risk, and except for a brief mention of the work of Ulrich Beck, many of the other studies (Anthony Giddens, Scott Lash, other studies by Beck) - these need to be added. For a critique of these theoretical / conceptual approaches from a developing country perspective, please also include - D.Parthasarathy,15. "Social and Environmental Insecurities in Mumbai: Towards a sociological perspective on vulnerability", South African Review of Sociology, 40, 1, 2009. | Thank you for providing us with this paper (there is a strong shortage of work in developing countries!) and for pointing out that sociological and anthropological perspectives are missing. We now cite the paper in our section 2.2.1.3. We agree that a broader range of social science disciplines than just economics needs to be represented in the IPCC |
| 10161 | 2 | | | | | To me it is a bit counterintuitive that the decision to be made affects the uncertainties in themselves (as the figure seems to say) rather than which uncertainties that need to/should be considered. This needs to be clarified in the figure so that a reader intuitively understands what is meant. | Figure 2.1 has been revised in the SOD so the first box is Problem Formulation |
| 6366 | 2 | | | | | Unclear what this figure portrays. It resembles a flowchart, but the boxes all identify concepts rather than actions. The meaning of the arrows is unclear, and in any case, they create an endless loop. Bottom line: this does not seem to be a very helpful figure. | Fig. 2.1 has been revised in the SOD so that readers will understand the importance of descriptive and normative |
| 17138 | 2 | | | | | See Adger, N., Barnett, J., Chapin, F., Ellemor, H., (2011) This Must be the Place: Underrepresentation of Identity and Meaning in Climate Change Decision-Making. In Global Environmental Politics 11 (2): 1-25. | Thank you for alerting us to this publication. It argues for a response to climate change based on methods other than economic cost-benefit analysis, based on the fact that some places of immense cultural yet non-market value (areas in the Arctic, Pacific islands) will be lost entirely as a result of climate change. While space is limited, the |
| 10481 | 2 | | | | | General comments below on this chapter are from Dan Sperling - LA Chapter 8 <dsperling@ucdavis.edu> | Thank you. |

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| 10482 | 2 | | | | | Chapter 2 is well written and a good overview of the literature on risk and uncertainty. It would be an excellent resource for a graduate seminar course. But, in the end, the chapter is too theoretical and too abstract to be of much value to decisonmakers in government or business. Even discussions that are a bit more grounded—for instance on price caps and feed-in tariffs—are far too general and insensitive to situational considerations to be useful to decisionmakers. In the end, assessments of risk and uncertainty and related decisionmaking are based on situational considerations specific to that decision. This chapter seems to show no appreciation of that fact, focusing on general theories, concepts and considerations.<br>Some other concerns:<br>• I was as surprised to find almost no insight or attention to business decisionmakers. The chapter is almost totally devoted to individual behavior, and a bit to government agencies. Almost nothing is said about business decisionmaking. In the energy areas, for instance, it did not address decisionmaking by oil, natural gas, electricity, and biofuels companies. It did not address car and truck manufacturing companies. It did not address infrastructure companies. And so on.<br>• The chapter provided minimal insight for government decisionmakers. The design of cap and trade programs entails a large number of decisions about allocating allowances; social, regional, and economic equity; financial integrity; international and national trade laws; trading robustness; and much more. I saw little or no insight into risk and uncertainty for these issues.<br>• The chapter does not address in any way a vast swath of decisions and policies under consideration. In my area of transportation and fuels, I did not see anything on land use changes (a huge issue with biofuels), regulations of vehicles and fuels, urban land use, and much more.<br>• Another citation regarding loss aversion, with respect to purchase of more efficient cars, is: David L. Greene, John German and Mark A. Delucchi, “Fuel Economy: The Case for Market Failure,” Chapter 11 in Daniel Sperling and James Cannon, eds,, Reducing Climate Impacts in the Transportation Sector, Springer, 2009. (I believe there were follow-up journal articles) | We agree that the discussion of the effects of risk and uncertainty on climate change response policies provided by Chapter 2 is general, as Chapter 2 is one of the framework chapters. Situational refinements and qualifications of these more general points are provided by the sectoral chapters later on in the report.<br><br>?We have now added mention and discussion of a much broader range of levels of decision makers, including business decision makers, as seen for example in Table 2.1, and at various other parts of the chapter.<br><br>?We now also spell out in much more detail the different types of decisions that need to be made (see again Table 2.1) and comment on different sources of uncertainty for those and different implications of how to deal with them as a function of decision maker level and type of decision.<br>Thank you for the Greene & Delucchi reference, it is a nice application of loss |
| 7217 | 2 | | | | | It is not clear to me to whom this report is addressed. Judged from the writing style, it seems to be by scientists for scientists. | The report is written for everyone. We have rewritten several sections of the report to clearly explain technical terms in simple language. We have also |
| 6784 | 2 | | | | | Add content about the risk of adaptation or mitigation policy choice in different sectors,because the risk or uncertainty of adaptation or mitigation policy choice for different sectors may be very different . | Accepted. The text will be modified accordingly. |
| 4611 | 2 | | 15 | | 17 | The meaning of this sentence is not clear as well; what does "greater sensitivity" illustrate: system 1 or system 2 ? | Thanks, Text has changed in SOD |
| 8115 | 2 | | | | | The summary sounds quite similar to the introduction. It should be focused on the main insights. | The Executive Summary in the SOD will provide the main insights of the chapter. |
| 4832 | 2 | | | | | The introduction section is in long parts a repetition of the summary (same examples, same arguments). Given that the space is so limited, I strongly advice to reduce this overlap. It is also tiring for the reader. | The introduction has been rewritten. |
| 3314 | 2 | | | | | I find the use of the category of "decision tools" narrow and potentially misleading, implying technocratic quick fixes to the considerable issues raised in this chapter. What is at stake, often, are not only "tools," but education, which takes time and more investment, and social or organizational processes, which are not simply tools, but ways of structuring information and decision-making based on information. I understand that you want a relatively streamlined language for policy-makers, but would urge some sort of caveat, at least in a footnote. It is worth flagging the depth of the challenge here, not inadvertantly making the challenge seem superficial simply by the way one frame the kind of response available. | A wise caveat, which we have incorporated into our introduction section 2.1. |
| 8914 | 2 | | | | | Section 2.1.1 is virtually identical to the Executive Summary. This is quite tiring - why the redundancy? | The Executive Summary in the SOD will provide the main insights of the chapter. |

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| 11481 | 2 | | | | | After each of the subheadings in this section, it would be useful to indicate where these topics are discussed in more detail later in the chapter by giving the page number. | The Sect. 2.1.1 would be too long and cumbersome if it specified page numbers for each of the topics in the |
| 8233 | 2 | | | | 1 | Most of Section 2.1.1 is a copy paste of the executive summary. Comments made on the executive summary also apply to this section. | The Executive Summary in the SOD will provide the main insights of the chapter |
| 8124 | 2 | | | | | The two modes of thinking are quite reasonable at first glance. However, for further analytical and empirical clarification, this concept is too simplistic. | We agree. In moving towards the Second Order Draft, we are clarifying that the two modes are applicable to thinking about individual decision makers operating in the abstract, and yet the ways in which decision-making |
| 13825 | 2 | | | | | If this report is accepting whole-cloth the hypothesis of Kahneman (2011) with no modification or caveat, that point should be made clear up front. This entire section seems like a review of that one contribution. The remaining references predate Kahneman (2011) and there is no reference to any critical literature citing his work. | The introduction to Section 2.2 which introduces the System 1 and 2 distinction has been rewritten to make it clear that this distinction predates Kahneman (2003 and 2011), and that he only provides the most recent synthesis. |
| 13826 | 2 | | | | | Many statements and claims are not substantiated by reference to literature. It is not clear if these are opinions of the author(s) or conclusions based on actual scientific analysis that has been peer-reviewed. An example is the paragraph beginning on line 30. But this is a common problem. | We tried to provide references to all specific claims. |
| 13827 | 2 | | | | | In general, I see no reference to confidence metrics related to any statements. | Confidence metrics are mandatory only for the key findings in the Executive Summary. We comply with this rule in |
| 11514 | 2 | | | | | This section needs a subsection on indigenous people's behavior and responses under risk and uncertainty because they are already experiencing the impacts of climate change. | We now discuss indigenous people's responses and indigenous knowledge |
| 8919 | 2 | | | | | One aspect that is not discussed in this chapter and that I think should be addressed in Section 2.2 is that people see climate change also as a very moral issue (e.g., Lorenzoni & Pidgeon, 2006). While morality is a different dimension than risk and uncertainty, it is an important aspect of how people perceive the consequences of climate change. Issues of justice, fairness, and responsibility are important in environmental risk perception (e.g., Böhm & Tanner, 2012), they also trigger emotional reactions which then guide behavior such as cooperation (Fehr & Gächter, 2002; Pfister & Böhm, 2008, 2012).<br>Böhm, G., & Tanner, C. (2012). Risk perception. In L. Steg, A. E. van den Berg, & J. I. M. de Groot (Eds.), Environmental psychology: An introduction. New York: Wiley-Blackwell.<br><br>Pfister, H.-R., & Böhm, G. (2008). The multiplicity of emotions: A framework of emotional functions in decision making. Judgment and Decision Making, 3, 5-17.<br><br>Pfister, H.-R., & Böhm, G. (2012). Responder feelings in a three-player three-option ultimatum game: Affective determinants of rejection behavior. Games, 3, 1-29.<br><br>Fehr, E., & Gächter, S. (2002). Altruistic punishment in humans. Nature, 415, 137–140. | We refer to this now in the introduction to Section 2.2, but can do so only in passing, because of space restrictions. The role of ethics and ethical concepts in climate change policy is the topic of Chapter 3. |

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| 12520 | 2 | | | | | Much of the analysis in this and following sections asserts a variety of phenomena as related to the proposition of “System 1” and “System 2” modes of human cognition. While this may merit a brief discussion, it is a far too simplistic and conjectural application of this particular cognitive model. Among other things, this and similar models ignore communication, interaction and group effects. This section should be rewritten to review a broader range of theories on human cognition, choice and decision-making. | A good point and we tried to do that. |
| 11505 | 2 | | | | | This section would benefit from an example from a part of the world where the effects of climate change are more apparent, such as in the Arctic or many mountainous regions. The relationships between expectations and perceptions are quite different in areas where climate change impacts have been acutely observed and adaptation is already occurin. | Some examples of this kind are now provided in Section 2.2.1 |
| 8483 | 2 | | | | | Again, much of this is framed assuming a deficit model of policy and knowledge transfer, as well as downplaying the relationship(s) between science and politics. Maasen and Weingart "Democratization of Expertise? Exploring Novel Forms of Scientific Advice in Political Decision-Making" (2005) provides some insight/content in this direction | Some of these suggested dynamics are described in Section 2.4. |
| 4835 | 2 | | | | | Another factor which might play a role is that climate change is confused with "local warming". So the effect that the global climate system warms is taken for a sign that also local climate should warm. Together with the climate/weather confusion exceptionally cold winters as experienced in the northern hemisphere in 2010 for example can make people disbelieve in climate change (phrased as "global WARMING"). Unfortunately, I do not have any studies available analysing this effect, only my personal experience reading the letters to the editor in a Norwegian newspaper during winter 2010. Hopefully, there are studies showing this effect. There is however, a reference in the report on page 42, lines 7-9 which seems to go into the same direction. | We report a study that established exactly the phenomenon you describe (Li et al., 2011) in Section 2.2. |
| 4836 | 2 | | | | | Social amplification of risk is one possible outcome of constant exposure to climate change communication. Another alternative outcome is that the perceived risk is reduced because of a higher familiarity. | Constant exposure is not a trigger of social amplification and I don't think that |
| 10269 | 2 | | | | | This section will be valuable, but more descriptions higher relevant to climate policy implications will be expected. | We tried to provide more examples and illustrations from a climate policy context |
| 4043 | 2 | | | | | This section is very comprehensive and clear in its aim, to list methods and discuss their merits and shortcomings. However, this may not be enough for the purposes of decision making under uncertainty. A useful addition to this section, and the whole concept of methods more generally, would be a procedural illustration of how to evaluate and assess the tool against the purpose and aim for application. In other words, how do we measure and account for the choice of decision-making approach under undertainty? from an accountability and governance perspective, this would be imperative. Standards and criteria for the evaluation of decision making processes do exist, and this discussion should form of this chapter. For example, Lasswell (1971) validation of decision-making pocesses in policy sciences is a very pertinent source that has been cited in a few climate change adaptation works, and no doubt have applicability in the mitigation context as well. See: Lasswell, H. D. (1971). A Pre-View of Policy Sciences: Elsevier Publishing Company. | Thank you, we have now modified the chapter in order to better link methods to actual examples and in order to contextualize methods under different choices types |
| 3318 | 2 | | | | | This entire section suffers from a deficit of attention to deep responses to uncertainty and risk bias. At the deepest level, public education is crucial, yet the section focuses on technocratic tools. This is a serious oversight. In a world where voter and consumer behavior makes a lot of decisions, we need to address deep, underlying ignorance and bias. You should find a way to include this consideration in your report. Allocating funds to climate risk education is very important in the long run, not simply using one of the tools you've described. | We have now made an extensive effort to link the section on behavioral issues and risk perception with the section on economic tools |

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| 13859 | 2 | | | | | This section fails to discuss 'scenario planning' . An example is Title: Climate change and future energy consumption in UK housing stock<br>Author(s): Collins, Lisa; Natarajan, Sukumar; Levermore, Geoff<br>Source: BUILDING SERVICES ENGINEERING RESEARCH & TECHNOLOGY Volume: 31 Issue: 1 Pages: 75-90 DOI: 10.1177/0143624409354972 Published: FEB 2010 --- OR --- Title: Climate change scenarios and citizen-participation: Mitigation and adaptation perspectives in constructing sustainable futures<br>Author(s): Larsen, Katarina; Gunnarsson-Ostling, Ulrika<br>Source: HABITAT INTERNATIONAL Volume: 33 Issue: 3 Pages: 260-266 DOI: 10.1016/j.habitatint.2008.10.007 Published: JUL 2009 --- OR --- Title: Use of participatory scenario modelling as platforms in stakeholder dialogues<br>Author(s): Andersson, Lotta; Olsson, Johanna Alkan; Arheimer, Berit; et al.<br>Source: WATER SA Volume: 34 Issue: 4 Pages: 439-447 Published: 2008 | The two reference do not deal with uncertainty, which is the chief objectinve of this chapter. |
| 11515 | 2 | | | | | The organization of this section is reader-friendly. Each tool is explained, its relevance to climate policy is discussed and advantages as well as limitations are stated. This is a notable improvement from Zero Order Draft. | Thank you |
| 3317 | 2 | | | | | You should discuss Gardiner (2011)'s critique of CBA with respect to climate equity. | A larger discussion of CBA and issues related to inequality, representative agent, interteporal equity is undertaken |
| 12996 | 2 | | | | | The claim that the precautionary principle is a version of maximin might be disputed. Although some authors suggest this, it is not clear that all versions of the PP demand it (e.g., the Rio version). Also, theoretical discussion of the foundations of the precautionary principle would be helpful (e.g., Sunstein 2005, Gardiner 2006). This is a topic on which chapter 3 might also touch. | Agreed, Delete text |
| 12523 | 2 | | | | | The precautionary principle does not lead only to a worst-case/minimax analysis. Modern approaches can use dynamical models selecting employing stepwise (e.g. annual for a 20-year planning horizon) assessments across multi-dimensional scenarios at each step, and converge on a 2-factor “efficient frontier” analysis using, for example, cost and risk. Northwest Power and Conservation Council, 2011. An Overview of the Council's Power Planning Methods, www.nwcouncil.org/library/2011/2011-02.pdf | Text has been changed |
| 13864 | 2 | | | | | Section 2.4 is a marked change in character from earlier sections. It is more literature review of the type typical of AR4 and less text-like teaching a subject noted previously for earlier sections. This change is jarring and suggests that the earlier sections need considerable improvement in style and mode of presentation. | To a large extent the change in style reflects the different functions this chapter is meant to serve, according to the Plenary Approved Outline. On the one hand it is meant to bring the reader up to speed on many of the technical and scientific issues surrounding risk and uncertainty; sections 2.2. and 2.3 do this, and for this reason they can read a bit textbooky, presenting some basic concepts and theories, rather than reviewing specific scientific studies of the past 7 years. On the other hand the chapter is meant to synthesize findings |

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| 3370 | 2 | | | | | This section could discuss that the literature on IAMs dealing explicitly with Knightian uncertainty is non-existant. IAMs are portrayed as system 2 frameworks. But what is the use of system 2 decision making under Knightian uncertainty? | The discusson of "Knightian uncertainty" is aided by referring to Frank Knight's book Risk, Uncertainty and Profit (1921). In Part III paragraph VIII.1, Knight says "We can also employ the terms 'objective' and 'subjective' probability to designate the risk and uncertainty respectively, as these expressions are already in general use with a signification akin to that proposed". Subjective probability is amply discussed. If the commmentor meant something other than what Frank Knight meant, then a definition would be most. "Risk proper" for Knight "is measurable by resolving outcomes into equi-probable alternatives" [III.VII.34]. In Knight's day, people did not appreciate the importance of dependence and limitations of the Laplacian definition of |
| 8997 | 2 | | | | | T | Comment is unclear - no response |
| 4119 | 2 | | | | | Please discuss this section with chapter 13 authors. | Yes. We will do this. |
| 8488 | 2 | | | | | Need to clarify scale and typology re: policy vs instruments | We don't understand the comment as |
| 5321 | 2 | | | | | The selection of references rather biased in favor of feed-in-tariffs. The authors focus on the risk reduction for investors but ignore the additional risks shifted to the market and thus to consumers. Increasing capacity in renewable energy with high volatility in sun and wind supply creates a high risk for energy security and thus creates additional cost in assuring secure energy supply. This effect is ignored in the report. For more critical articles on Feed-in tarifs see: del Rio, P., Gual, M. A., 2007. An integrated assessment of the feed-in tari system in Spain. Energy Policy 35:994-1012.K13<br>del Rio Gonzalez, P., 2008. Ten years of renewable electricity policies in Spain: An analysis of successive feed-in tariff reforms. Energy Policy 36:2917-2929.<br>Mendonca, M., Jacobs, D., Sovacool, B., 2009. Powering the Green Economy: The feed-in tariff handbook. Earthscan, London.<br>Frondel, M., Ritter, N., Schmidt, C. M., 2008. Germanys solar cell promotion: Dark clouds on the horizon. Energy Policy 36:4198-4204.<br>Frondel, M., Ritter, N., Schmidt, C. M., Vance, C., 2010. Economic impacts from the promotion of renewable energy technologies: The German experience. Energy Policy 38:4048-4056.<br><br>Reichenbach, J. and T. Requate 2011. Subsidies for Renewable Energies in the Presence of Learning Effects and Market Power, Resource and Energy Economics 34 (2012), 236-254. | Thank you very much for these references. As for the insight that, of course, policy instruments that succeed in stimulating investment in intermittent renewables do generate risks associated with supply interuptions, and higher costs associated with the additional average costs compared to existing power sources: we have included this into the introduction for section 4.4, with many of the references that you have suggested here. With respect to the latter, I believe that the sectoral chapter on Energy Systems and the governance chapter on the national scale(Ch 15) are both dealing with these issues. As to the former issue, we will include it. |

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| 5322 | 2 | | | | | As mentioned already in the remarks to chapter 1: The authors seem to be preoccupied by the concept of systematically bounded rational consumers and ignore switching cost and other hidden cost incurred by the consumers through adopting new technology. (See by contrast chapter 4, where switching cost are addressed, e.g. Farrell and Klemperer (2007), Chapter 31, Coordination and Lock-in: Competition with Switching Costs and Network Effects. Handbook of Industrial Organization). | Noted. Introduction clarified. |
| 3037 | 2 | | | | | It is not clear that promoting energy efficiency and removing barriers to its implementation for final consumers will always have the intended effect of reducing energy consumption, owing to rebound effects. For instance, consider compact fluorescent bulbs, which are mentioned here. Despite the seemingly commonsense appeal of such technology for restraining energy use, a Journal of Physics analysis of lighting technologies covering three centuries, six continents, and five technologies shows both very large gains in energy efficiency and essentially 100% rebound [Tsao, J.Y., Saunders, H.D., Creighton, J.R., Coltrin, M.E., Simmons, J.A., 2010. "Solid state lighting: an energy-economics perspective." Journal of Physics D: Applied Physics 43 (35), 354001; also Saunders, H.D. and Tsao, J.Y. "Rebound effects for lighting," Energy Policy, 49(2012): 477-478]. Importantly, note that such efficiency gains increase economic welfare even if they don't reduce energy use. Consumers benefit from efficiency gains, but their behavioral response may be surprising and counter to "one-for-one" energy reduction expectations in the long run. | The literature on the rebound effect is very important, and needs to be taken into account in all discussions of efforts to Improve energy efficiency. It is, however, somewhat tangential to the issue of risk and uncertainty in the area of energy efficiency. Rather, it has to do with the effectiveness of various policies, which are covered in the sectoral chapters on buildings and transportation. |
| 8918 | 2 | | | | | The section paints a picture of people being irrational creatures that are driven by emotions and by identity-based aspects such as cultural values. Emotions are an important, maybe the most important, determinant of behavior. But emotions have a cognitive basis and thus reflect a person's understanding of the situation. For example, a factor that has been shown to guide people's support for climate change policies apart from emotions is their understanding of the causes of climate change and which policy measures they judge to be effective (O'Connor et al., 1999, 2002; Bostrom et al., 2012), which is a cognitive and deliberative judgment.<br>Bostrom, A., O'Connor, R. E., Böhm, B., Hanss, D., Bodi, O., Ekström, F., Halder, P., Jeschke, S., Mack, B., Qu, M., Rosentrater, L., Sandve, A., & Sælensminde, I. (2012). Causal thinking and support for climate change policies: International survey findings. Global and Environmental Change: Human and Policy Dimensions, 22, 210-222.<br><br>O'Connor, R.E., Bord, R.J., Fisher, A. (1999). Risk perceptions, general environmental beliefs, and willingness to address climate change. Risk Analysis 19, 461–471.<br><br>O'Connor, R.E., Bord, R.J., Yarnal, B., Wiefek, N. (2002). Who wants to reduce greenhouse gas emissions? Social Science Quarterly 83, 1–17. | A useful observation, and one that we have tried to address in the introduction to section 2.2, describing in more detail the wisdom and contributions made by System 1 processes. |
| 16092 | 2 | | | | | No clear message in that section | The message -- that perceptions of risks associated with particular technologies, in particular nuclear and CCS, is a major obstacle to development -- could be brought out more strongly in the opening |
| 16093 | 2 | | | | | It is not clear in this section what knowledge is posterior to AR4 | This comment raises a fundamental problem with this section, namely that, unlike the rest of Section 2.4, this sub-section fails to focus on the empirical |
| 12991 | 2 | | | | | The fact that EU theory involves a distinct normative perspective, and indeed is only one way of operationalizing that perspective, is owrth emphasizing and should be addressed in chapter 3. | We agree that E(U) is only one way of highlighting a normative perspective. It |
| 18446 | 2 | | | | | Need for conclusion section that brings out key risks and uncertainities, common perceptions | See sections 2.1.1 and 2.1.2 in SOD |

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| 10267 | 2 | 0 | | | | Throughout this chapter, there are many general explanations about risk and uncertainty. You should focus on them regarding climate change. Please do not forget that this report is an assessment report on climate change. | Thank you for this comment. The risks and uncertainties associated with climate change are one of the elements that we consider in this chapter. It is important to recognize, however, that this chapter is not about risks and uncertainties in climate change per se, however, but about risks and uncertainties that are relevant to climate change policy responses. We are thus deliberately not focusing on risks and uncertainties associated with climate, but rather seeing these risks and |
| 8783 | 2 | 0 | | | | The approach is normative in focusing on utility rather than alternative ethical schemes such as rights/ deontological ethical approaches (e.g. right to life) or virtue ethic and epistemological approaches - e.g. (precaution/wisdom and seeing moderation of consumption as good for individuals, societies and the Earth System). One example is the focus of where people act as 'consumers' and have shorter term aims that some economic analysis suggests is wise, ignoring where people act as citizens and would take a longer term view than economics typically does in practice. Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) suggests that conventional economics cannot respond to the demonstrated level of difficulties in prediction of the climate. It also suggests that the utilitarian ethics of economics may not be K10the starting point of the majority of the global population. That is, economics is both an irrational and undemocratic response to climate change as described by climate science. | This is a very good point, thanks also for the reference, and we make this point now in an expanded introduction to Section 2.2. |
| 12231 | 2 | 0 | | | | General comment: It seems like most of the litterature and examples in this Chapter is from North America and some from Europe. Please consider some more regional balance, as there might be relative differences between nations and regions. | Has been changed, see specially section 2.1.5 from SOD and FAQ 2.2. |
| 4893 | 2 | 0 | | | | Excellent arguments, examples, language, however, less attention could be devoted throughout the chapter (actually, in sections 1 and 2) to the heuristic, intuitive or "System 1" approach (its analyses and examples) since the main purpose is to explain the importance and methods of the comprehensive analytic approach to deal with risks and uncertainties in decision-making in relation to climate change (except, e.g., the relation mentioned inter alia on p.16: "These behavioral and cognitive science insights highlight some of the challenges facing scientists and policymakers in their efforts to develop effective climate change risk communication strategies and raise important questions about whether efforts to guide System 1 learning might be used to stimulate System 2 behavior.". | System 1 is important for developing climate change policy along with System 2 tools as noted in Fig. 2.1 and the introduction to Sect. 2.2 |

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| 8114 | 2 | 0 | | | | The chapter attempts to integrate a broad field of disciplines, schools and research perspectives. Furthermore, it attempts to integrate a broad field of implementation (decision) situations. However, the concept used to structure the field seems to be too simplistic for this challenge. I am sorry to sound so harsh, but the chapter reads occasionally as a potpourri of thinkable decision situations and loosely linked tools. I strongly recommend to (1.) reduce the scope of this chapter, (2.) be more precise about what kind of decision situation at what kind of decision-phase is actually addressed (and what not), and (3.) assess the tools more carefully and balance the options and threats more clearly.<br>In my perspective, the work of the International Risk Governance Council (IRGC) is most instructive for this challenge. It structures the problem-situation threefold in complexity, scientific uncertainty and ambiguity. Since climate change impact is a combination of all three, this structure helps to characterize which tool or procedure has its strengths in which problem-situation challenge. Furthermore, the IRGC has developed a Risk Governance procedure structuring the risk assessment process. They distinguish five phases: pre-assessment, appraisal, characterization/evaluation, management and communication. In each phase the handling of risk and uncertainty needs a specific strategy. Evidence of the usefulness of this IRGC approach is published in several peer-review journals.<br>Some sources: www.irgc.org.<br>Van Asselt, M. B. A.; Renn, O. (2011): Risk governance, in Journal of Risk Research, 14 (4), S. 431-449.<br>Atkinson, R.; Klausen, J. E. (2011): Understanding sustainability policy: governance, knowledge and the search for integration, in Journal of Environmental Policy & Planning, 13 (3), S. 231-251.<br>Aven, T.; Renn, O. (2010): Risk Management and Governance, Technology, Risk, and Society, Berlin Heidelberg, Springer.<br>Cope, S.; Frewer, L. J.; Renn, O.; Dreyer, M. (2009): Potential methods and approaches to assess social impacts associated with food safety issues, in Food Control.<br>Renn, Ortwin; Dreyer, Marion: Food Safety Governance, Technology, Risk, and Society, Berlin Heidelberg, Springer.<br>Renn, O. (2008): Risk Governace. Coping with Uncertainty in a Complex World, Earthscan Risk in Society Series, London, earthscan.<br>Paper by IRGC:<br>IRGC, International Risk Governance Council, (2005): White Paper on Risk Governance. Towards an Integrative Approach, Geneva.<br>IRGC, International Risk Governance Council, (2008): An introduction to the IRGC Risk Governance Framework, Geneva.<br>IRGC, International Risk Governance Council, (2009): Risk Governance Deficits. An analysis and illustration of the most common deficits in risk governance, Geneva. Klinke, A.; Renn, O. (2012): Adaptive and integrative governance on risk and uncertainty, in Journal of Risk Research, 15 (3), S. 273-292. | Regarding (1) the scope of the chapter is as decided by IPCC at its plenary session October 26-29, 2009 (please see approved chapter outline on WG III site). Regarding (2) a new table (Table 2.1) develops a taxonomy of different types of decision-makers and the choices they face. Comment 3 and the suggested approach for assessing tools for decision-making as used by IRGC is accepted and the text will be modified accordingly and the 10 references mentioned will be included. |

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| 16916 | 2 | 0 | | | | This is a good chapter and has potential to be extremely valuable, but to do so I think it needs to be clearer in structural approach towards different types of decisionmakers, and needs further development in two main directions:<br>• The concepts of risk and uncertainty are applied almost entirely to climate impacts ("the nature of the problem") rather than aspects of mitigation – which is rather odd for a report on Mitigation: in more than 40 pages, for example, there is less than a page on energy efficiency despite the fact that the energy efficiency is central and the literature identifies perceptions of uncertainty, risk aversion and other behavioural dimensions as crucial to understanding;<br>• Whilst the chapter gives intellectual clarity over "System 1 behaviour", and its distinction between that and "System 2", it then addresses a range of other issues with implication that they are hard to fit into "System 2" decision framework, but without this ever really pinned down. I think the chapter would be far clearer if it acknowledged the existence of "System 3" processes around strategic risks and deep uncertainty, including the role of security, strategic judgement, innovation and systems transformation. It would then help to clarify the boundary between these, and System 2 processes which generally aspire to quantification and work best under conditions of limited uncertainty and trade-offs at the margin.<br>I would also suggest value in trying to find another term, since the word "System" is hugely used through the Mitigation report for many different purposes (Energy System, Economic system, Systems Transformation, Innovation Systems, etc etc). The term I have found most useful is "domain".<br>The chapter also needs at minimum to say a bit more about the role of inertia at many levels of decisionmaking and the (physical and social) systems involved. Inertia in its broadest sense is what renders "wait and see" untenable in the face of uncertainties. □ | We will respond to the reviewer's two bullets separately. Bullet 1: In its revision, Chapter 2 now offers far more coverage on uncertainty in climate change mitigation, starting with a list of multiple sources of uncertainty, of which climate impacts are only one among many. Bullet 2: chapter 2 has been extensively revised and now mentions many of the aspects the reviewer found missing. However, we did not add a "System 3" as Systems 1 and 2 refer to two different processing systems, rather than types of uncertainty. We also did not switch to a different terminology for System 1 and 2, because this is the way in which both academic publications and the more popular press refer to those types of psychological processes, but now frequently define what these "systems" stand for, as in "intuitive System 1 processes," or "analytic |
| 7300 | 2 | 0 | | | | Chapter 2 concentrates on qualitative (textual) description of risks and uncertainties relevant to climate change response policies. The quantitative assessments are almost missing. It would help, if the quatitative assessments of the relevanr risks and uncertainties are included in the chapter, wherever possible. | Thanks for this comment, I assume you want inclusion of quaNtitative assessments?:-). There is much experience with (quantitative uncertainty analysis (QNUA) in engineering and science based policy, but not much yet in climate change. An overview for integrasted assessment models is appearing in Cooke, Roger. M. (2012) "Uncertainty Analysis Comes to Integrated Assessment Models for Climate Change…and Conversely Climatic Change. DOI: 10.1007/s10584- |
| 4255 | 2 | 0 | | | | The current draft of chapter 2 ends rather inconclusively and its difficult to see the practical implications of the various approaches to decision making. It would benefit from a few illustrative examples. I wasn't convinced that devoting the second chapter to this topic was appropriate - it might be better to give the reader a better idea of mitigation options first. There is no discussion of the use of macroeconomic modelling including the co-benefits of mitigation strategies eg.CGE models | Regarding the sequence and scope of the chapter this is as decided by IPCC at its plenary session October 26-29, 2009 (please see approved chapter outline on WG III site). Co-benefits at the sectoral level are addressed in sector-specific chapters such as those on energy, transport, buildings, industry and agriculture (Chapters 7 to 11). Macroeconomic models (including CGE |
| 13793 | 2 | 0 | | | | This chapter is relevant to both WGIII and WGII. Integration, consistency, and cross-referencing will be challenging. | In the SOD we will devote particular effort in improving on the aspects that |

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| 13871 | 2 | 0 | | | | This chapter fails to identify any 'key findings' and fails to assign any metrics of confidence or uncertainty to statements. This is not appropriate. There are many places where useful ideas are made that rise close to the level of a recommendation and that should be presented as a key finding. These would be particularly valuable to a policy maker who wishes to draw from the useful material in this chapter. | Summary and Executive Summary will be augmented accordingly. |
| 4515 | 2 | 0 | | | | The discussion of risk in this chapter seems inconsistent with the glossary definition of risk which focuses only on hazards (presumably associated with changing climate). It should be made clear that/if risk is being considered more broadly. For example, there are a wide risks to investments that are not caused by climate hazards but are relevant to climate policy. Suggest that the glossary definition be changed to be consistent with this chapter. | The mutual relation of definitions of risk in the Glossary and in our Chapter will be made clear in the SOD. Ideally, both can be made identical. |
| 4831 | 2 | 0 | | | | In general a nice and interesting chapter covering the necessary basics in risk psychology. However, parts of the summary and introduction overlap massivly (even down to paragraphs that have just been copied and pasted). | This comment is absolutely right. We are completely revising the introduction and the executive summary, among |
| 9139 | 2 | 0 | | | | Biases of perception might be explained by biological evolution. It might be a good idea to employ this viewpoint in the discussion part. (cf. Haselton, M. G., Nettle, D. & Andrews, P.W. ( 2005 ) . The evolution of cognitive bias. In D. M. Buss ( Ed. ) , Handbook of Evolutionary Psychology, (pp. 724-746). ) Slovic has started this kind of discussion too. (cf. Slovic, P. (2007) If I look at the mass I will never act: Psychic numbing and genocide. Judgment and Decision Making, 2, 1-17. Retrieved April 24, 2007 from http://journal.sjdm.org/vol2.2.htm) | Because of space constraints, we don't think that such a discussion can be included, even though it would be interesting. |
| 14522 | 2 | 0 | | | | This draft offers an excellent survey of how individuals interpret and deal with risk and uncertainty. But it could benefit from placing these discussions in a broader context. For instance, the chapter never makes the argument, or even a statement, that addressing climate change in a challenge of risk management. The chapter largely focuses on individual decision making, and could benefit from placing its discussions in a risk governance (Orwin Renn) and/or decision support framework that would capture some of the important institutional and social contexts, and associated decision processes, in which these individuals reside. This chapter's current themese are clearly vital to understanding climate change as a risk management challenge, but it is at least as important to situate these ideas in the broader contexts since most important climate-related decisions (and the associated formation of risk perceptions) will be made by individuals acting within society, rather than as individuals acting along. These contexts will have an important influence on how people perceive and manage risk, and how they can best interact with the information provided in the rest of this IPCC WGIII report. | Excellent points. The SOD highlight the issues of risk governance as discussed by Ortwin Renn and indicate climate policy is an exercise in risk management. |
| 4693 | 2 | 0 | | | | Surprising that you discuss climate change communication but then don't follow up with strategies for doing it well and having it contribute to improved responses | Good point, and in good part because of space constraints, as the chapter is charged to do so much with such a small page allocation. We do, however, provide at least a brief discussion and a |
| 4701 | 2 | 0 | | | | Somewhere in this chapter, the problems of moral hazard from risk reduction should be addressed. For example, the US helped people rebuild in New Orleans, directly in the path of more frequent hurricanes. | The issues of rebuilding New Orleans falls more in the domain of WGII on Adaptation. The SOD will discuss insurance and note the importance of |
| 4709 | 2 | 0 | | | | For the whole chapter, I would suggest more use of Nudge-theory policies which suggest the best approach to the obstacles posed by System 1 thinking is to accept those as "givens" and design decision architectures that lead to the "socially desired" outcomes while allowing people to make System 1 "cognitive errors." Much more could be made of this. | Yes, thank you, we tried to do that. |

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| 18582 | 2 | 0 | | | | What is the intention? To give advice on how to handle risk and uncertainty? If so, to whom? To explain behavioural aspects? To discuss/inform about apropriate decision tools and their capability to cope with uncertainty? To present some sort of general reasoning on risk/cost strategy seen from a mankind/society perspective? | The intention of Chap 2 is to indicate why climate change is a challenge for risk management and suggest how to address this issue |
| 18583 | 2 | 0 | | | | Gives an overview but no/little advise. Relevance for policymaking? Directly, no or highly questionable. Indirectly, maybe but I guess the audience is limited. | (See response to Comment 49) |
| 18584 | 2 | 0 | | | | The chapter is incomplete. | Thank you, we have extensively worked on improving the status of the chapter |
| 18585 | 2 | 0 | | | | More of an annex? | Comment is unclear - no response |
| 8994 | 2 | 0 | | | | To be comprehensive and accurate treatment of the subject, it will be important for the chapter to recognize that different societies can have different ways of managing and sharing risk. Individuals reduce their vulnerabilities to rsk by having broader social networks, for example. The chapter places too much emphasis on price-based, insurance market approaches. | Yes, an excellent point that we now make in a new Section 2.2.4.5 on Risk diversification by formal and informal institution, with social networks that |
| 8995 | 2 | 0 | | | | It is important to recognize that what is involved in climate change choices is that it is collective, not individual, decisions that are the most important. It is more important to highlight how people make collective choices under uncertainty than how individuals make these decisions under uncertainty. Because of this, ten pages of treatment of micro-based approaches, which applies most directly to choices made by individuals, raises the question of emphasis. The tools emphasized by the chapter, such as cost-benefit analysis, are mainly applicable to "bounded" problems. Climate change, which is a cumulative process, is by nature an unbounded problem for which prices and costs are often not well defined. For these kind of problems, other methods, such as expert assessment, might be more appropriate. | We have refocused the emphasis of the chapter, and now acknowledge the wide range of levels of decision making, from the individual to collectives and to policy makers at different levels, as shown in Table 2.1. We also point out the connections between responses to uncertainty at these different levels far |
| 8996 | 2 | 0 | | | | The Chapter privileges the Kahnemann System 1 and System 2 approaches to characterizing decision-making under incomplete information. Care should be taken to emphasize that what is at stake are effective and timely decisions. In the case of climate change, these decisions are made in a highly charged political context, with large gaps in power and capability among the parties involved. If the question is one of arriving at effective collective political decisions – whose appropriateness cannot be fully judged at decision-time, the System 1 approach, associated with intuition, perception, less analysis, and more myopic, is not necessarily an inferior one. | We are now more careful to point out that System 1 responses are not necessarily inferior to System 2 responses, but that good judgment involves knowing when to supplement System 1 rapid responses with more effortful and analytic System 2 |
| 5426 | 2 | 0 | | | | The Chapter promotes the view, that perceived risks are always inferiour to "expert judgement", presumable meaning risk=probability times damage, but there are many examples that the perceived risk can be more realistic. In any case, the literature is full of much deeper discussions of the different tisk concepts (for example my book, Sørensen: Life-cycle analysis of energy systems, RSC Press, Cambridge) | We certainly do not want to say that perceived risks are always inferior. We will describe the model of social planner/ behavioral interaction that we have in mind more carefully. In fact, acording to our interpretation, both levels of |
| 18396 | 2 | 0 | | | | Chapter 2 is well written and a good overview of the literature on risk and uncertainty. It would be an excellent resource for a graduate seminar course. But, in the end, the chapter is too theoretical and too abstract to be of much value to decisonmakers in government or business. Even discussions that are a bit more grounded—for instance on price caps and feed-in tariffs—are far too general and insensitive to situational considerations to be useful to decisionmakers. In the end, assessments of risk and uncertainty and related decisionmaking are based on situational considerations specific to that decision. This chapter seems to show no appreciation of that fact, focusing on general theories, concepts and considerations. | In the SOD we will make a severe attempt to better link concepts and applications. |
| 18397 | 2 | 0 | | | | I was as surprised to find almost no insight or attention to business decisionmakers. The chapter is almost totally devoted to individual behavior, and a bit to government agencies. Almost nothing is said about business decisionmaking. In the energy areas, for instance, it did not address decisionmaking by oil, natural gas, electricity, and biofuels companies. It did not address car and truck manufacturing companies. It did not address infrastructure companies. And so on. | Good point. The SOD will examine the impact of risk and uncertainty on business and organizational decision making |

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| 18398 | 2 | 0 | | | | The chapter provided minimal insight for government decisionmakers. The design of cap and trade programs entails a large number of decisions about allocating allowances; social, regional, and economic equity; financial integrity; international and national trade laws; trading robustness; and much more. I saw little or no insight into risk and uncertainty for these issues. | This is a very important comment, and one that we are trying to address. What we are doing in the Second Order Draft is being much clearer about the diversity of choice types and actor levels, and doing our best to identify the most important risks and uncertainties across these types and levels. In so doing we hope to make it clearer for government decision-makers which risks and uncertainties matter for them. But we are constrained in two ways. First, we are constrained by the existence (or lack) of peer reviewed literature specifically addressing the impacts of |
| 18399 | 2 | 0 | | | | The chapter does not address in any way a vast swath of decisions and policies under consideration. In my area of transportation and fuels, I did not see anything on land use changes (a huge issue with biofuels), regulations of vehicles and fuels, urban land use, and much more. | Thank you for this comment. We are doing our best in the Second Order Draft to be more specific about the impacts of particular risks and uncertainties in particular contexts. But to some extent a full treatment of, say transportation |
| 18400 | 2 | 0 | | | | Another citation regarding loss aversion, with respect to purchase of more efficient cars, is: David L. Greene, John German and Mark A. Delucchi, “Fuel Economy: The Case for Market Failure,” Chapter 11 in Daniel Sperling and James Cannon, eds,, Reducing Climate Impacts in the Transportation Sector, Springer, 2009. (I believe there were follow-up journal articles) | Yes, we now mention it in Section 2.2.3 |
| 9218 | 2 | 0 | | | | Through the chapter, the technical terms "system 1" and "system 2" are used very frequently. Although they are concisely explained on Page 11 based on Kahneman (2011), many readers may not read the paragraph and move on to other parts of the chapter. In such a case, the concept of "dual process thoery" and the meaning of "system 1/2" might not be understood properly by general readers of the chapter, who are not an expert of psychology (like me).<br>Furthermore, I am concerned that specific decision-making styles/processes which the chapter authors don't valuate highly (i.e. subjective expert view) are possible to be classified into "system 1" in an arbitrary or ambiguous manner.<br>From the reasons above, though I like the concept of system 1/2 is mentioned in the chapter, I think it should not be used too intensively as a backbone concept of the chapter. | The role of Systems 1 and 2 for climate change policy will be more clearly defined in the SOD |
| 14231 | 2 | 0 | | | | The chapter is a well-organized, clearly structured, and ties the conceptual approaches in risk and uncertainty analysis nicely to the relevant climate change applications. It performs well in covering a wide array of approaches, and trading-off between comprehensiveness, relevance, and length. | Thank you! Positive comments are very helpful in achieving balance. |

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| 3137 | 2 | 0 | | | | This chapter has improved massively since the ZOD. This chapter has a very different feel from WG1 and WG2 chapters and much of WG3. there is little/no discussion of "what's happened since AR4." I don't have a problem with that, but perhaps it is useful to have some text at the outset indicating that the kinds of issues addressed here haven't in past had much attention in IPCC. Thus most of this is "new." Some of the most interesting parts of this chapter relate to risk perception. Shouldn't that be in the title? At present, the title refers to "integrated" yet much of the chapter is actually about how risk analysis isn't integrated. This chapter is really about "Uncertainty, Risk Perception and Implications for Climate Change Response Policies." This chapter needs cross references to other chapters. For example, the discussion of uncertainty and risk has big implications for policy design and choice. That's taken up in lots of other chapters. It would be helpful if the executive summary indicated more of the key substance of what the chapter finds and argues—such as on risk perception; social planner vs other decision making perspectives; evaluation frameworks; etc. | We will relate our Chapter to AR4 in our new Intro. |
| 10375 | 2 | 0 | | | | There are several kinds of risks, including risks with definite distributions, random risks and chaos risks. Maybe researches about risks should be focused on in the future. | Thanks. These issues are bound up with the representation of uncertainty (2.3), but the emphasis on the future pervades |
| 2333 | 2 | 0 | | | | The risk and uncertainty are main technical terms in this chapter. Having baseline on these terms, comprehensive definitions on “Risk” and “Uncertainty” cannot be notified in the chapter. By quoting, UN World Water Assessment Report Volume 1, Managing Water under Uncertainty and Risk,<br>“Risk commonly refers to an adverse event or the con-sequence of a decision. (see Section 8.1.2; see also Aven, 2003; Bedfore and Cooke, 2001; Cooke, 2009; Covello and Mumpower, 2001; Kaplan and Garrick, 1981; Kasperson et al., 1988; Mays, 1996; Slovic, 1992; Yoe, 1996).<br>Uncertainty is often used in connection with the term risk (sometimes even interchangeably). The most widely held meaning of uncertainty refers to a state of mind characterized by doubt, based on a lack of knowledge about what currently exists or what will or will not happen in the future. It is the opposite of cer-tainty, which is a conviction about a particular situation (Bogardi and Kundzewicz, 2002; Morgan and Henrion, 1990; Pindyk, 2007).” Thus, I would like to suggest above UN World Water Assessment Report Volume 1, Managing Water under Uncertainty and Risk and inter quotation as main sources for this chapter when 2nd revision. | Thanks for pointing us to this reference. However, we rely on the definitions of risk and uncertainty as spelled out in the IPCC-AR5's uncertainty guidance notes. The link to those as well as the definitions we are using will be explained clearer in the SOD. |
| 6056 | 2 | 0 | | | | Thorughout this chapter, there are so many textbook style explanation about risk and uncertainty especially 2.1, 2.2 and 2.3. What really matters with respcet to climate policy and uncertainties are, for example, how to manage the risk and uncertainty of fat tail issue of catastrophic damages when deciding/agreeing global target concentration, how to evaluate the role of bio-CCS and food security, how to invite all the countries to an international framework (immediate participation) in order that mitigation effort will not become too late. In contrast, concrete examples in this chapter very often start with uncertainty with farmers or carbon tax. I think these uncertainties are so well known and not appropriate to be cited so frequently. These may make the chapter feel rather redundant. Another point on this chapter is that cited concrete examples are heavily biased to US and European examples. Examples from other regions will add value to this chapter. The last point is that there are certain duplication among chapter 2 and 3. Chapter 2 should focus on risks and uncertainty aspect. | Thanks for the comment. The initial sections review standard material and are by their nature more text book style. Refracting risk as you suggest now plays a large role in Ch. 2 and the polity of risk management has become a unifying theme. |
| 16079 | 2 | 0 | 0 | | | In the whole chapter -otherwise very interesting and pedagogic- it is difficult to distinguish between existing knowledge and new science. There could be also a benefit in mentioning more where this knowledge has been improved through climate policy (UNFCC bodies, spectific programs or policies...). | Thank you, we will stress more the difference between new science and existing knowledge |
| 18448 | 2 | 0 | | | | A clearly structured content, balanced discussion with case scenario analysis, however, there is | Thank you, unfortunately the last part of the comment was truncated |

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| 7894 | 2 | 0 | | | | If it is true that different agents can choose different tools for risk assessment the questions occurs what combination of tools the benevolent social planner should choose. In fig. 2.2 it looks as if the identification of stabilization targets using CBA in combination with adaptation planning is the most reasonable tool for the social planner. This judgment, however, does not follow from the reasoning in section 2.3. If our observation is correct, the chapter adopts Nordhaus' approach that faces massive criticism. Subsequent comments are related to this general remark. | The social planner's choice of assessment method should be the result of a society's debate, as it is a deeply normative issue. CBA is just one option. We will modify Fig2.2 to further reduce the risk of mis-interpretation. |
| 3366 | 2 | 1 | | | | This is an excellent chapter. Others chapters should learn from it, such that uncertainty discussion within all chapters is put on a high level. | Thank you! Positive comments are very helpful in achieving balance. |
| 4892 | 2 | 1 | | | | Ch.2 Integrated Risk and Uncertainty Assessment .. | Comment is unclear - no response |
| 13828 | 2 | 1 | | end | | In general, use of the term myopic (implying myopia) is not advisable. It has a specific scientific meaning that is not intended here. What is implied by its use is a perjorative (i.e. ascientific judgemental statement unfounded by citation of literature). Sometimes the use of system 1 leads to survival. This is not a myopic choice. Use a term from the scientific literature that conveys the point of interest and we may find better success reaching the intended audience. Page 18, line 7 is an appropriate use of the term as it refers to a professionally-defined concept (cognitive myopia). | We did not intend to use the term in a pejorative way, but instead as describing an attentional focus on objects and concerns closer by that are therefore getting privileged by actions taken. We have tried to be more careful in any unintended connotations throughout the paper and also emphasize much more the adaptive function of such a focus |
| 2593 | 2 | 1 | 1 | 74 | 21 | This chapter is very knowledgeable, like a textbook. If possible, lots of examples or study cases might enrich its content, and would be attractive. | Table 2.1 provides an opportunity for Chapter 2 and other chapters to provide |
| 11476 | 2 | 1 | 74 | | | While there is an improvement over the previous daft, overall the whole chapter is not tightly integrated among different sections, resulting in some sections being well developed while others are not. In addition, there is some overlap, making the whole chapter a little repetitive. | We will address these issues in the SOD. Our aim is a qualitative improvement of the level of integration |
| 4902 | 2 | 1- | | | | MISPRINTS etc. | This comment is ambiguous. However, the entire section has been edited. |
| 6065 | 2 | 10 | 1 | 10 | 2 | Please explain why the investment that may result in a small loss to investors be justified. | Such investments may be justified on account of risk aversion or risk loving. The rank ordering of expected utilities associated with different options may differ from the rank ordering of their |
| 7693 | 2 | 10 | 10 | | | Please clarify: "[…] the right-hand tail the distribution of climate never diminishes to zero[…]". Assuming that the distribution refers to damages, could this be rephrased as "there is a non-zero possibility that climate damages can be infinitely large", or some other expression that does not explicitly mention distributions. The text would be then be more accessible. | Thank you. Correction has been made. |
| 11495 | 2 | 10 | 10 | 10 | 10 | Grammar: "the right-hand tail the distribution" - needs correction. | Thank you. Correction has been made. |
| 7227 | 2 | 10 | 10 | | | tail the distribution -> tail of the distribution | Thank you. Correction has been made. |
| 7228 | 2 | 10 | 10 | | | It is not clear what is intended to say with this? What is a climate distribution? What does "right hand" mean in this context? | Point taken. We have changed the phrase to "the right-hand tail the probability distribution of climate |
| 3189 | 2 | 10 | 10 | | | "distribution of climate only slowly changes" | Thanks. We have changed the text as suggested in the working draft. |
| 7229 | 2 | 10 | 14 | | 16 | the sentence does not parse. Maybe "adapting" -> "be adapted" | Thanks. We have changed to "guide the targets for greenhouse gas emissions, and suggest the need to adapt to a wider possible range of climate impacts than |
| 13802 | 2 | 10 | 15 | | | Remove first 'possible' from this sentence | Done! Thanks. |
| 13803 | 2 | 10 | 16 | | | Remove 'may not have been' | Done. Thanks. |

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| 6369 | 2 | 10 | 17 | | 26 | The uncertain GHG mitigation effect of some proposed mitigation measures creates a risk of increasing GHG emissions in the name of reducing them. More broadly, our methods for assessing these reductions (e.g., life cycle assessment, approved CDM methodologies) include many data, model, and scenario uncertainties. This is most famously the case for biofuels, but is true even for fuel switching from coal to natural gas, given uncertainty about NG leakage rates and the increasing trade in coal. It's important to compare both the mean and variance/uncertainty of the GHG reduction benefits of different strategies so these risks can enter into the discussion. | The point raised here is absolutely valid, but is tangential to this particular paragraph, which was written mainly to clarify the types of systems and unceratinties that matter for policy development. Hopefully the issues that the reviewer raises will be addressed in |
| 9114 | 2 | 10 | 18 | 10 | 20 | Do the figures include embodied energy in the goods that are importetd? In developed countries cities tend to outsource heavy industries but import a large proportion all the utilized goods. | I don't understand the comment, because we do not provide any figures at |
| 13804 | 2 | 10 | 19 | | | Change 'can' to 'might' | Thanks, but we will stick with "can." Both words work. Levies can protect people. Levies might protect people. The former word is a bit more theoretical and abstract, the latter a bit more practical. This paragraph is written at the more |
| 11723 | 2 | 10 | 20 | 20 | 24 | Already established technologies like energy transmission in Japan, USC for power generation have great potential to reduce CO2 in the world. Original sentences could make readers misunderstand that available technologies doesn't have much potential. It would be apropriate [...technologies for energy transmission, storge, and greater energy efficiency which are new or in stages of rapid improvement can reduce furtehr carbon emissions. It is however ....]. | Good point. We have changed "Many of these technologies" to "Some of these technologies," which carries less of a connotation about relative numbers. |
| 13805 | 2 | 10 | 20 | | | Change 'can' to 'might' | Thanks, but we will stick with "can." Both words work. "Can" is a bit more theoretical and abstract, "might" a bit more practical. This paragraph is written at the more theoretical and abstract |
| 13806 | 2 | 10 | 21 | | | Change 'can' to 'might' | Thanks, but we will stick with "can." Both words work. "Can" is a bit more theoretical and abstract, "might" a bit more practical. This paragraph is written at the more theoretical and abstract |
| 4908 | 2 | 10 | 27 | | 38 | some hint on the uncertainties related to the new SSPs would also be in line with the purpose of this listing | As far as we are aware the SSPs are in too preliminary a stage of development for the uncertainties to have become |
| 13807 | 2 | 10 | 28 | | | Make it clear that you mean AR3 and AR4. Right now it reads as if there have only been two previous assessment reports. | Thanks. We have changed it to "The most recent two assessment reports…" |
| 12233 | 2 | 10 | 29 | 10 | 29 | SRES should be explained, as it is introduced for the first time in WGIII report. | If the SRES scenarios were to be discussed at length in this report, we would do so. But they now belong to the dustbin of history, and so given space limitations we will allow interested |
| 8123 | 2 | 10 | 4 | 10 | 5 | The kind of policy choices and the phase during the policy cycle (or risk assessment) should be characterized. | We agree. We are revising the introduction substantially in order to do |

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| 9791 | 2 | 10 | 4 | 11 | 13 | The five distinct areas can be referred to as PESTE(L) or STEEP-analysis (political, ecological, social, technological, economic and legal environment) and thus build on a framework widely used in organizations. | Thank you for bringing this analysis (known variously as PEST, PESTEL, PESTLE, STEEPLE, and STEEPLED) to our attention. We believe that the ideas we present here match that quite closely. We do not suplicate the PESTLE format, because as far as we understand that format is one designed primarily for use by private sector firms, across a wide range of choices or |
| 13801 | 2 | 10 | 4 | | | Change 'policy choices' to 'policy choices concerning climate change' | Good suggestion. We have incorporated it in the working draft. |
| 9115 | 2 | 10 | 42 | 10 | 43 | A reference would be needed here in my opinion. I would anticipate that in these cities especially the differences between a consumption-based and a production-based assessment results would be very different. | Thank you. The text has been revised accordingly. |
| 10268 | 2 | 10 | 43 | 10 | 47 | Keynesian models are minor for analyses of global warming mitigation. The limitations of the assessments by Keynesian models particularly for long-term analyses of global warming mitigations should be discussed. The explanations regarding these points are required. | The point is well taken. Our point in this chapter is not to appraise the relative merits of the two models, but rather to suggest the fact that their presence introduces an aspect of uncertainty. What we have done is to change the sentence to make it clear that the Keynesian approach is the minority view: "As Knopf and Edenhofer (2010) report, for example, the majority of energy models, based on a Ramsey (1926) full employment growth model of the economy, predict net reductions in global economic activity as a result of |
| 4702 | 2 | 10 | 43 | 10 | 48 | Environmental Kuznets curves might also be mentioned here. | We don't understand what environmental kuznets curves have to do with uncertainties associated with future regulations and their effects, if the line |
| 3190 | 2 | 10 | 43 | | | "Ramsey(1926) full-employment growth model" | Done. Thanks. |
| 14369 | 2 | 10 | 45 | | | It is misguided to give the impression that abatement will be cost-free because of Keynesian considerations. Keynesian unemployment is a temporary issue, not a persistent phenomenon for half a century. | The point is well taken. Our point in this chapter is not to appraise the relative merits of the two models, but rather to suggest the fact that their presence introduces an aspect of uncertainty. What we have done is to change the sentence to make it clear that the Keynesian approach is the minority view: "As Knopf and Edenhofer (2010) report, for example, the majority of energy models, based on a Ramsey (1926) full employment growth model of the economy, predict net reductions in global economic activity as a result of |

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| 5320 | 2 | 10 | 45 | 10 | 47 | There is no reference in the chapter proving that in Keynesian models the increase of mitigation increases economic activity. This claim is also not quite true in general. A Keynesian model based on production functions and a budget constraints on inputs, say capital, does not make this prediction. Even if investment in abatement is treated as a "normal investment", there is the concept of "crowding out" in Keynesian models which can be up to 100%. Third, a Keynesian model may predict increase of economic activity in the short run. However, a deficit financed increase without productivity investment may have contracting effects in the long run, also in a dynamic Keynesian model. In my view Keynesian model are often abused to prove that abatement investment (which may be well justified by environmental reasons) has a second dividend, which it usually does not have. | The point is well taken. Our point in this chapter is not to appraise the relative merits of the two models, but rather to suggest the fact that their presence introduces an aspect of uncertainty. What we have done is to change the sentence to make it clear that the Keynesian approach is the minority view: "As Knopf and Edenhofer (2010) report, for example, the majority of energy models, based on a Ramsey (1926) full employment growth model of the economy, predict net reductions in global economic activity as a result of |
| 6066 | 2 | 10 | 45 | 10 | 47 | Need citation for net increases in global economic activity | The result appears in Knopf and Edenhofer (2010), which as been cited. |
| 3191 | 2 | 10 | 46 | | | "Keynesian model of an unemplooyment economy" | I put in the "full employment" part before the Ramsey model. But as far as I know the Keyensian model differs in that it does not assume full employment. Hence, it could be full employment, or could be partial employment. So I will |
| 9116 | 2 | 10 | 48 | 10 | 49 | One potential density effect is an increase in overall consumption leading to higher emissions. This perspective should not be totally omitted. | This is a good point, and I trust that it will be covered in another chapter. Here |
| 13808 | 2 | 10 | 48 | | | Change 'actor' to 'actors' | Done. Thanks. |
| 13809 | 2 | 10 | 49 | 11 | 1 | Change 'as to what future climate policy will be' to 'about what climate policies will be adopted in the future' | I am going to leave it as it stands. The version you suggest implies that climate policies are things that need formally to be adopted. The more expansive definition of policy, which we use in this |
| 3188 | 2 | 10 | 5 | | | "five broad areas" ["distinct" too strong] | Good suggestion. We have incorporated it in the working draft. |
| 8234 | 2 | 10 | 6 | 10 | 16 | Another aspect of low-probability high-impact events and tipping points raised by Weitzman (2009b) is that they may also be irreversible, which strenghtens the argument for including a precautionary effect in climate change decision-making. | Thank you for this reference. It has been inserted in the text. |
| 11494 | 2 | 10 | 9 | 10 | 10 | The description of "fat tails" is misleading. Both tails can be fat, depending on the climate variable under consideration - not just the right-hand tail, as indicated in the text. This is important because in many cases, communities need to simultaneously prepare for precisely opposite extreme events , e.g. both floods and droughts. | Thank you. The sentence is not a description of 'fat tails,' rather, it is just an instance of the tails as you have correctly highlighted. |
| 10163 | 2 | 10 | 9 | 10 | 12 | This sentence is unclear. First an explanation/definition of "fat tail" is needed, secondly it is not clear what is not diminishing to zero. | Thank you. We have included a description/definition of fat tails. The |
| 6883 | 2 | 10 | 7 | 10 | 7 | Proper reference needed to WGI AR5. | Ultimately yes. I don't think we know what that reference is yet, in terms of |
| 13810 | 2 | 11 | 1 | | | Change 'as to' to 'about' | Thank you. Correction has been made. |
| 13813 | 2 | 11 | 10 | | | Clarify 'they' and 'them' | Thank you. Correction has been made. |

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| 9117 | 2 | 11 | 14 | 11 | 18 | There is relatively little research on how the lifestyles change in overall when coming from e.g. dense downtown area or other dense agglomeration and moving towards the outskirts. The assessments tend to concentrate on changes in transport related emissions and housing, but omit the possibility that other consumption may change significantly as well. | yes, a good point. |
| 11496 | 2 | 11 | 14 | 11 | 21 | What is the definition of "social systems" in this paragraph? What does it include/exclude? Is it the same or different from "human systems" (see Ellis, 2009 "Earth science in the Anthropocene") | the term is used in contrast to natural systems, so is meant to be very broad and inclusive. To be more precise, we |
| 6067 | 2 | 11 | 14 | 11 | 15 | "Social system" should be changed to "socio economic system". | Thank you. Correction has been made. |
| 13814 | 2 | 11 | 17 | | 18 | You are mixing ideas. I think the parallel issue is the impact of uncertainty in social system dynamics upon decision making. | thanks, we reworded this statement. |
| 6068 | 2 | 11 | 20 | 11 | 20 | "Social system" should be changed to "socio economic system". | Thank you. Correction has been made. |
| 7231 | 2 | 11 | 22ff | | | Put the storyline at the beginning of each subsection? Write more in a newspaper style: Important information at the beginning, fillers towards the end. | Will consider this point in writing the SOD |
| 11497 | 2 | 11 | 24 | 11 | 26 | What does 'natural system' refer to? Is there on system or are there many? Is it the same as or different from "Earth system" (see Ellis, 2009 "Earth sciences in the Anthropocene") | Thank you. We have replaced 'natural' with 'earth' |
| 4910 | 2 | 11 | 25 | | | {Add} associated with {}the changes of the natural system | Thank you. Correction has been made. |
| 13815 | 2 | 11 | 25 | | | Strike 'and need to be made given'. This is opinion, not science and is not needed to make the point. The point is stronger without it. Instead say 'and that are affected by' | Thank you. Correction has been made. |
| 14529 | 2 | 11 | 27 | | 28 | The chapter should be careful with phrases such as “misperceive the risks.” Sometimes expert and lay perceptions of risk differ because the experts have better information and are thinking more carefully. But sometimes expert and lay perceptions differ because the two groups value different things. Chapter 1 of the IPCC SREX report tried to use language that captured the full range of possibilities. Language along those lines might be useful here. | yes, thank you, we have tried to be more careful. |
| 13811 | 2 | 11 | 3 | | | Change 'to' to 'of' | Thank you. Correction has been made. |
| 13816 | 2 | 11 | 32 | | | Change 'influences' to 'influence' | Thank you. Correction has been made. |
| 13817 | 2 | 11 | 34 | | | Strike 'key' - an evaluation best left for the reader | Thank you. Correction has been made. |
| 8125 | 2 | 11 | 37 | 11 | 41 | The two modes of thinking are quite reasonable at first glance. However, for further analytical and empirical clarification, this concept is too simplistic. Furthermore, it should not only focus on the limitation of the decision maker but in the same extent, on the limitation of the decisions' support tools. | We discuss the distinction in a more critical fashion now. Section 2.3 is explicitly addressing your second |
| 13818 | 2 | 11 | 37 | | | Strike 'key' - an evaluation best left for the reader | done. |
| 16080 | 2 | 11 | 39 | | | Extensive quote could be simplified | The bullets are not a quote but a |
| 13819 | 2 | 11 | 39 | 11 | 40 | Reference to Kahneman (2011) seems inappropriate. This is not peer-reviewed literature. Dr. Kahneman has published multiple peer-reviewed articles containing his ideas that would be more appropriate to cite. | thank you and we now also quote his nobel address in a peer reviewed econ |
| 16920 | 2 | 11 | 4 | | 21 | Probably should note that perceptions (I assume) is partly with reference to perceptions of climate change; and that extreme weather events may have disproportionate impact on these.<br>Its hard to be definitive about a list of uncertainties but I’d make a case for at least one more than the five listed: the state of international negotiations and of international relations more broadly, and the role of governments vis-à-vis other actors within this. The social science literature seems to have retreated somewhat from proclaiming either the death of the nation-state as dominant actor, or the demise of an international order – but there are quite major uncertainties, associated not least with the shift in centre of gravity to the emerging economies. | Thank you, we have added a section on "International Relations and Negotiations". |
| 8235 | 2 | 11 | 4 | 11 | 21 | An example of how people's preferences impact decisions when facing risk could be given using two agents with different profiles for risk aversion. | good point, though risk aversion is not the only and perhaps not even the most important difference in preference when it comes to climate-related decisions. |

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| 4909 | 2 | 11 | 6 | | | The anticipated impacts and costs of climate change | done, thanks. |
| 12234 | 2 | 11 | 8 | 11 | 10 | It's not clear what the reference is for this statement. We'd expect the negotiators to rely on their mandate from the government they represent, rather than depending on their perception of the preferences of the parties across the table. | We have added a reference to what Plous had labelled "perceptual dilemmas". In addition to following instructions on preferred actions from their government, international negotiators also need to infer what the preferences of the other parties are, a task on which there is uncertainty and |
| 13812 | 2 | 11 | 8 | | | Change 'outcome' to 'outcomes' | Thank you. Correction has been made. |
| 7230 | 2 | 11 | 8 | | | depend -> depends | Thank you. Once we change 'outcome' to 'outcomes,' then 'depend' is just |
| 8784 | 2 | 11 | 36 | 20 | 22 | Section 2.2 is insightful and helpful; however, much of the broad thrust of the analysis and more concrete discussions of how to address the issues raised are implicit in Aristotle's Nicomachean Ethics and subsequent virtue epistemology and ethics literature. I have completed an unpublished book manuscript that applies these insights directly to sustainable development and climate change. This includes questioning needing control for happiness - important given that humans cannot control the Earth System. It also includes discussion of how 'System 1 behaviour impacts on particular policy instruments [and] on ways to encourage System 2 behaviour.' the latter being more direct. | thank you. We now discuss the antecedents of the System 1 and 2 distinction in as much detail as space constraints allow. |
| 7694 | 2 | 11 | 36 | | | Can "System 1" and "System 2" have more descriptive names, although these would not be from Kahneman's book? "System X" can mean virtually anything, and the terms are used often in later subsection without reference to the source. (Not a big issue, but would improve readability.) | We are probably stuck with these labels, given that they have been popularized by Kahneman. We tried to add clarifying |
| 4704 | 2 | 11 | 36 | | | Section 2.2 could benefit by a summary at the end of the overall view that there is a significant disconnect between homo economicus and real people and that this disconnect creates a clear set of specific obstacles to understanding risk AND responding to it. | Excellent point which we have implemented, both for Section 2.2 and especially for the Executive Summary. |
| 6069 | 2 | 11 | 36 | | | Although the classification of two models of thinking is meaningful in dealing with behavioral responses, real problem with respect of uncertainties and risks exists in the field of System 2. It is better if this kind of explanation will be added here. | Good point, and many of the discussions of tools in Section 2.3 address this. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16921 | 2 | 12 | | 13 | | This is, or should be, the intellectual heart of the chapter. My sense is it needs attention to a few things to play this role well:<br>* It is hard to follow – having mentioned associative and affective processes, one assumes they have some link to the material that follows but its not obvious; cant eg the subsection titles that follow reflect these processes?<br>* I think the System 1 and System 2 are defined too narrowly at the outset broadly in terms of cognitive processes. The concepts are of far wider application. The First really could usefully span the realm of instinctive or embedded psychology and behavioural characteristics of both individual and organisational short-term responses. The latter is concerned with considered, "rational" evaluation generally based on attempts to quantify and trade-off costs and benefits. To an important degree – and highly relevant in a chapter of this nature - this is the domain of most economic theory.<br>* As indicated, I just don't think these two actually capture the span of issues. I think this section needs to introduce a third 'Strategic' decision-system/domain approaches in the face of deep uncertainty, objectives of security, and analytic traditions around innovation and transformation. This should include reference to the importance of "Black Swan" (Taleb, 2008) events in real-world developments, and might also include learnings from the financial crises (eg. Rajan, 2010). For an analysis of "Third Domain" issues in relation to energy and climate see Grubb, Hourcade and Neuhoff (Chapter 2 (completed) and Chapters 9-11 (in preparation).<br>This would then provide an intellectual framework within which, for example, the later Precautionary / "Robust Decision-making" discussion can be located by readers.N.N. Taleb (2007), The Black Swan: the Impact of the Highly Improbable, Pearson, 2007.<br>F.G.Rajan (2010), Fault Lines: how hidden fractures still threaten the world economy, Princeton University Press, 2010.<br>Somewhere in this section, I'd suggest reference also to herd behaviour (including corporates, as in stock and financial markets). These systems can create strong tendencies to "self-fulfilling prophesies" for a duration, and also boom-and-bust cycles. | Thank you for the useful feedback. We do frame the System 1 and 2 distinction more broadly now, though not as far you suggest. We don't quite see it as Psychology vs. Economics. We also think that the third strategic system you propose can be thought of as a System 2 response. Finally, we do now talk far more broadly about decisions at different levels, including organizational decision makers, see for example the new Table 2.1. |
| 7233 | 2 | 12 | | | | Talking about myopic: It might be better to demonstrate everyone's myopicity by an example policy makers can relate to. When reading about myopic views, one is quick to apply this label to others, but not to one self. Hence the need to drive home this point to EVERYONE. | A really nice point, which we have implemented in Section 2.2, using the example that policy makers who are focusing too much on political feasibility |
| 7234 | 2 | 12 | | | | try to phrase things in a way that makes use of modern psychology: people are much more afraid of losing something they have than of not getting something (or the other way around, I'm not sure). If one phrases key aspects of this report appropriately, this might influence decision makers | done, thanks. |
| 13822 | 2 | 12 | 10 | | | Change 'not only … choices by' to 'found in decision-making by the general public," [The problem is endemic!] | done, thanks. |
| 4610 | 2 | 12 | 11 | 12 | 14 | This is supposed to illustrate how exports also use System 2; however, I do not understand how the use of frequent and timely feedbacks illustrate System 2 use | We changed that statement to better describe what it was meant to show, namely that experts only make good predictions using System 1 processes when their evidence base matches |
| 13823 | 2 | 12 | 11 | | | Refeences seem dated given the objective of AR5 | that may be true, but these are classic references. We made an effort to also add references to more recent work, though there has not been a lot of either |
| 13824 | 2 | 12 | 13 | | | Change 'namely' to 'such as' | done, thanks. |
| 8482 | 2 | 12 | 15 | | 17 | Note the concept of "intuitive toxicology" here, and the variation of expert and lay assessments of risk | good point, thanks, done. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11498 | 2 | 12 | 27 | 12 | 29 | The implication that social planners are inherently more thoughtful than individual decision makers appears unfounded. | We changed "can" to "may be" to make this an aspiration rather than description. |
| 8126 | 2 | 12 | 3 | 12 | 7 | In contrast to this statement, the two modes of thinking are used in this chapter as analytical, clear reasoning for behavior. In my perspective, the use of the two modes of thinking in this chapter is not in line with the work and evidence of Kahnemann, 2011. See also: p. 13, line 4-7. | We are using the two modes of thinking as a useful organizing principle, and in a necessarily simplifying fashion that does not always do justice to all qualifications and complexities that a detailed psychological analysis of specific |
| 14530 | 2 | 12 | 3 | | 7 | I very much like organizing this discussion around System 1 and System 2. But this chapter needs to do more to put its discussions of individual decision making into the context of the group decisions that will be crucial in addressing climate change. Towards the end of his wonderful "Think Fast, Think Slow" book, Kahneman notes "organizations are better than individuals when it comes to avoiding errors, because they think more slowly and have the power to impose orderly procedures….Whatever else it produces, an organization is a factory that manufactures judgments and decisions…The corresponding stages in the production of decisions are the framing of the problem that is to be solved, the collection of relevant information leading up to the decision, and reflection and review." Given its topic is climate change, the chapter could do much more to place its discussions in a broader institutional and organizational context, because organizations such as businesses, governments, NGOs,churches, and political groups will be the focus of many if not virtually all impactful climate decisions. In this vein, the chapter should really draw more heavily on concepts such as risk governance (Renn) and the concepts of decision support. Both these frameworks emphasize just the steps laid out by Kahneman, in particular processes that organizations use to frame problems and use in the generation, transmission, and interpretation of information about risk. | We now address decisions across the whole spectrum of decision makers, including the organizational and policy levels, much more explicitly, see the new Table 2.1. |
| 9792 | 2 | 12 | 30 | 12 | 36 | Moreover planning horizons in companies are short-term, family businesses think more long-term. The literature on incentive systems, e.g. Ibrahim, S.; Lloyd, S. The association between non-financial performance measures in executive compensation contracts and earnings management. In: J. Account. Public Policy 30 (2011) 256–274 might add additional value. | An interesting reference, thank you. |
| 13829 | 2 | 12 | 30 | | | delete "and be myopic." It is redundant here at the least. | done, thanks. |
| 11499 | 2 | 12 | 30 | 12 | 36 | What does 'System 1' say about 'strategic behavior'? When people make choices about future their behavior can be strategic on the time frame that they choose. This paragraph, however, makes a case for 'human tendency to be myopic' that can mean it is a human condition. Is it really? | Research suggests that System 2 processes are required for strategic thinking and planning, which involves abstractions at multiple levels and processes. This is not to say that |
| 8127 | 2 | 12 | 39 | 12 | 39 | The author should be careful to claim an 'objective reality'. At least it should be clarified to whom 'objective reality' is meant. | Thank you, a loaded term, we changed it to "external" reality. |
| 11500 | 2 | 12 | 39 | 12 | 39 | What is "objective reality"? This term is contentious. | Thank you, a loaded term, we changed it |
| 13830 | 2 | 12 | 45 | | | why it is 'relevant' here is not explained. | now explained better |
| 8128 | 2 | 12 | 47 | 12 | 48 | Quite a few terms have to be defined. Here, as an example: what is 'second-order' uncertainty? | The sentence has been reworded. |
| 13831 | 2 | 12 | 48 | 13 | 2 | This sentence is convoluted and may be hard for a reader to decipher unambiguously. | The sentence has been reworded. |
| 13820 | 2 | 12 | 5 | | | Strike 'convincingly' - an evaluation best left for the reader | done. |
| 10164 | 2 | 12 | 8 | 12 | 23 | References that possibly can illustrate the outcomes/effects of using system 1 vs system 2 in decision making: Shenhav, Rand & Greene (2011) Divine Intuition: Cognitive Style Influences Belief in God. Journal of Experimental Phsychology: General, 141: 423-428; Gervais & Norenzayan (2012) Analytic Thinking Promotes Religious Disbelief. Science, 336: 493-496. | We added the second reference, thank you. |
| 4911 | 2 | 12 | 9 | | | {Add: t} reflect the more | done, thanks. |
| 13821 | 2 | 12 | 9 | | | Change 'he' to 'the' | done, thanks. |
| 7232 | 2 | 12 | 9 | | | he -> the | done, thanks. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6302 | 2 | 13 | | 41 | | The chapter as a whole is sound, persuasive and well documented. It raises issues of critical importance and it does so well, on the whole. However, I have some concerns about the way in which System 1 and System 2 thinking guide the discussion. System 1 thinking is described as somewhat simplistic, uninformed, affective and biased thinking, with System 2 thinking described as analytical and informed. However, it is vital to recognize that often, pre-thematic (what the IPCC authors recognize as System 1 thinking) can also be extremely well-informed. For instance, I quote from my recent article to provide an example, which reads: "In an incident during Operation Desert Storm, when American Marines were to liberate Kuwait from Iraqi invaders, a fleet of coalition aircraft carriers were stationed twenty miles off the coast as backup for the ground troops. They were also thereby positioned in close proximity to potential Iraqi missile fire.<br>Lieutenant Commander Michael Riley was responsible for protecting the Allied fleet by monitoring the radar screens onboard a British destroyer. He came on duty at midnight. In the early morning, one blip on the screen began to cause him consternation even though, from all available evidence, there was no reason to doubt that the blip was simply another American A-6 fighter jet. However, Riley became increasingly concerned that it could be a Silkworm missile headed for the USS Missouri. If that ship were hit, hundreds of U.S. sailors could die. There was no clear way to figure out from the radar screen what the blip was, and because the object was moving quickly, a decision had to be made right away.<br>Riley gave the order to fire even though he had no rational evidence for his concern and despite the fact that if the blip really was an allied fighter jet, two innocent American pilots would die. Four hours later, the results were reported: the blip was indeed a Silkworm missile, and Riley had saved hundreds of American lives.<br>Why did Riley experience this reaction to a blip on a radar screen that was indistinguishable from the other blips that indicated American jets? Riley himself could not explain his anxiety, and others concluded that his decision had simply been a lucky guess. However, a cognitive psychologist decided to investigate Riley's decision-making process and revealed that the answer lay in the timing of the appearance of the radar blip on the screen. It had appeared eight seconds earlier than the average A-6 fighter jet. Somehow, Riley had picked up on this minimal, almost unnoticeable time discrepancy.<br>The point of the story for me is that lived experience teaches us in ways that we are often unaware of. Sometimes, we are able to know and to understand without explicitly recognizing and following a set of rational rules and procedures. Riley himself was unable to give a logical explanation of his fears, even though he had intuitively recognized that something was wrong.<br>In fact, knowledge and reason do not consist only of explicitly acknowledged facts and values. Often, we operate with a non-calculative, pre-thematic understanding of the world. The notion of a sense of place, for instance, often is formed pre-linguistically and pre-reflectively."<br>See Stefanovic, Ingrid Leman (2012), Honoring the Landscape through Thoughtful Decision Making", Minding Nature, May 2012, Vol. 5, Issue 1, 12-18. | This is a beautiful example of the wisdom of intuition, which we now describe far better in Section 2.2. |
| 8129 | 2 | 13 | 12 | 13 | 14 | Imprecise language. This sentence clarifies a general critique I have to the overall chapter. Of course, there are much more than two psychological risk dimensions! Especially Solvic would agree to that. What might be meant by the text is: there are two _most relevant_ psychological risk dimensions. This kind of imprecise language makes is difficult to grasp the right conclusion of the chapter. | wording has been changed. |
| 8130 | 2 | 13 | 28 | 13 | 28 | What is the meaning and relevance in this context of this paragraph? | this paragraph has been deleted to make room for other material |
| 4833 | 2 | 13 | 35 | 13 | 44 | Another factor which might play in here is that the manifestations of climate change are all known events to humans (humans have seen storms, floodings, draughts, etc. before). Following the psychometric paradigm, this should lead to lower risk perception. This possible effect is discussed in Klöckner, C. A. (2011). Towards a Psychology of Climate Change. In W. Leal Filho (ed). The Economic, Social and Political Elements of Climate Change. Climate Change Management (pp. 153-173). Berlin: Springer Verlag. | thank you, we added this reference. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11501 | 2 | 13 | 36 | 13 | 38 | In some cases, isn't it possible that if a hazard is not observed over a long period of time, we can conclude that the likelihood of that hazard is reduced? | When there is evidence that the probability might have changed/decreased, increased periods of time without any incident do provide Bayesian evidence about a potential |
| 11502 | 2 | 13 | 40 | 13 | 43 | It seems that options such as moving to a different part of the country are written with mid to higher socioeconomic classes in mind. People with lower incomes may not find this to be an option, even if they have several years notice. Perhaps suggest that the non-immediate nature of the change allows time for planning of alternatives and strategies. | Yes, thank you, that is a better illustration. |
| 8131 | 2 | 14 | 1 | 14 | 48 | On this page there are quite a lot of repetitions. The relevance of some paragraphs remains unclear (line 13-21). Again, imprecise language: The statement from line 10 remains in contrast to line 13/14. People are almost always exposed to weather since climate change is a phenomenon over decades. A few local storms and flooding are not 'physical evidence of climate change'. | This section has been revised and shortened, thanks. |
| 11504 | 2 | 14 | 13 | 14 | 13 | The claim that "most people consider themselves expert on the weather" is unfounded and highly unlikely in many cultural contexts where weather is regarded as highly unpredictable. | This section has been revised. |
| 7235 | 2 | 14 | 13 | | | define climate vs. weather | This section has been revised. |
| 14232 | 2 | 14 | 14 | | | I think "Loss Aversion" should be formatted non-italic bold | This section has been revised. |
| 11503 | 2 | 14 | 3 | 14 | 4 | It is important to acknowledge that statistical analysis are not the only way to engage in System 2 processes. Many societies without a tradition of statistical description nevertheless maintain nuanced and highly-effective decision-making systems. | It would be very helpful to have specific examples of what these decision making systems entail. Please provide us with |
| 4912 | 2 | 14 | 30 | | | {Add} A recent study of a representative sample {Add}of the in Britain .. | This section has been revised. |
| 11506 | 2 | 14 | 30 | 14 | 30 | There seems to be a word missing between 'the' and 'in' | This section has been revised. |
| 7236 | 2 | 14 | 30 | | | sample of the in Britain public | This section has been revised. |
| 13832 | 2 | 14 | 36 | 14 | 39 | This statement is not substantiated by reference to literature. It is not clear if these are opinions of the author(s) or conclusions based on actual scientific analysis that has been peer-reviewed. | Statement has been taken out |
| 16081 | 2 | 14 | 40 | 15 | 6 | Paragraph made of too long sentences with alternate propositions. It could gain by shorter sentences (i.e. less that two lines) with references at the end. | Paragraph has been revised accordingly. |
| 3192 | 2 | 14 | 6 | | 9 | confusing sentence: "highly unlikely"[?] | This section has been revised. |
| 8236 | 2 | 14 | 17 | 14 | 21 | It is not necessarily true that the colonist continued to clung to their expectation based on latitude, I think it was because the benefits of settling overrode the expected loss or damage from colder temperature. I do not think this is good example. There are better examples given later in the chapter. | These two explanations are not mutually exclusive. In the interest of space for other content, we eliminated the |
| 6884 | 2 | 14 | 22 | 14 | 23 | A reference from 1997 is not a "recent example". Suggest to rephrase. | done, thanks. |
| 16922 | 2 | 15 | | | | "Other factors". Is the chapter too polite to mention lobbying? It is estimated that US industry spent $500m on lobbying on climate change in 2010 and presumably much of this was targeted a public opinion. | We now discuss such vested interest campaigns in Section 2.2.1.3. |
| 16923 | 2 | 15 | | | | Section 2.2 overall might benefit from cross-check against literature in the most recent (June 2012) Special Issue of Risk Assessment which is on climate change (eg. Spence et al., 2012). | Good suggestion, thanks. |
| 7237 | 2 | 15 | | | | talk only about "people's" reluctance to deal with climate change. Maybe explicitly mention politicians as well? Or will this antagonize too much? rewrite it less abstractly. Say that people don't like to deal with negative things or things that they are not in control of as the first sentence. | Nice suggestion, done. |
| 8132 | 2 | 15 | 1 | 15 | 16 | What are the conclusions from these findings? | This section will be revised with better content and conclusions. |
| 11507 | 2 | 15 | 1 | 15 | 6 | The distinction between weather and climate is more subjective than one might think, particularly as the rate and magnitude of changes increase. Climate is described by long-term trends and parameters, but extreme events are increasingly likely (i.e. fat tails). As abnormalities (as described here) are observed more frequently, so-called extreme weather may be increasingly indicative of climate. Furthermore, many people have acquired transgenerational knowledge of climate that enables them to be keenly aware of long-term climate changes, so the claim that people are generally unfamiliar with climate rings false. | All valid points. We have toned down our statements on this issue. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10165 | 2 | 15 | 14 | 15 | 16 | It is unclear what "similar results" refer to here. Is it that there is higher concern amongst scientists than non-scientist? But the levels of concern in both groups are higher than in the US. | it refers to similar variability in concern over time, which we now say more |
| 14370 | 2 | 15 | 17 | | | Sad that a chapter would have to be written explaining climate change denial | yes, indeed. |
| 4834 | 2 | 15 | 19 | 15 | 20 | "people with finite processing capacity" is an unfortunate phrase since all humans have finite processing capacity. | fixed, thanks. |
| 16082 | 2 | 15 | 29 | 15 | 35 | Paragraph short and to the point, focused on knowledge useful for policymakers, not too many references. | thank you. |
| 8133 | 2 | 15 | 31 | 15 | 31 | Definition: systemic uncertainty?; what is meant by: expert disagreement about many forecasts? | both have been reworded |
| 13833 | 2 | 15 | 36 | 15 | 38 | Please provide a reference for this sentence. It is not demonstrated by the reference given on line 41. | This is not an empirical statement, but a simple logical fact. Any mitigation or adaptation policy intervention may solve a climate problem but in doing so will |
| 12519 | 2 | 15 | 42 | | | The sentence is: “The cognitive demand of a calculated response to climate risks normally loses out to behavior that satisfies emotional needs and minimizes tradeoffs.” Is there a citation for this assertion, and are there other views? | We took this statement out, since it was a conjecture. |
| 4629 | 2 | 15 | 44 | 15 | 47 | “Motivated reasoning, as 44 exhibited by the confirmation bias (i.e., a tendency to attend to evidence confirming favored beliefs) 45 tends to steer individuals to System 1 behavior. More specifically, wishful thinking and motivated 46 cognition in the face of growing evidence of climate risks helps explain increased polarization in 47 attitudes and beliefs about climate change over the past two decades . . .” Even scientists who know the theories of Karl Popper still focus on confirming evidence for a theory, when they should of course look for disconfirming evidence. I think these sentences are speculative and unsupported – you might say an example of motivated reasoning. Is there increased polarization, or is there, as in most things, a distribution of beliefs? Is there more polarization or just more awareness among the general public of the issue? | Yes, there is increased polarization, now documented with a reference, Pew (2010). |
| 13834 | 2 | 15 | 47 | 15 | 48 | Please document this 'increased polarization' | Done, Pew (2010). |
| 4256 | 2 | 15 | 35 | | | This discussion does not place enough emphasis on the role of organised climate change denialism see for example 'The Merchants of Doubt' by Naomi Oreskes which shows how powerful interests are funding denialist activities in the USA | We discuss the book and argument in Section 2.4.3.5, but have also added a reference to it here. |
| 4249 | 2 | 15 | 47 | 15 | 48 | This discussion does not place enough emphasis on the role of organised climate change denialism see for example 'The Merchants of Doubt' by Naomi Oreskes which shows how powerful interests are funding denialist activities in the USA | We discuss the book and argument in Section 2.4.3.5, but have also added a reference to it here. |
| 17326 | 2 | 15 | 7 | 15 | 16 | This session brings about the question "how does concern over climate change relates to specific individual/collective action? In this session and the previous one the discussion makes no allusion to what if anything happens after raising "concern" about an issue such as climate. The specific example here used considering the study made after people who had seen the movie "The Day After Tomorrow" seems very particular singular to stand as the marker of this session on its own. Is it possible to find studies that inform on the effects of how climate is discussed in the media and its effects? | This is a very good question and we will try and find such studies for the SOD. |
| 8134 | 2 | 16 | 1 | 16 | 40 | Again, repetitions and unclear conclusions. | Section has been revised. |
| 13837 | 2 | 16 | 10 | | | The inference ("therefore") is not clearly based on a logical syllogism. I am not convinced it follows from the evidence cited. | Has been reworded. |
| 7238 | 2 | 16 | 10 | | | are -> is | done. |
| 13838 | 2 | 16 | 12 | 16 | 17 | The first sentence refers to a different point than the remaining sentences in the paragraph. | This section has been revised. |
| 13839 | 2 | 16 | 15 | 16 | 17 | The example is not appropriate for the preceeding sentence. | This section has been revised. |
| 11508 | 2 | 16 | 18 | 16 | 24 | This paragraph is miselading because it does not address the many regions of the world where people are already observing and responding to climate change, and therefore recognize climate change as both local and immediate. | This section has been revised. |
| 16083 | 2 | 16 | 19 | 16 | 22 | Odd sentence (lacking a verb?), too long | This section has been revised. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13840 | 2 | 16 | 21 | | | "to that" … missing a word? "to conclude that" ?? | This section has been revised. |
| 11509 | 2 | 16 | 21 | 16 | 22 | This part of the sentense is not clear. Perhaps a missing word: "Americans to … that" | This section has been revised. |
| 7239 | 2 | 16 | 21 | | | a verb is missing in the sentence, maybe "believe"? | This section has been revised. |
| 13835 | 2 | 16 | 4 | | | Delete "with respect to the future." It is redundant. | done, thanks. |
| 3193 | 2 | 16 | 4 | | 6 | sentence unclear, convoluted | Has been reworded. |
| 16925 | 2 | 16 | 41 | | | Shouldn't the title be something like "Social amplification and attention of risk perception"? It seems to cut both ways, particularly if industry spends $500m convincing publics that there is not a problem | Section has been revised. |
| 11510 | 2 | 16 | 41 | | | Why is there is only one subheading 2.2.2.1, what sense does such subtitle make? | We added another subsection on Individual differences in numeracy. |
| 16084 | 2 | 16 | 47 | 17 | 6 | The example given is probably specific to North America (?), maybe too local. | This section has been revised and made |
| 11511 | 2 | 16 | 47 | 17 | 6 | The purpose of this example is not clear, and needs to be elaborated. The implication seems to be that most people quickly forget their concerns about climate change, but this is not particularly strong evidence. Why not look at examples from indigenous communites? | This example has been removed and the section made more general. |
| 13836 | 2 | 16 | 6 | 16 | 9 | This sentence seems out of place here. The idea is not clearly related to the preceeding or following sentence. | Section has been revised. |
| 4042 | 2 | 16 | | | | This section should also include a discussion on values-based approaches to the characterisation of climate change cognition. In the field of adaptation, that has largely been discussed in terms of (non-monetary) values associated with preferred outcomes. However, this is just as pertinent for mitigation as well. Suggested published literature includes: O'Brien, K. (2009). Do values subjectively define the limits to climate change adaptation? In W. N. Adger, I. Lorenzoni & K. O'Brien (Eds.), Adapting to climate change: Thresholds, values, governance: Cambridge University Press. and O'Brien, K. L., & Wolf, J. (2010). A values-based approach to vulnerability and adaptation to climate change. Wiley Interdisciplinary Reviews: Climate Change, doi: 10.1002/wcc.30. | This is more of a topic for Chapter 3, and space constraints prevent us from addressing it in Chapter 2. |
| 6885 | 2 | 16 | 29 | 16 | 29 | Refer to Mastrandrea et al. 2011, IPCC AR5 Guidance Note on the treatment of Uncertainty. | done. |
| 4631 | 2 | 17 | | | | , time discounting. There is a large literature on the apparently large discount rate used by most people in making decisions about future events, e.g., not investing in insulation or fluorescent light bulbs despite their clear economic benefits. It's either that or a budget constraint (possible for some investments, especially by local government decision-makers) or inertia in the face of too many competing decisions (otherwise known as procrastination). (There is a substantial section in chapter 3 on this topic which should be referenced.) | We now refer to Chapter 3 for its treatment of discounting. |
| 8135 | 2 | 17 | 1 | 17 | 6 | What is the conclusion of this statement? | This section has been revised. |
| 11512 | 2 | 17 | 14 | 17 | 33 | The concepts of loss aversion and status quo bias appear to be interrelated. It is not clear how they can be considered separately. | yes, correct, and the sections have now been combined |
| 7240 | 2 | 17 | 14 | | | loss aversion: Say one clear sentence, e.g. "People are more afraid of losses than they are keen on winnings." | a better definition has been provided. |
| 7241 | 2 | 17 | 15 | | 16 | Too abstract. People who read this probably won't know what a slope is! | a clearer definition of loss aversion has |
| 3194 | 2 | 17 | 15 | | | define or describe "expected utility theory" first time term is used. | It is defined in Section 2.3, to which we |
| 4630 | 2 | 17 | 26 | 17 | 28 | "The crop 26 allocation decision will also be influenced by degree of risk aversion and the magnitude of loss 27 aversion." This throwaway sentence ("also be influenced") is the entire behavioral side of the decision under uncertainty. | We are not quite sure what you mean by this comment. All of Section 2.2 and large parts of Section 2.4 address the behavioral side of decisions under uncertainty, and the Behavioral X-cut of |
| 8136 | 2 | 17 | 29 | 17 | 33 | What is the conclusion? | A better take away has been added. |
| 16085 | 2 | 17 | 34 | 17 | 48 | Interesting example and quote, but is it so new? Could you precise? | We are not sure what example and quote you refer to in this section on |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 9793 | 2 | 17 | 34 | 17 | 48 | Please sound this paragraph with the corresponding deliberations in chapter 3. | All the x-cuts are designed to connect themes across chapters. We also now refer to Chapter 3 for its treatment on |
| 4837 | 2 | 17 | 34 | 17 | 48 | The comparison between the hurricane on the next day and the potential flooding 5-20 years from now is a bit confound because it does not only vary the time perspective but also the certainty. Whereas the forcast of a hurricane coming through the next day is relatively certain, is the forcast of flood some day in 5-20 years necessarily uncertain. | We are not sure what comparison on p. 17 you are referring to or anywhere else in that vicinity. Though much of that discussion has been revised and your concern hopefully addressed. We agree |
| 7242 | 2 | 17 | 35 | | | Scientists know what "exponential" means and have certain connotations. Policy makers don't! | We now define exponential and hyperbolic discounting in accessible |
| 4703 | 2 | 17 | 7 | | | This section should be a comprehensive list of these factors but does not appear to be. Alternatively, ensure these are the "most important" factors and note that this was the basis for inclusion here. Loss aversion should be the same run-in format as the other headings as well, of course. | thanks, we added the fact that this is not an exhaustie list and fixed the formatting. |
| 6070 | 2 | 17 | 7 | | | This subsection seems to discuss phenomena in "people's decisions" under risk and uncertainty. What I am wondering is where we can find discussions of phenomiena in "policy-makers' decision"? The latter is more relevant to policy makers. | We now address decisions made at all levels, from individuals and households to company and policy maker decisions |
| 3067 | 2 | 18 | | 20 | | 2.2.4 has a strong undertone of political advocacy, as if the task of IPCC is to change the political choices people and society make. That is not a proper role of IPCC, which is to review and evaluate the science, and discredits IPCC in the eyes of much of the public. It is possible that continuing to increase emissions is a rational decision. | The purpose of Sect. 2.2.4 is to document the biases and heuristics that characterize behavior with respect to risk and uncertainty as it affects climate change decisions. To the extent research reveals there are ways of improving individual and societal |
| 4913 | 2 | 18 | 10 | | | {Add} consider themselves to {}be experts in | done, thanks. |
| 13841 | 2 | 18 | 10 | | | "to experts" … missing a word? "to be experts" ?? | done, thanks. |
| 7243 | 2 | 18 | 14 | | | Section heading 2.2.4 should be renamed: maybe "Improving decision making: counteracting the prevalence of system 1" | Sect. 2.2.4 is not about improving decision making but the biases and |
| 12235 | 2 | 18 | 27 | 18 | 27 | In which country was the Program - or was it an international Program? | the United States (have added in the |
| 11513 | 2 | 18 | 27 | 18 | 30 | The discussion of NFIP needs to recognize the issue of 'moral hazard' as well, i.e. those who have insurance and are compensated frequently because they live in flood zones, and they are reluctant to relocate because of incentives inherent in the insurance schemes, e.g. almost every year they upgrade their furniture. In addition, post-disaster relief grants by the federal government creates further incentives not to buy insurance and not to relocate. | The new NFIP legislation stresses the importance of risk-based rates so this will incentivize individuals to invest in adaptation measures. There is little empirical evidence that individuals are |
| 16924 | 2 | 18 | 31 | 34 | | This is almost the first mention of energy-related decisions (notably energy efficiency) in the chapter, and it is not a strong one – I note, with no reference. It reads as a theoretical assumption, not evidence-based: actually over most of the range, efficient fridges are not more expensive than less efficient ones, and the evidence is that labelling has had a huge effect - though probably because of branding concerns of manufacturers as well as actual rational choice by customers. See the Buildings chapter of this (AR5 FOD) report, and also Grubb, Hourcade and Neuhoff, Chapters 4 and 5. Grubb M., Hourcade J.C., Neuhoff K, Planetary Economics and the Three Domains of Sustainable Energy Development, Taylor & Francis, forthcoming (chapters 1-5 submitted and available on request. Chapter 4: "Why so wasteful"; Chapter 5 "Tried and tested: three decades of energy efficiency policy"). | we changed the example to lighting technology, and are now referring to Chapter 5, as well as providing a reference. |
| 13842 | 2 | 18 | 31 | 18 | 41 | These paragraphcs come across as unsubstantiated opinions. This is not appropriate for AR5. Please provide professional citatoins and/or identify these sentences as 'findings' and state your level of confidence. | These findings are document in the SOD |
| 13843 | 2 | 18 | 46 | 18 | 48 | This sentence is not documented and comes across as unsubstantiated opinion. | This sentence is revised and document |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11516 | 2 | 18 | 46 | 18 | 48 | While long term planning is essential for climate change, we cannot disregard the fact that immediate survival is still on the minds of many people who live day to day with war, food shortages, contaminated water etc. | Short-term concerns are important to consider. The challenge is how to address these short-term constraints |
| 8484 | 2 | 19 | 1 | | 6 | Note the emerging literature on adaptive policymaking (Swanson and Dhandal 2009) | Good point. This is a solution that has generally not been reflected in the behavioral literature, because it concerns governance strategies rather than |
| 7244 | 2 | 19 | 22 | | 24 | The sentence does not parse. Maybe "will obtain" -> "will be obtained"? | Thank you. Correction has been made. |
| 13844 | 2 | 19 | 39 | | | Change 'There' to 'They' | Thank you. Correction has been made. |
| 7245 | 2 | 19 | 40 | | | inability -> difficulty | Thank you. Correction has been made. |
| 2334 | 2 | 19 | 44 | 20 | 22 | When applying the game theory within Prison Dilemma, the key question can be raised that under which circumstances or conditions will an international climate agreements be signed or ratified? . Michael Finus (2000) concern about criticism against game theoretical analysis on international environmental problems with realistic ground issues (Finus 2000:1). I would like to suggest this highlight for this argument to gain robustness for the argument in this paragraph.<br>Finus, Michael.,(2000) Game Theory and International Environmental Co-operation: A Survey with an Application to the Kyoto-Protocol, NOTA DI LAVORO 86. Fondazione Eni Enrico Mattei □ | Text has been modified |
| 7246 | 2 | 19 | 45 | | 46 | either probabilistic or uncertain -> either probabilistic or deterministic | I left this comment unaddressed, because I believe that there is a difference between probabilistic and uncertainty. The notion the reviewer is |
| 3195 | 2 | 19 | 46 | | | explain distinction between "probabilistic" and "uncertain" | Probability is (nowadays) a formal mathematical concept, uncertainty is not. Probability is a positive normed measure, and is operationalized as limiting relative frequencies in random sequences, or as partial belief of a |
| 13259 | 2 | 19 | 39 | 19 | 39 | "They have (…)" instead of "There have (…)" | Thank you. Correction has been made. |
| 6071 | 2 | 19 | 43 | | | Several theories are explained here, including prisoners' dillemma. What is really policy relevant is not just the explanation of theories but assessment of literatures. Especially in 2.2.4.5, impact of coordination and cooperation is the main theme. In this respect, what policy makers wish to know is the analysis of impact of uncertainty on coordination and coopration. If this subsection include the assessment of literatures discussing barriers to cooperate under uncertainty and any idea to overcome these barriers, this chapter will add value. | The purpose of this section is to discuss research that examine how uncertainty impacts on cooperation and coordination |
| 16926 | 2 | 20 | | | | end of section 2.2<br>The section could do with a conclusion. In relation to energy-related decisions, there is a clear implication about the non-optimality of energy decisions which is backed strongly by empirical data. Since most choices on energy consumption are taken by private decision-makers strongly influenced by “System 1” processes, whereas most supply investments are by big companies using “System 2” processes, there is an intrinsic bias towards supply-side investments in the energy system. Within supply-side (at least for electricity), the influence of risk aversion and uncertainty in energy markets further biases investments towards established fossil fuels rather than the more capital intensive low carbon options. See Grubb, Hourcade and Neuhoff (2012), Chapters 4 and 7. | Text has been changed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13845 | 2 | 20 | 11 | 20 | 15 | This inference should be couched in some uncertainty. It seems to be based on a single study that did not even study this particular situation. Can we be certain it is fully robust? Or are you suffering from an 'availability bias?' | This sentence will either be defended with a citation or revised in the SOD |
| 8485 | 2 | 20 | 16 | | 22 | This is an important element that would benefit from greater explanation, either in terms of informational cascades (Suzanne Lohmann in particular) or collective action more generally (Axelrod, Ostrom, etc) | This paragraph will be clarified in the SOD |
| 9794 | 2 | 20 | 23 | | | I really enjoyed reading this section from a scholars point of view. For decision makers each models should end with a section on the implications for decision makers. | We have now made an extensive effort to link this section with that on behavioral issues and risk perception. In addition we are working with other |
| 9795 | 2 | 20 | 23 | | | As mentionned above resilience management should be integrated either as a separate chapter or together with adaptive management | Thank you, we are restructuring the chapter |
| 14531 | 2 | 20 | 23 | | 24 | I like the format of this section. The description of methods and tools, followed by advantages and limitations, is nice. | Thank you |
| 7247 | 2 | 20 | 23 | | | Maybe merge 2.2.4 and 2.3? | Rejected. We prefer to keep behavioral responses as parts of the Tools section. |
| 10418 | 2 | 20 | 25 | 26 | 32 | This entire section has too much theory. There is no need to go into utility theorem. You can represent uncertainty using percentages | Noted. The authors stand by the theoretical angle, on the ground that it is a framing chapter and that Summary for |
| 14532 | 2 | 20 | 28 | | | It would be useful to say more about how these tools can facilitate system 2 behavior, in particular by providing more of a sense of who would use these tools, how, for what ends, and by what means and processes (in the sense of risk governance and decision support). | We have now made an extensive effort to link the section on behavioral issues and risk perception with the section on |
| 6370 | 2 | 20 | 28 | | | Include a reference to the definition of System 2. | Accepted. |
| 8785 | 2 | 20 | 29 | 27 | 23 | A useful discussion of the issues in using utilitarian ethics to address climate change, including trying theorise the precautionary principle through this lens and apply optimality and 'management'; however, Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) illustrates the more fundamental issue of using consequential managerial approaches when consequences cannot be predicted in a meaningful way, thus cost estimation and optimality are chimera. | Thanks to the reference. Forwarded to Chapter 3 dealing with Economic, and Ethical Concepts and Methods |
| 7248 | 2 | 20 | 34 | | 37 | Add an example: e.g. buying flood insurance. Maybe it's worth sticking with a single example for each level of decision making (individual, group, government) and clearly state so at the beginning of the Chapter. Maybe along the following lines: For the sake of clarity, we will make repeated use of the following examples of decision making under uncertainty on the level of individuals, groups, and governments. | Thanks for the suggestion. The writing team will consider it collectively. |
| 7249 | 2 | 20 | 40 | | | list all/ some axioms mentioned | Noted. Some axioms listed. |
| 13846 | 2 | 20 | 41 | | | Changed abbreviation to EU from E(U). Please check for consistency. | Done. |
| 13847 | 2 | 20 | 41 | 21 | 3 | Citations are needed in multiple places in this paragraph. | Agreed. References to up to date and comprehensive sources on the |
| 12521 | 2 | 20 | 5 | | | Add after "2009" -- "Building on work by Perlo-Freeman (2006) and others, DeCanio and Fremstad examine the entire 2x2 possibility space and informally assess elements of climate policy and negotiations dynamics, concluding that no single game fully describes the state of play and suggesting that assessment of alternative game outcomes can shape evolution of an effective policy regime for climate response." Stephen J. DeCanio and Anders Fremstad, 2010. Game Theory and Climate Diplomacy, www.e3network.org/papers/Basic_Game_Anlaysis.pdf | Will consider adding the proposed sentence related to the De Canio-Fremsted paper in the SOD |
| 4612 | 2 | 20 | | 30 | | Generally, irreversibility, especially the one for climate change, has been given short shrift in this chapter; a good source on irreversibility is Ch. Perrings and W. Brock, Irreversibility in Economics, Annu.Rev. Res.Econ. 2009, 1: 219-38 | Noted. Option values are mentioned in 2.4.2.1 (p26 l12) and the main result on irreversibility effects summarized in |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 14830 | 2 | 20 | | | | The phrase "political and societal negotiation processes" is used (p. 24 line 17). It should be elaborated as one way of making decisions under uncertainty. Negotiated decisions (especially when characterized by procedural equity) can be an important way of dealing with decision-making under uncertainty, especially deep uncertainty involving value judgements. Another subsection should be added to include negotiated decisions as one tool for decisino-making under uncertainty. | Noted, agreed. New material on risk and society will be added. |
| 14238 | 2 | 20 | | | | The authors might want to consider a brief dicussion of robust control theory and ambiguity theory as well. While, e.g., the less wide-spread approach of RDM is discussed at some extent, the more common economic decision theories of robust control theory, and decision making under ambiguity are not discussed. | Text has been modified |
| 4705 | 2 | 20 | 23 | | | This is a well-structured delineation of ECONOMIC strategies for improving risk perception and decision-making but appears to be written in complete isolation from the insights of the prior section. If many of the obstacles to people understanding and responding to climate change are psychological in nature (as per section 2.2), then the strategies in section 2.3 all suggest that if people will just become homo economicus, it will all work out just fine. Put differently, if the problems laid out in section 2.2 really ARE the problems (and I think they are), then these solutions are irrelevant to addressing those problems. This is a crucial part of this chapter that should be addressed. This surely reflects that psychologists wrote 2.2 and economists wrote 2.3 but, now, those two groups have to sit down and make a coherent argument to each other. More broadly, this also suggests that there may be some important economic obstacles to decision-making and responses to climate change that could be better addressed in section 2.2 (e.g., the economic argument involved in my moral hazard point above -- if you take away the costs/risks of something, then people will rationally do more of it). | We have now made an extensive effort to link the section on behavioral issues and risk perception with the section on economic tools |
| 4706 | 2 | 20 | 23 | | | Structurally, this section has relatively parallel headings -- they should be identical if you are going to go that way, not halfway similar. | We have made an effort to cover in a symmetric way different tools, but only |
| 9219 | 2 | 20 | 23 | 30 | 11 | I appreciate that tools (thories) for improving decisions related to uncertainty and risk in climate change are summarized efficiently in Section 2.3. However, it is rather textbookish and lacking in concrete examples of climate risk analyses which applied those tools and theories. | We have now made an extensive effort to link this section with that on behavioral issues and risk perception. In addition we are working with other |
| 6304 | 2 | 20 | 34 | 20 | 37 | Once again, in describing expected utility theory, anyone wisely employing that decision making model should recognize that before one "defines a possible set of alternatives," the problem has to be explicitly defined, scoped and justified. | Thanks. That's true; much effort goes into the formulation of alternative courses of action. The same also holds for 'quantifying uncertainties…' and |
| 18445 | 2 | 20-30 | | | | Simple, clear and thoroughly discussed tools with illustrative scenario analysis, pros and cons.Good. | Thank you! Positive comments are very helpful in achieving balance. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4632 | 2 | 21 | | | | . In the section on the expected utility hypothesis, I am surprised that no mention is made of the method of certainty equivalents, in fact CE are not mentioned anywhere in the chapter. | CE's play a role in the operationalization of partial belief as subjective probability, esp in von Neumann and Morgenstgern (1944), who (unwittingly) follow Ramsey (1926). However, it is not essential in the more modern account of Savage. To recall, event A is qualitatively more probable than event B for a subject if (s)he prefers a lottery giving a Good consequence if A and a Bad consequence if not-A to a similar lottery involving event B. Under (mild) restrictions, this qualitative ordering is necessary and sufficient to determine a unique probability measure. The idea is that we can construct 'almost uniform partitions' of arbitrary size in which no partition element is qualitatively more likely than the union of any two elements, and then compare events to unions of partition elements. The strongest restriction (the sure thing principle) says that if "Good if A, Bad else" is preferred to "Good if B, Bad else", and if event C is disjunct from A and from B, then "Good if A or C, Bad |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 14233 | 2 | 21 | 13 | 21 | 19 | The paragraph on "Subjective versus objective probability" does not contain a definition or discussion of objective probabilities. The usual objective probability definition is based on the relative frequencies referred to in the pragraph (e.g. van Mises R. von Mises [1928 German](1954 English translation), Probability, Statistics and Truth. New York: Macmillan), or symmetry arguments (or Popper's (1959) [The propensity interpretation of probability, British Journal for the Philosophy of Science, Vol. 10, p.25-42.] notion of propensity). Two secondary sources discussion objective versus subjective probabilities are Kyburg, Henry E. Jr. und Howard E. Smokler (1964), Studies in Subjective Probability, John Wiley & Sons: New York. and Eisenführ, Franz und Martin Weber (2010), Rational Decision Making, Springer: Heidelberg. It might be worthwhile to explicitly address the issue prevalent in climatic change evaluation that objective probabilities are rarely given and purely subjective probabilities only help for individual decision making, but not for guiding institutional analysis. This problem naturally leads to the discussion in the chapter's appendix on trying to find different, partly new wordings to describe uncertainty in the IPCC process. | Thanks for this comment, which is spot on. The literature on the objectivist interpretation is well known to us. The best modern renderings (IMO) of the frequentist interpretion are based on the definition of a random sequence as those which pass all 'recursive tests', i.e. avoids recursive null sets (as in Martin Lof and Schnorr). The discussion is rather technical, but it does enter the vernacular through the notions of probabilistic explanation in Hempel and others. In climate change, this is related to the problem of deciding what is 'natural variability' and testing that all 'secular trends' have been accounted for. Earlier drafts contained some text on this. I would be happy to (re-) include this discussion but the decision to allocate space is above my pay grade.<br>(1)Schnorr, C.P. (1971) Zufa”llighekt und Wahrscheinlichkeit Lecture notes in Mathematics, 281, Springer?Verlag.<br>(2) Schnorr, C.P.(1973) “Process complexity and effective random tests” J. Comp. Syst. Sc. 7, 376?388.<br>(3) Martin?Lof, P. (1970) On the notion of randomness, in A. Kino, J. Myhilol, R.E. Vesley (eds) Intuitionism and Proof Theory, North Holland 73?78.<br>(4) Martin?Lof, P. (1966) The definition of random sequences, Inf. And Control 9, 602?619.<br>(5) Kolmogorov, A.N. (1968) Three approaches to the definition of the |
| 7250 | 2 | 21 | 3 | | | it -> they | Thank you. Correction has been made. |
| 14533 | 2 | 21 | 30 | | 31 | This is the first mention of Chapter 3. There might be a discussion early on about how this chapter’s focus on individual decision making links with Chapter 3’s focus on Social, Economic and Ethical Concepts and Methods. | Thanks, we could add a link to chapter 3. *** |
| 13848 | 2 | 21 | 4 | 21 | 31 | Citations are needed in multiple places in these paragraphs. It comes across as a discourse from a textbook. | See reply to #13847 |
| 7251 | 2 | 21 | 7 | | | behavior described in Sect. 2.2 -> behavior, based on System 1, described in Sect. 2.2. | Noted, Text changed. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2156 | 2 | 22 | | | | The section on cost-benefit analysis and uncertainty (Section 2.3.2) provides an appropriate coverage for the purposes of the report once expanded to clarify how uncertainty is accounted for in cost-benefit computations. Ayyub (2003) offers a fundamental and simple model based on the moments of underlying random variables to compute the probability of not realizing benefits, i.e., P(B<C) where B=benefit and C=cost. Such an approach enables users to account for both B/C ratio and the uncertainties in B and C.<br>Reference: Ayyub, B. M., Risk Analysis in Engineering and Economics, Chapman and Hall/CRC, 2003. | Thank you |
| 14534 | 2 | 22 | 1 | | 11 | This box on the Condorcet voting paradox is interesting, but from what little I understand about social choice theory (which largely comes from Amartya Sen's The Idea of Justice) most of these voting paradoxes depend on assumptions about well-characterized uncertainties and stable individual rankings, and thus aren't particularly relevant for vast societal issues such as climate change. Such issues involve large groups of individuals grappling with complex ethical considerations and economic tradeoffs where the consequences of actions are poorly understood; the fit with existing moral traditions is still unsettled; and debates are subject to strong filtering by existing values, information networks, and economic interests. The space used by this box might be better spent on topics more relevant to these issues. | Thanks, its all true. However the discussion in ch 2 focuses on foundational issues, and shows that the concepts of subjective probabiity and utility are meaningful for individual choice, but there is no straightforward way to generalize them to social choice. The factors you mention reinforce this conclusion, but on the abstract level of |
| 14535 | 2 | 22 | 14 | | | It might be useful to say how cost-benefit analysis relates to expected utility theory. | Thank you, text has been revised |
| 7252 | 2 | 22 | 14 | | | Cost Benefit Analysis -> Cost Benefit Analysis (CBA) | Thank you, text has been revised |
| 6072 | 2 | 22 | 15 | 22 | 17 | The text says "CBA does not address the challenges in achieving agreement across countries with respect to strategies for mitigating the impacts of climate change". It is difficult to understand why. Citation please. In page 24 line 14, there is description that the target can be defined through a CBA, through the application of a principle. Those two sentences are not consistent each other. | Text has been modified |
| 16086 | 2 | 22 | 17 | 22 | 22 | Does it mean a treaty or a global policy cannot be assessed by CBA? Whant about global equilibrium modelling by economists? Does it mean it is worthless in assessing possible path of policy? Maybe it is contradictory with the next paragraphs. | Text has been clarified |
| 12992 | 2 | 22 | 17 | 22 | 18 | The claim that CBA should be used only at the national or subnational level is interesting, but seems out of step with much work in contemporary climate economics, which is focused at the global level. More explanation or defense would be helpful. | Text has been clarified |
| 7253 | 2 | 22 | 17 | | | to utilize -> to be utilized | Thank you, text has been revised |
| 14824 | 2 | 22 | 21 | | | I don't it is justified to claim that "CBA can still provide useful insights when applied to the global problem of climate mitigation". A strong case can be made that it is not suited to the problem. Please see Ch 6, where, among other observations, they state<br>"no cost-benefit study finds an optimal level of mitigation that stabilizes atmospheric concentrations. Instead, conc entrations continue to rise throughout the modeling period. " (p.26) | Text has been clarified |
| 4633 | 2 | 22 | 23 | | | Why the highest social net present value? Referring to the levee example in the previous paragraph, what would be the social benefits? Lower government payments to owners of previously flooded land? It seems to me that a lot of the benefits are captured by individuals, not society in general, while the costs of flood control are almost always borne by taxpayers, or society in general. | Thank you, text has been modified |
| 6073 | 2 | 22 | 25 | 22 | 25 | In CBA applied to climate change issues, private and social cost are compared with benefits (refer to, for example, many literatures by William Nordhaus and other schelars. | A more complete discussion on social versus individual costs and benefits is reported in Chapter 3. We are only |
| 13849 | 2 | 22 | 33 | | | Change 'numbers' to 'number' | Thank you, text has been revised |
| 7254 | 2 | 22 | 33 | | | numbers -> number | Thank you, text has been revised |
| 7255 | 2 | 22 | 33 | | | as -> e.g. | Thank you, text has been revised |
| 14825 | 2 | 23 | 1 | | | "… by encouraging System 2 behavior." Can this be substantiated? | We will modify this sentence to read "… and in this can encourage System 2 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7257 | 2 | 23 | 16 | | | funded -> founded | Done. |
| 9140 | 2 | 23 | 26 | 23 | 30 | Of course I agree that CBA is a useful tool for decision making process. However, many researches dealing with biases of perception suggest humans are not good at understanding the concept of probability correctly, meanwhile CBA highly relys on System 2 process. Thus I don't think CBA plays a "critical" role to overcome System 1 of all humans. I would suggest that you would soften the tone of the words. | Yes, good point, done. |
| 7258 | 2 | 23 | 29 | | | want -> wants | Done. |
| 7259 | 2 | 23 | 30 | | | greenhouse gas emissions know -> ..greenhouse gas emissions. It knows there | Done. |
| 12993 | 2 | 23 | 32 | 23 | 33 | This claim about the status of CBA may mislead. Many normative perspectives are internally coherent and claim to be either based on or consistent with rational norms. Moreover, the norms associated with CBA are often claimed to be very weak, and so to do little in themselves to guide action (e.g., without stronger and more contentious value assumptions). See, e.g., Daniel Hausman and Michael McPherson, Economic Analysis and Moral Philosophy (Cambridge, 2006). | Text revised to acknowledge the scope of the debates on CBA, focus on risk and uncertainty and refer to 3.5.2 for more detailed discussion. |
| 13850 | 2 | 23 | 32 | | | Is this the advantage over all other methods? Over system one methods? This does little to recommend CBA. Is not an advantage that it has a record of success? Success in comparable situations? | See reply to #12993 |
| 8237 | 2 | 23 | 36 | 23 | 37 | While it is noted that some impacts are hard to measure in monetary terms which may lead to their omission, it should also be noted that there are tools available in environmental economics to value these impacts such as the contingent valuation and the avoided cost methods. | Text added. |
| 16087 | 2 | 23 | 41 | 23 | 46 | Excellent paragraph, but maybe you fail to remark that many events described with IPCC vocabulary as "low probability" would be highly probable by your local insurer if compared with his trade made of grave injuries or fires. This gap shows that what laks is not a "new psychological frame" in the decisionmakers, but often just a fair description of the risk. | Noted. |
| 12994 | 2 | 23 | 41 | 23 | 43 | This may be the most prominent objection amongst economists, but I doubt that it is the most common more generally. More importantly, other major objections should at least be mentioned, and especially the ethical ones. See, for example, Mark Sagoff, The Economy of the Earth (Cambridge, 2008) and Stephen Gardiner, 'Cost-Benefit Paralysis', chapter 8 in A Perfect Moral Storm (Oxford, 2011). | See reply to #12993 |
| 7895 | 2 | 23 | 41 | 23 | 43 | You write: "The strongest and recurrent argument against CBA (Azar and Lindgren, 2003; Tol, 2003; Weitzman, 2009b, 2011; Nordhaus, 2011) is related to its failure to deal with low probability, catastrophic events that might lead to unbounded measures of either costs and/or benefits." This is not the strongest argument against CBA. One oof the main challenges is that CBA entails several normative and empirical assumptions (the rate of discount, the curving of the damage function, aggregation of impacts in a single welfare function, the marginal value of future consumption units, the assumed value of a statistical life, technological innovation as either exogenous or endogenous to climate change, monetary value of environmental change and loss of biodiversity, shifts in transaction costs, control costs, and search costs, etc.) that are not dealt with appropriatly by existing CBAs on climate change - and that are hard to deal with in general. The argument mentioned in the quote only deals with one of these many aspects, namely with how the damage function is curved. It is somewhat funny that only proponents of CBA are quoted at this point. See also comment 36. | Thank you, we now have emphasized more other challenged to CBA |
| 4512 | 2 | 23 | 43 | 23 | 45 | Here and perhaps elsewhere, reference should be made here to the work of Chichilnisky on the incorporation of catastrophic possibilities into expected utility analysis. A recent example is her paper with Chanel in the forthcoming special issue of Ecological Economics. | Thanks for the suggestion. Reference added in 2.3.1.1 when discussing research on EU theory alternatives. |
| 9141 | 2 | 23 | 43 | 23 | 45 | As well, I think it's more important to consider how we human systematically fail to estimate fat tails events from the viewpoint of biological evolution than just constructing robust techniques. Such a viewpoint might consequently provide countermearures to systematic failures of our decision making. The countermeasures might be simply how calculation results should be shown or something, rather than novel methods of calculation. | Thanks, good point. Its true that fat tails can frustrate standard statistical methods. A discussion of fat tails is submitted to the Glossary. Space constraints have kept it out of our chapter |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2964 | 2 | 23 | 46 | | 23 | leaving off extremes seems irrational and likely to lead to disaster -- consider the decision of planners to consider only the past century of experience with tsunamis in designng the Fukushima facility, excluding earlier more severe events. | see response to comment 9141 |
| 8238 | 2 | 23 | 47 | 24 | 10 | The paragraph notes that one way to get around the fat tail issue in a CBA is to "leave off extremes when the consequences from these 47 outcomes do not demand serious consideration now". The text should specify under which circumstances extremes do not demand serious consideration and how this may relate to the degree of risk aversion of decision makers. | We have now specified this better |
| 14826 | 2 | 23 | 48 | | | "to leave off extremes…" This sentence is unclear. | We have now specified this better |
| 14234 | 2 | 23 | 8 | 23 | 9 | "In either case the decision maker is assumed to be maximizing expected utility". The formulation is unfortunate because what is usually referred to as Monte-Carlo analysis in the integrated assessment literature only averages deterministic paths. The generated results usually do not reflect the response to uncertainty that an expected utility maximizer would reveal. | Thank you for the comment, we are actually referring to cases where the expected utility framework is actually adopted here. We have now specified |
| 7256 | 2 | 23 | 9 | | | how is CBA different from E(U) if both maximize expected utility? Maybe add a table comparing E(U), CBA, CEA? | CBA can be used to maximize net benefit, without uncertainty or utility function. More detailed discussion of decision making belong to chapter 3, |
| 13851 | 2 | 24 | 16 | | | Change 'funded' to 'founded' | Done. |
| 6371 | 2 | 24 | 29 | | 30 | Grammatically muddled sentence. | Paragraph rewritten |
| 3196 | 2 | 24 | 29 | | 35 | Opaque. Rewrite more clearly. | Paragraph rewritten |
| 6074 | 2 | 24 | 32 | 24 | 33 | Pleae explain why CEA could enable the government to assess the "optimal" mitigation policy. In my understandings, CEA could enable governments to assess the cost effective mitigation policy, but not optimal mitigation policy where marginal cost equalizes marginal damage. | Text rephrased without « optimality ». |
| 3197 | 2 | 24 | 42 | | | Here and elsewhere, use "discount rate" for "pure rate of time preference" | We eliminated the whole discussion as it seemed that it belonged more to |
| 12995 | 2 | 24 | 44 | 24 | 46 | This claim should be more balanced. Particular CBAs are not immune to politics, and are often thought to be hostage to the particular ethical assumptions and other preferences of the analyst. The latter is one of the major objections to CBA in public policy. | Text rephrased. |
| 12522 | 2 | 24 | 44 | 25 | 2 | With over 30 years of experience in cost-effectiveness analysis (CEA) applied to integrated resource planning of power systems at the utility and region level, I presume perhaps the literal wording of this paragraph does not convey the author's intention clearly. But given that experience, it is simply incorrect to say “A drawback of CEA relative to CBA is that it does not enable one to undertake an integrated valuation and comparison of benefits and costs.” The following sentences basically read as non sequitur. | Text rephrased. |
| 14827 | 2 | 24 | 44 | | | This would make more sense: "An advantage of CEA relative to CBA is that it does not force one to undertake an integrated valuation and comparison of benefits and costs. The choice of the target could instead be addressed by a political decision reflecting people's preferences." | Text rephrased. |
| 14235 | 2 | 24 | 11 | | | It might be useful to point out that CEA is a special case of CBA that replaces benefits from emissions and optimization over the emission level with an exogenously emission trajectory, but keeps the optimization over costs. Making part of the policy analyzed in CBA exogenous directly implies the discussed advantages and disadvantages. Similarly, CCP and CRA (methods the reviewer is less familiar with) seem to be special cases of CBA that replace the emission benefits with some exogenously defined objective instead. | Thanks. Text added. |

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| 8239 | 2 | 24 | | 24 | | The explanation around when and how to conduct cost-effectiveness analysis should be explained more clearly. "Cost-effectiveness analysis is useful when benefits cannot be expressed in monetary values in a meaningful way. In this case, it can ensure technical efficiency in the process of achieving a desired outcome. A CEA calculates cost-effectiveness ratios of different alternative policy options and then compares the resulting ratios so that the most efficient option is chosen. The pure cost-effectiveness of a policy option is calculated by dividing the present value of total costs of the option by the present value of a non-monetary quantitative measure of the benefits it generates. The ratio is an estimate of the amount of costs incurred to achieve a unit of the outcome from a policy option. The cost-effectiveness analysis does not evaluate benefits in monetized terms but is an attempt to find the least-cost option to achieve a desired quantitative outcome". (Canadian Cost-Benefit Analysis Guide, p. 29, retrieved at www.tbs-sct.gc.ca/ri-qr/documents/gl-ld/analys/analys-eng.pdf ) | Thanks. The 2.3.3.2 has been rewritten. In part, we quoted the definition of CEA as to be found in the Canadian CBA-Guide. However we do not follow the definition to the point where ratios are to be taken. So far the climate community has avoided taking ratios and left the assessment of how to balance mitigation costs and avoided non-monetary damages to society. |
| 8240 | 2 | 24 | | 24 | | The section should add that another drawback of CEA is that it usually does not account for the timing of emission reductions compared to the CBA framework. CEA assists in determining the most effective way of reducing emissions but does not account for when reductions will occur over time. The CBA framework will capture when emissions are reduced and their associated benefits (discounted), while the CEA framework informs of the reductions achieved (in physical units) and their associated costs achieved without specifying when they occur. | This is not correct. Indeed CEA has been extensively performed using a cap on temperature or radiative forcing allowing for full flexibility in the timing of the emission abatement |
| 14236 | 2 | 25 | 16 | | | Might the authors have intended to write "CEA" instead of "CRA"? | Thanks. Text corrected. |
| 7260 | 2 | 25 | 29 | | | What is EUmax? | Clarified. |
| 7695 | 2 | 25 | 3 | | 8 | The text should be clarified on what "target can only be observed probabilistically" refers to. I assume that it means that the temperature response resulting from an emission pathway is not known with certainty ex-ante. This does not yet necessitate CCP if the prevailing temperature can be observed. The emission pathway doesn't have to be decided at one instant. We can observe the realization of temperature increase later during the century, and adjust the emission pathway recurrently so that the temperature target will be ultimately met (with certainty, if the amount of emission reductions are sufficiently large). Scenarios with a temperature target and risk-hedging through sequential decision making include:<br>* Syri, S., Lehtilä, A., Ekholm, T., Savolainen, I., Holttinen, H. & Peltola, E. (2008), 'Global energy and emissions scenarios for effective climate change mitigation - deterministic and stochastic scenarios with the TIAM model', International Journal of Greenhouse Gas Control 2(2), 274–285.<br>* Webster, M., Jakobovits, L. & Norton, J. (2008), 'Learning about climate change and implications for near-term policy', Climatic Change 89(1-2), 67–85.<br>* Johansson, D. J. A., Persson, U. M. & Azar, C. (2008), 'Uncertainty and learning: Implications for the trade-off between short-lived and long-lived greenhouse gases', Climatic Change 88(3-4), 293–308.<br>* Ekholm, T. (submitted), Hedging the climate sensitivity risks of a temperature target. Submitted to Resource and Energy Economics in Feb. 2012. | We agree with the referee that decisions can be corrected for in the course of time. This is what we refer to as 'learning'. We introduce our terminology more carefully in the SOD. However we disagree with the referee that learning opens the ex ante perception to be able to observe the target with certainty. An infinity-tailed climate sensitivity distribution opens the chance that the target cannot be observed any more, no matter when and how much we learn, simply because of the stock of carbon already in the atmosphere and limited carbon sinks. |
| 14828 | 2 | 25 | 3 | | 21 | These three paragraphs are not clear. It is in particular not clear what is said here that is not also a drawback of CBA. | Thank you, we have now changed the text. |
| 6372 | 2 | 25 | 32 | | | Should say "likelihood .. is ", not "likelihood … are" | Done. |
| 14237 | 2 | 25 | 32 | | | check use of noun versus adjective | Thank you, text has been edited |
| 12236 | 2 | 25 | 34 | 25 | 34 | "minimax regret", "maximin" and "maximax" should be explained, if used. | Thank you, text has been edited |
| 8241 | 2 | 25 | 34 | 25 | 34 | Minimax regret, maximin, and maximax approaches should be defined. | Thank you, text has been edited |
| 6075 | 2 | 25 | 34 | 25 | 34 | For reader friendliness, short explanation is necessary for words such as minimax regret, maxmin and maximax. | Thank you, text has been edited |
| 14239 | 2 | 25 | 38 | 25 | 40 | Note that the United Nations Framework Convention on Climate Change Article 3.3 contains a very similar formulation of the precautionary princinple (http://unfccc.int/resource/docs/convkp/conveng.pdf). | Definition has been edited |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12997 | 2 | 25 | 41 | 25 | 43 | Not all versions of the PP give discretion to the decision-maker. For example, Soule 2003 contrasts strong and weak versions of the PP, and calls the discretionary ones "weak". (See Gardiner 2006.) | A more critical discussion of PP has now been introduced |
| 3198 | 2 | 25 | 41 | | 46 | Point out that PP is highly subjective and pays ZERO attention to probabilities | A more critical discussion of PP has |
| 18450 | 2 | 25 | 22 | 26 | 32 | As part of the robust decision making approach specific approaches deserve a much broader discussion. This concerns especially the rich literature on the "tolerable windows approach" (guard rail approach) or the safe landing approach. For the probabilistic extension of the guard-rail approach please refer to "T. Bruckner, K. Zickfeld: Inverse Integrated Assessment of Climate Change: the Guard-rail Approach, International Conference on Policy Modeling (EcoMod2008), July 2-4, 2008, Berlin" and the references therein. The deterministic version is described in "T. Bruckner, K. Zickfeld: Emissions Corridors for Reducing the Risk of a Collapse of the Atlantic Thermohaline Circulation, in: Mitigation and Adaptation Strategies for Global Change 14, 61-83, 2008". | Thanks for the references. Forwarded to chapter 3 where this literature is reviewed (3.9.2.1). Furthermore we add a hint in our PP-section. |
| 14536 | 2 | 26 | 1 | | 7 | RDM can use an objective function that interpolates between a minimize maximum regret criteria and an expected utility criteria. In these contexts, RDM provides decision makers tradeoff curves that allow them to debate how much expected performance they are willing to sacrifice in order to improve performance in worst cases. This is offered as a more systematic means of capturing the spirit of the precautionary principle in a way that illuminates the tradeoffs being made. That said, it is important to regard various decision support methodologies as more than just decision criteria. In a recent paper, we used three criteria to compare alternative robust decision approaches: 1) their decision criteria, 2) their representation of uncertainty, and 3) the information presented to decision makers. (See Hall, J. M., R. Lempert, K. Keller, A. Hackbarth, C. Mijere and D. McInerney (2012). "Robust Climate Policies under uncertainty: A comparison of Info-Gap and RDM methods." Risk Analysis. Another article offers a related set of criteria for comparing decision support methodologies: Lempert, R. J. and S. C. McKay (2011). "Some thoughts on the role of robust control theory in climate-related decision support." Climatic Change.) You might find such a set of criteria useful for your comparisons here. | We will discuss RDMs tools more explicitly in the SOD, in particular the role of trade-off curves. |
| 6373 | 2 | 26 | 1 | | 3 | Cite Lempert et al. 2006. | Thank you, we have improved the text |
| 4613 | 2 | 26 | 12 | 26 | 13 | There is here an allusion to irreversibility through real options theory; this is the only place where the fundamental irreversibility result is indirectly mentionned: in general, the irreversibility effect does not exist. | This issue is actually discussed in details in 2.4.2, from page 32 line 19 onwards. Text updated to this end. We have weakened our statement here and left this discussion for the more |
| 10683 | 2 | 26 | 12 | 26 | 13 | "cannot" is a very strong term - surely the point is that the precautionary effect/principle does not automatically dictate a reduction in greenhouse gas emissions solely on the basis of uncertainty in climate projections. | We have weakened our statement here and left this discussion for the more general overview on numerical results in |
| 17137 | 2 | 26 | 15 | | | There are documented cases in the literature of adaptive management to climate change - see for example: Berkes, F., Colding, J., and Folke, C. (2000) Rediscovery of Traditional Ecological Knowledge as Adaptive Management. In Ecological Applications 19: 1251-1262. See also Berkes, F. and Armitage, D. (2010) Co Management institutions, knowledge and learning: adapting to change int he Arctic. In Inuit Studies 24(1) 109-131 | Thank you for for these references, especially the latter one with special reference to climate adaptation in the arctic. We have included them in the text as examples of passive adaptive |
| 7261 | 2 | 26 | 33 | | | Mention problems due to local differences (in culture, circumstances, values) that make AAM somewhat challenging on global scales. | I don't think that we are making any argument that adaptive management could possibly be implemented on a |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3199 | 2 | 26 | 33 | | | Section 2.3.5 on adaptive management is perhaps tangential. Maybe omit? | I am puzzled as to why it would be viewed as tangiential. Adaptive management is an approach to governance, coming out of the ecological research community, that precisely deals with uncertainties and the potential for learning, and hence fits squarely with the remit of this chapter. Of course it is not an approach that has |
| 17394 | 2 | 26 | 34 | 26 | 35 | The definition of AM is a bit awkward since AM rests on the recognition that knowledge will never be adequate. Given inadequate knowledge and continued uncertainty, perhaps the greatest strength of AM is that it specifically aims to increase the resilience of the system involved. This could be added, e.g., "Adaptive management is an approach to governance that explicitly incorporates mechanisms for reducing uncertainty over time and increasing system resilience, growing out of the field of conservation ecology in the 1970's…" | I am not sure that I agree with this interpretation of AM. My understanding of AM is not that it is intended, per se, to increase system resilience. Rather, it is intended to generate the datathat will lead to needed learning, which in turn will support improved management practices in the future. In applying adaptive management, it is important to understand the existing system resilience, so as not to cause permanent |
| 6374 | 2 | 26 | 8 | | 18 | This paragraph is a non-sequitur that breaks the flow of discussion about RDM. | This § is indeed not about RDM but about another notion of the precautionary |
| 6375 | 2 | 26 | | | | The paragraph/section structure here could be improved. Section 2.3.4.2 starts by describing how RDM can help, but the rest of the paragraph describes a decision not based on RDM. The RDM part is split out into 2.3.4.3. These two sections should be combined, and the text reworked to flow better, and to better describe RDM (e.g., the minimax regret approach). Indeed, this whole section talks more "around" the idea of RDM and never really gets to defining it well. See Lempert et al. 2006 for a concise definition. | Thank you, we have improved the text |
| 17395 | 2 | 26 | 33 | | | A key strength of AM is that it enhances the resilience of socio-ecological systems and strengthens social and ecological capital e.g., by enhancing linkages between system components, building awareness etc. This is perhaps as pertinent to the climate change problem as the other features of AM mentioned here. | To my knowledge this strength has not been demonstrated empirically, and so we will omit it. |
| 2157 | 2 | 27 | | | | The coverage of uncertainty types and models is somewhat brief making look deficient – this might be intentional by the authors. I recommend directing readers to an expanded meaning of uncertainty (including evidential reasoning) based on the work of Ayyub and Klir (2006), Klir (2005) and other similar books and papers. Reference: Ayyub, B. M., and Klir, G. J., Uncertainty Modeling and Analysis for Engineers and Scientists, Chapman & Hall/CRC, Press Boca Raton, FL, 2006. | Thanks, these references are known to us, as are the concomitant problems, see Cooke, R.M.,Book Review Elicitaton of expert opinions for uncertainty and risks Elsevier, Fuzzy Sets and Systems 133 (2003), page 267-268, ISBN 0-8493-1087-3. The paradoxes in interpreting "and" and "or" as intersections and unions of fuzzy sets are not discussed in these references. However they lead to conclusions like: IF the uncertainty that Qunicy is a man is 1/2, and the uncertainty that Quincy is a woman is 1/2, THEN the uncertainty that Qunicy is a man AND a woman is also 1/2. This is |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4690 | 2 | 27 | | | | in Chapter 2 (p. 27, Box 2.2) treatment of uncertainty needs to be expanded and nuanced a bit further. In particular, targeted use of work from Science and Technology Studies (STS) can help here. For example, in 1992, STS scholar Brian Wynne wrote about the importance of disaggregating these broad-brush considerations of risk and uncertainty in order to more capably consider open and more complex human-environment actions. Wynne unpacked these considerations in the context of what Silvio Funtawicz and Jerry Ravetz characterized during this time as the spaces of 'post-normal science', where "facts are uncertain, values in dispute, stakes high and decisions urgent" (1993, 739). Wynne described 'four kinds of uncertainty' in this way:<br>(1) 'risk' – where we know the odds, system behavior, and outcomes can be defined as well as quantified through probabilities<br>(2) 'uncertainty' – where system parameters are known, but not the odds or probability distributions<br>(3) 'ignorance' – risks that escape recognition<br>(4) 'indeterminacy' – this intersects with the previous three kinds, and captures elements of the conditionality of knowledge and other contextual scientific, social, political factors<br><br>Considering the well-known utterance from former US Secretary of Defence Donald Rumsfeld can help to make these distinctions (and the importance of doing so) more concrete. In February 2002 – regarding US military risk and uncertainty – Rumsfeld commented, "As we know, there are known knowns. There are things we know we know. We also know there are known unknowns. That is to say there are some things we do not know. But there are also unknown unknowns, the one's we don't know we don't know". These Rumsfeldian distinctions break down quite usefully along the categories defined by Brian Wynne.<br><br>Funtowicz, Silvio O. and Ravetz, Jerome R. 1993. "Science for the post-normal age," Futures 25: 739-755.<br>Wynne, Brian 1992. "Uncertainty and environmental learning," Global Environmental Change June: 111-127. | Wynne's 4 categories map on our definitions as follows. #1-#2 are in-line with the original definitions as developed within statistics and economics. However in the climate community as somewhat different use of these terms has manifested itself as documented in the IPCC-Uncertainty Guidance Notes Mastrandrea et al., 2011. There, 'uncertainty' is equivalent with a cognitive lack of knowledge that might or might not be expressed by a precise probability measure. Pairing 'uncertainty' with an undesirable outcome then gives 'risk'. Ignorance can in part be captured within subjective uncertainty, or it cannot scientifically be captured at all to our understanding – hence we cannot represent it. Finally the abovementioned conditionality is captured by conditional modeling that IAMs try to mimic, in that sense we do already represent it. |
| 8486 | 2 | 27 | 11 | | 14 | This is a particularly illustrative case study in terms of challenges to adaptive policy, and sustainability action more generally. Particularly for smaller communities or political units where resources (ie, capital and capacity) are limited, short term barriers or goals will typically over-ride longer-term goals, objectives and values. See for example Sayer and Campbell 2004 re: Sustainable Development | Thank you for this comment. We will search for the paper you suggest and add as appropriate. |
| 12524 | 2 | 27 | 11 | 27 | 14 | "Replace sentence "As Lee..." as follows -- "As Lee (1993) documented, policy-makers on the Columbia River employed multiple perspectives to improve protection and recovery of federally listed fish stocks. While progress has been slow, adaptive management based measures slowly gained acceptance and are resulting in improved smolt-to-adult returns. However, current measures remain well short of the levels required for long term viability (Fish Passage Center 2011)." Fish Passage Center, Final 2011 Comparative Survival Study Annual Report, http://www.fpc.org/documents/CSS/2011%20CSS%20Annual%20Report—Final.pdf | This important. Obviously it puts a much more positive spin on the case that Lee documents. My sense is that Lee documented that adaptive management had not been particularly successful at the time, but as you point out, it is a matter of degree. I have revised the sentence accordingly to suggest that AAM had not altogether failed to take |
| 11517 | 2 | 27 | 12 | 27 | 13 | In the example about attempts to conduct experiments on salmon in adjacent tributaries, local people are implicated as selfish. It is important to consider whether they were acting to protect their own longer-term interests, ie important local food sources. Ironically, the authors seem to dismiss the risks and uncertainties associated with experimentation on salmon populations. | I am not sure that I understand this comment, but I think that the spirit of it can be captured by deleting the word "immediate." |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17396 | 2 | 27 | 15 | 27 | 17 | AAM is in fact being applied to the area of climate change (although this is of course a work in progress), and some of the relevant studies should be cited, e.g., Lawler, J.J., Tear, T.H., Pyke, C., Shaw, M.R., Gonzales, P., Kareiva, P., Hansen, L., Hannah, L., Klausmeyer, K., Aldous, A., Bienz, C., Pearsall, S., 2010. Resource management in a changing and uncertain climate. Front Ecol Environ 8 (1): 35-43. Littell, J.S., Peterson, D.L., Millar, C.I., O'Halloran, K.A., 2011. US National forests adapt to climate change through science-management partnerships. Climatic change, DOI 10.1007/s10584-011-0066-0. | Thank you for these references. We have included them, and the points they make. |
| 14537 | 2 | 27 | 15 | | | Are energy technology R&D programs an example of AAM? The government invests in a wide range of early-stage technologies, with the explicit expectation that some will be dropped and others move on to latter stages of funding. | That seems right. Adaptive management involves trying out a diversity of approaches, with the explicit expectation that some approaches will work better than others; the successful ones will be retained and improved upon, and the |
| 7262 | 2 | 27 | 16 | | | What is UNFCC? | United Nations Framework Convention on Climate Change. We trust it will be in |
| 4634 | 2 | 27 | 40 | 27 | 41 | , I do not understand "If five logically independent statements each hold with probability 0.8, the probability 40 that all of them hold can be anything from 0.8 to 0." Why is the answer not (0.8)5? | Logically independent' means that none of the statements logically implies any of the others. However, they may be probabilistically dependent. The answer 0.8^0.5 holds if the probabilities in question are independent. It can happen that each of five events has probabiity 0.8 but their intersection has probability zero. In this case it is impossible that they all hold. It can also happen that |
| 13852 | 2 | 27 | 40 | 27 | 45 | Sentence beginning with 'If five …" through line 45 seems out of place in this box. It would be more appropriate to let the box stand for itself and have this material in the text, referring to the box as needed. | I would disagree. It is essential to understand that attaching probability qualifiers to statements can conceal the problem of propagating uncertainty through a chain of reasoning. This is an |
| 14240 | 2 | 27 | 40 | 27 | 41 | The example seems to be at least easily misunderstood, if not wrong. Given independence, the joint probability should be easility calculated and unique. I think the authors have in mind that the formulation would not contain the information whether these events are independent or not. Then indeed the given range seems right. | See response to comment 13852. If 'logically independent' causes confusion, we could just leave it out, the statement in the text remains true. |
| 8391 | 2 | 27 | 46 | | | It is not clear what "uncertainty analysis" is as distinct from everything else in section 2.3. This section seems to be a repository for things that didn't fit in well above. I suggest thinking very carefully about what "uncert analysis" might mean, and how to organize the entire section 2.3 given this. | Thanks for the opportunity to expand on this. Definitions are given, and the meaning of 'uncertainty analysis' is anchored in a long tradition within technical risk analysis. Quantitative uncertainty analysis (QNUA) requires a mathematical model, qualitative uncertainty analysis is a structured narrative. The former has not yet played a large role in the climate debate, which explains its subordinate role in this chapter. See however Cooke, Roger. M. (2012) "Uncertainty Analysis Comes to |
| 12237 | 2 | 27 | 49 | 27 | 49 | What is QUA? Both QLUA and QNLA are explained. | QUA is a typo, it should be QLUA |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13853 | 2 | 27 | 49 | | | Change QUA to QLUA | see response to comment 12237 |
| 6376 | 2 | 27 | 49 | | | Change QUA to QLUA? | see response to comment 12237 |
| 7263 | 2 | 27 | 49 | | | What is QUA? | see response to comment 12237 |
| 2158 | 2 | 28 | | | | Section 2.3.6.1:<br>The readers of the report would benefit from additional sources on this subject such as the book by Ayyub (2001) among other books.<br>Reference: Ayyub, B. M., Elicitation of Expert Opinions for Uncertainty and Risks, CRC Press, 2002. | Thanks, see response to comment 2157 |
| 9796 | 2 | 28 | 10 | 28 | 14 | Combining Delphi-based studies and scenarios is considered a promising approach. In existing Delphi-based scenario studies, the most often used Delphi function is the judgment function. For a comprehensive systematic review on Delphi-based scenarios see: NOWACK, M.; ENDRIKAT, J.; GUENTHER, E. (2011): Review of Delphi-based scenario studies: Quality and design considerations. In: Technological Forecasting and Social Change, Volume 78, Issue 9, November 2011, pp. 1603-1615. doi:10.1016/j.techfore.2011.03.006, online: http://www.sciencedirect.com/science/article/pii/S0040162511000576. | Thanks for the reference, which gives an interesting list of applications and a proposal for combining Delphi and scenario analysis, so as to capture the "genius" of Herman Kahn. In addition to the three critical articles you cite, H. Sackman Delphi critique; expert opinion, forecasting, and group process, Lexington books, 1974, 0669961566, may be of interest. The genius of Herman is very controversial, "thinking |
| 16088 | 2 | 28 | 16 | 28 | 29 | The example given (Rasmussen and nuclear risk) is now fully obsolete. Nuclear safety relied on a "one in 100 000 reactor years" accident and on a "one in a million reactor years" catastrophy. After 14 000 reactor years, there have been 3 occurrences of catastrophic events and double of accidents, i.e. an error of 20 times the goal. Thus the paragraph should either skip this example, or mention the failure of this approach for large systemic risks. | The Rasmussen report was retracted after critique by the Lewis Commission see US Nuclear Regulatory Commission (1979), Nuclear Regulatory Commission issues policy statement of Reactor Safety Study and Review by the Lewis Panel, NRC press release, no. 79-19, 19 January.. However, the Lewis Commission applauded the methodology, in particular its use of |
| 13855 | 2 | 28 | 18 | | | Please add reference to some of those 'successive studies' | An overview and reasonably complete set of references is found in Cooke, Roger. M. (2012) "Uncertainty Analysis Comes to Integrated Assessment Models for Climate Change…and Conversely Climatic Change. DOI: 10.1007/s10584-012-0634-y, free online access: http://dx.doi.org/10.1007/s10584-012-0634-y (see esp Supplementary Online Material). An overview and summary appeared in Radiation Protection and Dosimetry Special Issue 90(3) |
| 13854 | 2 | 28 | 3 | | | Provide at least one reference for QLUA | I would suggest EPA's Cancer Guidelines for a good discussion of weght of evidence. U.S. EPA. Guidelines for Carcinogen Risk Assessment (2005). U.S. Environmental |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8392 | 2 | 28 | 9 | | | Structured expert judgement is a tool that can be used to populate probabilty distributuions for all the other tools in the chapter, and so it is confusing to have it presented in a parallel manner. Expert judgment should not be used on its own (it is not a good idea to just ask experts what they think we should do), but rather as a way of creating probability distributions. This should be made more clear, both in the writing, and also by the structure of the sections. | Thanks, see response to comment 8786. Note also the distinction between 'expert judgment' and 'structured expert judgment'. Expert judgment tout court can mean anything from blue ribbon |
| 14829 | 2 | 28 | | | | This is a very helpful section, and could even be usefully expanded. It is arguably more useful | Thanks , I agree. Talk to the Page |
| 8786 | 2 | 28 | 9 | 29 | 24 | Again generally good discussion of the approach but no discussion of the fundamental difficulties in using expert opinion in this manner when it is difficult to gauge the impact of the experts ideological and religious positions, ethical, ontological and epistemological assumptions, expertise in philosophy of science, etc. | Thanks, this comment invites a long discussion. Here's a short reply. All experts, like most of us, have biases, predlictions proclivities etc. This is why it is essential to guage expert performance ( in terms of statistical accuracy and informativeness) with objective measures - to treat them as statistical hypotheses. Most EJ methods attempt to sensitize experts to biases etc. However, the proof of the pudding is in the eating. The credibility of an EJ study depends on these objective measures, and not on a narrative claiming bias removal. Indeed, 'unbiased' experts can still return poor performance. Many studies have tried to relate expert |
| 7264 | 2 | 29 | 10 | | 12 | How does this number compare with the forecast? | We do not know to which number you |
| 12525 | 2 | 29 | 20 | | | It is implausible to say that structured expert judgment is “just opinions and not hard facts.” Peer review, to name one salient example, is not “just” opinions. | "just…' is in quotes. Studies have shown that eg citation indices do not predict expert performance. Eg Cooke, R.M., ElSaadany, S., Xinzheng Huang, X. (2008) On the Performance of Social Network and Likelihood Based Expert Weighting Schemes, Special issue on expert judgment Reliability Engineering & System Safety , 93 , 745-756 |
| 13856 | 2 | 29 | 31 | 29 | 34 | Recommend updating this part to reflect the new 'Representative Concentration Pathways' of WG I | Good idea, will do |
| 7265 | 2 | 29 | 31 | | | May not be the first occurence, but define "emission pathway" | see response t comment 13856 |
| 14538 | 2 | 29 | 35 | 30 | 11 | Schoemaker (1993) writes “the multiple scenario method thus differs from traditional planning and risk analysis in its psychological basis,” referring to scenarios attempted role in addressing over-confidence and allowing groups to reach consensus on the need to consider potential risks without first agreeing on their magnitude or precise form. This chapter’s discussion takes a much narrower view of scenarios, essentially focusing on their use in laying out a range of plausible future climate conditions. But the climate community has a much richer view of scenarios, as described, for instance in Parson, E. A., V. Burkett, K. Fischer-Vanden, D. Keith, L. O. Mearns, H. Pitcher, C. Rosenweig and M. Webster (2007). Global-Change Scenarios: Their Development and Use, Synthesis and Assessment Product 2.1b, US Climate Change Science Program and a special issue of Environmental Research Letters (see O'Neill, B. C., S. Pulver, S. D. VanDeveer and Y. Garb (2008). "Editorial - Where next with global environmental scenarios?" Environ. Res. Lett. 3: 1-4.) | This is a very good point, but since Chapter 2 addresses uncertainty and risk, we refer to the aspects of scenario methods related to that. This does not preclude other uses. |
| 7266 | 2 | 29 | 41 | | | What is SRES? | Thank you. SRES is an acronym for Special Report on Emissions Scenarios. |
| 6076 | 2 | 29 | 41 | 29 | 41 | Examples of SERES can be replaced by the most recent ones including EMF 27. | see response t comment 13856 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13857 | 2 | 29 | 43 | 29 | 44 | Suggest relating this sentence to previous sentences by noting that the Meehl at al (2007) study involved multiple runs of multiple models. | see response t comment 13856 |
| 3897 | 2 | 29 | 47 | 29 | 48 | Sentence difficult to read and understand -recommend redrafting it. | The last line is number 43?? |
| 12526 | 2 | 29 | 48 | | | Add after “change” -- “estimating system boundaries and thresholds” | The last line is number 43?? |
| 2965 | 2 | 29 | 1 | | | would it be worth saying something about use of decision markets as a way of aggregating opinions (e.g., intrade)? | Outside the scope of this chapter. |
| 3138 | 2 | 29 | 12 | | | section 2.4.4 might helpfully begin with a macro view of the kinds of "errors" that can be made in policy choice (and remedies for those errors). That larger framework, which might be just a few sentences or such and refer to other chapters, will help readers understand the context for the discussion of instruments that follows. Also, the discussion that follows strikes me as overly weighted on market and technology policies and perhaps underplays the role of regulation. (Later chapters also deal, often, with policy instrument choice and they, too, underplay the role of direct regulation.)<br><br>Throughout, the stuff on risk perception and decision making is really helpful. fyi, there is some evidence that different types of people make decisions differently—our lab has a big review paper (now accepted at Perspectives on Politics for publication in March 2013) that looks, in particular, at elite vs. non-elite methods for making decisions. Here's a link:<br>http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1917037<br><br>I have the impression that decision-making strategies that involve "act, observe, learn, and adjust" are under-played in this chapter. Lempert and others, including at EMF, have done a lot in this area and it seems to be a big part of the climate policy analysis literature. Maybe its in the chapter and I missed it. □ | This is an interesting comment. With respect to errors, the intention was to cover these, and their effects on policy, in section 2.2. With respect to the decision-making strategies, that is a good point, and is covered in section 2.3 under robust decision-making and adaptive management. The point with respect to regulation is very much right, and yet I see it as more apprpriate in chapter 16, Ithough we make note of it now in the introduction to 2.4.4. |
| 13858 | 2 | 30 | 1 | | | It seems like the term 'optimal signal' is not what you mean here. Do you mean 'optimal method?' | Optimal signal is a technical term, and denotes forming a linear combination of separaste signals in such a was as to minimize the variance of the combined signal. Think weighted least squares, where different variables are combined with weights proportional to their inverse variances. In climate applications the role of variance is played by natural variability. Owing to short observation |
| 10419 | 2 | 30 | 12 | 33 | | The uncertainty quantification references are good, but you forget to mention Computable General Equilibrium (CGE) models, where you could incorporate uncertainity inside sector modelling | Thank you. However, we would need references to published literature to add |
| 8137 | 2 | 30 | 13 | 30 | 17 | Evidence? Sources? | I trust that the existence of a literature on policy analysis and implementation is not controversial, just as it would not be controversial to claim the existence of a literature on chemsistry, physics, or economics. The specific references to this literature, numbering into the thousands, are tangential to this chapter |
| 3903 | 2 | 30 | 23 | 30 | 23 | The term 'at all costs' implies that these parties are behaving irrationally. Would a less extreme hypothesis be better? | I am not sure why "at all costs" implies irrationality per se. It is not necessarily irrational, for example, to spend all the |
| 3200 | 2 | 30 | 24 | | 25 | What is the fourth reason? | Oops. Change to "for several reasons." |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2579 | 2 | 30 | 30 | 30 | 30 | The role of subnational and local governments in addressing Sustainable Development issues, notably climate change, has been increasingly recognized by the UM System. For instance, the Rio+20 final declaration has 23 matches to "subnationals" (initial draft had just a couple) | Thank you. I believe that the peer reviewed papers we cite make exactly this point. |
| 13860 | 2 | 30 | 35 | 30 | 40 | Include reference to 'carbon taxes'. It is a major topic of discussion in this context. An example is: Title: Exxon is right: Let us re-examine our choice for a cap-and-trade system over a carbon tax<br>Author(s): Wittneben, Bettina B. F.<br>Source: ENERGY POLICY Volume: 37 Issue: 6 Pages: 2462-2464 DOI: 10.1016/j.enpol.2009.01.029<br>Published: JUN 2009 | Thank you. We have added carbon taxes. |
| 3368 | 2 | 30 | 4 | | | Epistemological challenges related to scenario analysis and uncertainty should not be ignored. Scenario analysis does not follow the scientific gold standard of falsification and there is risk of systematic bias, e.g. due to herd crowding, in e.g. integrated assessments. Discussion of this point seems to be absolutely crucial. One important study on this issue is: "Betz, G. (2009),Underdetermination,Model-ensemble,andSurprises | Thanks, Scenarios of course do not follow the rule of falsification, they never happen. They are biased by authors' perspective. They only give a path for "what happens if." |
| 3369 | 2 | 30 | 4 | | | An example for this herd crowding are future scenarios on bioenergy deployment. More specifically, top-down studies were reluctant to take up bottom-up insights on the life-cycle assessment of bioenergies, producing a bias in bioenergy scenarios, nearly exclusively portraying bioenergy as "carbon neutral". See: "F. Creutzig, A. Popp, R. Plevin, G. Luderer, J. Minx, O. Edenhofer (2012)<br>Reconciling top-down and bottom-up modeling on future bioenergy deployment.<br>Nature Climate Change 2: 320-327" | Thanks for the helpful suggestion. |
| 6377 | 2 | 30 | 4 | | 11 | Another disadvantage of scenario analysis is that the choice of scenarios is somewhat arbitrary. This is one of the issues addressed by RDM, by using large-scale, automated scenario generation. It would be good to discuss this, as RDM has already been presented. (See, e.g., Groves and Lempert 2007, doi:10.1016/j.gloenvcha.2006.11.006) | We have taken this point into account. |
| 8487 | 2 | 30 | 41 | | 46 | Note unanticipated costs as well, and may want to note that action across this expanded scope of governance is not only multi-level, but also formal and informal (see Middlemas 1997) | I don't understand this comment in the context of the specified paragraph. |
| 3367 | 2 | 30 | 4 | 30 | 11 | The paragraph on the limitations of scenario analysis goes to the heart of the AR5 report and should be expanded to allow a more careful interpretation of chapter 6's results. For example, the two following studies detail the limitations of integrated assessment studies with respect to dealing with the uncertainties of future development:<br>A) Ackerman, F., DeCanio, S. J., Howarth, R. B. & Sheeran, K.<br>Limitations of integrated assessment models of climate change. Climatic Change 95, 297–315 (2009).<br>B) Cullenward, D., Schipper, L., Sudarshan, A. & Howarth, R. Psychohistory revisited: fundamental issues in forecasting climate futures. Climatic Change 104, 457–472 (2011). | The section on scenario analysis is not a critical review of IAM's, but a review of scenario analysis. The sec5ion has been expanded. Further, I have re viewed and commented on Ch. 6. Scenarios are not 'predictions' or 'forecasts', they are "projections" the intent of developing scenarios is to cover the range of possibilities. If you will, they attempt to descry be the support of the uncertainty distribution on future paths |
| 5389 | 2 | 30 | 18 | 30 | 46 | In line 38 is stated four reasons, but in the same pargraph up to line 25 only three reasons are mentioned… however, there are four reasons mentioned in the following pargraphs ……. | The section has been edited. |
| 13260 | 2 | 30 | 18 | 30 | 25 | The paragraph states four reasons related to risk and uncertainty, but the explanation cover only three | The section has been edited. |
| 8243 | 2 | 30 | 18 | 30 | 25 | I think also that it also becomes more problematic due to lengthy time taken in policy making. | The section has been edited. |
| 16089 | 2 | 31 | | | | Not clear what the figure means and what its aim is. | This figure is being dropped for the SOD. |
| 13261 | 2 | 31 | | | | Although all actions are directly or indirectly aimed to protect societies and people against adverse effects of climate change, many of them are directly focused on natural systems. The figure has strong presence of action in the upper side, i.e., measures or actions with high sensitivity in social systems. A policy for glacier protection, conservation policies to protect endangered species against climate change threats, etc. could be placed on the lower side, at the right. The only reference to the precautionary principle could be more theoretical that the examples on the upper side of the figure. | This figure is being dropped for the SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13861 | 2 | 31 | | | | Better to label at least the x axis as low and high rather than + and - which gives the impression of a continuoum that is not reflected by placement of the decisions listed and cannot be justified by the level of analysis representd in the figure. | This figure is being dropped for the SOD. |
| 14831 | 2 | 31 | | | | This is almost a useful figure. It would perhaps be more useful if it had a single axis showing different types of uncertainty (from deep and unqualtified to straightforward and well-quantified), and types of decisions that characterized those types of uncertainty were above the axis, and apropriate deciison-making tools were below the axis (perhaps with lines connecting decisions and corresponding tools) | This figure is being dropped for the SOD. But I also disagree with the comment. The point of the fgure was not to view uncertainty in terms of its |
| 14241 | 2 | 31 | | | | This is the only figure in the article that I did not find very helpful, ever somewhat confusing. Should the vertical position denote increasing sensitivity? Why is the design of a carbon monitoring system more subject to uncertainty in the climate system than e.g. formation of the national climate policy commitments? I would think it's the other way round. The precautionary principle would make the resulting climate outcome probably less subject to climate uncertainties, but is more responsive to the introduction of uncertainty. While these are just examples of possible misunderstandings, it might be worthwhile to re-think the layout itself. | This figure is being dropped for the SOD. But to answer your example question, the design of a carbon monitoring system is very sensitive to uncertainties in natural systems, such as decomposer food webs in the soil, as well as in social systems, such as non-point emissions sources of black carbon. The formation of national climate policy commitments, in the context of a global target to achieve a particular climate target such as 2°C, would be in theory |
| 3904 | 2 | 31 | 11 | 31 | 17 | These lines focus on irrational decision-making, in the sense of someone who is not taking decisions that are clearly optimal in terms of their own preferences. The real problem with public policy is that decision-makers are behaving optimally, but their incentives (political, bureaucratic of whatever) are not well aligned with interests of 'the common person', 'the representative individual', the 'median voter' or whatever other expression is used to represent the (non-partisan) 'public interest'. So bad policies result from the conventional political expediency that magazines like the UK Economist document in every issue. Could the chapter be structured so as to distinguish the problem of failure to optimise (ie irrational behaviour) from the problem of optimising the 'wrong' objective function (eg the imperative to win the next general election)? | Good points that we will address more fully in the SOD |
| 13862 | 2 | 31 | 16 | | | Remove word 'the' since this section cannot discuss ALL examples. OR replace 'the' with 'some' | Good point. Thanks. |
| 10684 | 2 | 31 | 21 | 31 | 22 | Why is establishment of a stabilisation target sensitive only to uncertainties in the natural system? Surely the magnitude of many climate change impacts (and thus the level to be avoided) is dependent on vulnerability and exposure of social systems too? Indeed, Article 2 talks about food production and economic development - both strongly socio-economic systems. | The statement was too condensed and will be modified. |
| 9797 | 2 | 31 | 26 | | | What is a "social planner" from your point of view? You furtheron refer to a modelled decision maker. This might work in quantitative models but does not reflect real decision makers. What can they learn from this chapter? I have already raised this issue earlier, that the chapter should address the decision makers perspective more appropriately. | To us, in a nutshell, it describes a perfectly cooperative society - a benchmark how good it could get. The idea is that 'if you maximize the cake to distribute, it is easier to get an agreement afterwards'. Social planner |
| 11519 | 2 | 31 | 26 | 34 | 22 | The title of section 2.4.2 indicates it is about pathways, but only a small proportion (section 2.4.2.3) address this topic. | If one takes a global mitigation decision to be a pathway, as this Report does, then this section is very much about |
| 8138 | 2 | 31 | 7 | 31 | 19 | Evidence? Sources? | This figure is being removed for the |
| 14242 | 2 | 31 | 9 | 31 | 10 | Please define System 1 and system 2 or refer to where it was defined. | Done. |
| 7896 | 2 | 31 | | | | The concept of the social planner should be explained with repsect to utilitarian ethics and economic theory. What kind of knowledge is the social planner supposed to have? Is the social planner a benevolent utilitarian or is she looking for an efficient economic solution or do you consider both to be the same? Is the social planner assumed to have God-like knowledge? | The concept of a social planner, as we understand it for our chapter, shall be made more explicit in the SOD. |

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| 4708 | 2 | 31 | 26 | | | This section, as with 2.3, leans excessively on System 2 thinking and assumes that sufficiently good System 2 policies can alter the basic System 1 obstacles. | This is a valid point, and the section has been revised accordingly to deal with |
| 16090 | 2 | 32 | | | | Baranzini et al (2003) and Baudry (2000) are not in the reference list | Thank you, a set of references was missing and this has now been corrected |
| 8141 | 2 | 32 | 13 | 32 | 13 | Again, imprecise language: Actually, you did use only a fraction of existing literature. How was it selected? How was it analyzed? | Authors did their best to include all literature published so far. We may add more literature if it meets the deadline. If |
| 14832 | 2 | 32 | 13 | | | It seems that this is the most important part of the chapter, and should certainly be more of a guiding element of it's structure. The conclusion "There appears to be consensus in the literature that the inclusion of uncertainty implies a more significant short-term response to climate change." is extremely important, and should be highlighted, elaborated significantly, and made a key message. | Thank you, we have now made an extensive work to bring in the introduction some of these conclusions |
| 11520 | 2 | 32 | 13 | 32 | 13 | Table 1 should be changed to Table 2.1 | Thank you text has been edited |
| 7267 | 2 | 32 | 13 | | | Table 1 -> Table 2.1 | Thank you text has been edited |
| 7268 | 2 | 32 | 17 | | | What is continuous damage uncertainty? | Thank you text has been edited to be clearer. It refers to continuous climate-feedback damages as opposed as to |
| 4614 | 2 | 32 | 19 | 32 | 21 | The source of this assertion should be provided or how it is arrived at | We have classified literature reported in the table for the results they report. The source is the aggregate of the literature |
| 7696 | 2 | 32 | 24 | | | Two additional references for the "downstream - continuous" / "accelerates mitigation" box (both deal with uncertainty and learning on climate sensitivity under a temperature target):<br>* Syri, S., Lehtilä, A., Ekholm, T., Savolainen, I., Holttinen, H. & Peltola, E. (2008), 'Global energy and emissions scenarios for effective climate change mitigation - deterministic and stochastic scenarios with the TIAM model', International Journal of Greenhouse Gas Control 2(2), 274–285.<br>* Ekholm, T. (submitted), Hedging the climate sensitivity risks of a temperature target. Submitted to Resource and Energy Economics in Feb. 2012. | Thank you, references have been considered |
| 7269 | 2 | 32 | 24 | | | The Table caption is above the table, but Figure captions are below figures? Also, define up stream, down stream in the caption! | Thank you, text has been edited |
| 13863 | 2 | 32 | 3 | | | IAM refers to models already. Remobe the word 'models' after IAM. | Thank you text has been edited |
| 7270 | 2 | 33 | 10 | | | Table 1 -> Table 2.1 | Thank you, text has been edited |
| 7271 | 2 | 33 | 19 | | | Table 1 -> Table 2.1 | Thank you, text has been edited |
| 6378 | 2 | 33 | 20 | | | Mangled citation | Thank you, a set of references was missing and this has now been corrected |
| 7272 | 2 | 33 | 24 | | | New paragraph for (iii) | Unfortunately we cannot add paragraphs for each of the uncertainty sources for space concerns, although we do see the |
| 7273 | 2 | 33 | 28 | | | New paragraph for (iv) | Unfortunately we cannot add paragraphs for each of the uncertainty sources for space concerns, although we do see the |
| 7274 | 2 | 33 | 48 | | | Table 1 -> Table 2.1 | Thank you, text has been edited |
| 14834 | 2 | 33 | | | | This part of the chapter is important and should be expanded. | The whole chapter is constrained by page limits. However some of the points in this section are now mentioned in the |
| 4707 | 2 | 33 | 6 | | | The language of this first paragraph is particularly opague. | This section has been extensively |
| 2159 | 2 | 34 | | | | Forming treaties should consider not only treaty verification but also treaty verifiability. This area is well established and rich with sources based on work in missile defense systems and nuclear armament. | Thank you. The text has been revised accordingly. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4894 | 2 | 34 | 24 | | 29 | The 2 sorts of evaluations are not in contradiction. Clarity in this is a crucial issue for the ongoing c.c. negotiations. Actually these effects of uncertainties depend on the nature/type of the uncertainty: i.e. whether it is related to the phenomenon (e.g. ozone layer depl. or to the necessary common mitigation action and its "share" for individual countries e.g. in line with the c.b.d.r.). The latter factors governing the political willingness to agree were clearly demonstrated e.g. for such conventions/protocols a the LRTAP and its protocols, the instruments on ODS or the UNFCCC-KP and their unclear followup. | This is an important point and I have changed the text accordingly. |
| 7275 | 2 | 34 | 28 | | | uncertain as -> uncertain about | Thanks. Have changed it to "uncertain |
| 4895 | 2 | 34 | 32 | | 42 | The same as above, however, here: some kind of learning has the reverse effect; namely, learning more on the potential adverse impacts + on the opportunities for some assistance (or lessening uncertainties about such opportunities) had a clear positive impact on the number of "candidates" for the KP, i.e. accelerated the ratification by the developing countries. | This may be, but I don't know of any papers documenting this. I wish the reviewer had provided a reference. |
| 4511 | 2 | 34 | 43 | 34 | 48 | Reference could be made here to recent work by DeCanio and Fremstad ("Game theory and climate diplomacy," Ecological Economics, in press) showing how recognition of the seriousness of climate catastrophe on the part of leading governments could transform a Prisoner's Dilemma game into a Coordination Game, leading to greater likelihood of reaching an international agreement to limit emissions. | Thank you, references have been considered |
| 4615 | 2 | 34 | 7 | 34 | 10 | The meaning of this sentence is not clear | Thank you. We changed 'what' to 'which' |
| 14835 | 2 | 34 | | | | This does not appear sufficiently relevant to this chapter to devote this much text to it. | A decision was made concerning the overall organization of the report that in this chapter we would cover research results concentrating on the issue of uncertainty across a range of policy and governance contexts, rather than having that literature reviewed in the policy and sectoral chapters. That is what is going |
| 7897 | 2 | 34 | | | | The problem of treaty formation is mainly addressed in game theoretical ways. The perspective of institutionalism is marginalized (Oran Young, one of the leading proponents of inst., is mentioned once). If game theory is adopted as genral appraoch for decision making, the prisoners dilemma and the problem of sub-optimal outcomes must be taken into account. Game theory without prisoners dilemma is not state of the art. It neglects the fact that maximising one's own position has highly undesirable consequences: everybody ends up in jail; i.e. humanity will faces "dangerous anthropogenic climate change" and most "players" will be worse off. | This is a very valid comment. At the least, we need to acknowledge that there are other academic approaches to understanding treaty formation than those relying on game theory. At the same time, however, we have struglled to find references in these other literatures focusing on the issue of |
| 7358 | 2 | 34 | | | | A sub-section addressing "compliance" in addition to MRV is necessary to fully reflect the elements relating to uncertainty and international agreements | This is a good point. We have indicated the connection with compliance. |
| 4710 | 2 | 34 | 18 | | | This whole section seems out of place in this chapter -- shouldn't it be moved wholesale to Chapter 13: International Cooperation: Agreements and Instruments? | The short answer is yes. The longer answer is that a decision was made concerning the organization of the report that Chapter 2 would highlight particular issues of uncertainty, and the relevant research results concentrating on uncertainty, across a wide range of policy and governance contexts. Given that, the material fits here, just as later |
| 4897 | 2 | 35 | | | | 2.4.3.3 (a) At the outset, industry is also mentioned (together with land use), however, later there is no concrete reference to that sector. (b) In terms of MR(V) regimes in developing countries, besides the referred uncertainties and lack of MR-capacities another essential (and sensitive) point is the "sovereignty" issue (that includes the uncertainties on how other parties may use the information received through the (M)RV channels): it is clearly indicated in course of the negotiations and also in the relevant outcomes of the COPs). | This may be, but I don't know of any peer reviewed sources that say this. |

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| 7276 | 2 | 35 | 10 | | | Who is "they"? | Thank you. The text has been revised |
| 7277 | 2 | 35 | 21ff | | | break the sentence in two, e.g. "[...] in time. He found [...]" | I don't understand this comment in the context of the specified page and line |
| 12527 | 2 | 35 | 3 | 37 | 7 | This paragraph cites two slightly varying views on the inefficacy of the multilateral negotiations approach, most notably if indirectly referring to the UNFCCC. This represents a very narrow range of views from a very extensive literature, and this summary should be expanded to include those broader views. From personal experience observing the UNFCCC and related activities for nearly a decade, the UNFCCC process has actually delivered a broad range of innovative results, including the launch in Cancun of an important array of new global delivery mechanisms for climate action, the Green Climate Fund, Adaptation Committee, Climate Technology Center and Network, and progress toward a REDD+ mechanism. Progress is alarmingly slow on core issues in the UNFCCC negotiations, and the Durban Platform is somewhat vague while launching an important new 4-year negotiating round toward a new instrument. But the “death of multilateralism” (or more specifically, the “death of Kyoto” has been pronounced ceaselessly for 20 years, and yet the process continues and makes progress, even if it is slow, uneven and difficult. There are many valid points of view in the debate about how far the multilateralist approach has come and what its prospects are. There is no reason to truncate the range of those views and the vitality of that debate as the cursory summary here now does. | Thank you. The text has been revised accordingly. |
| 4896 | 2 | 35 | 32 | | 34 | It would be worth mentioning that it is the "essence" of the EU's ETS. (Personal comment: this was one of the key reasons/goals in 1997 of the "background" agreement between US and RF in the finalization of the KP and the insertion and acceptance of Art 17 during the last days(nights over there.) | Thank you. The text has been revised accordingly. |
| 6077 | 2 | 35 | 33 | 35 | 33 | The text is correct. The point, however, is that if one country's marginal abatement cost is exceptionally high, the country will never join such treaty.In this sense, this explanation is not relevant. | Thank you. The text has been revised accordingly. |
| 7278 | 2 | 35 | 35 | | | What about remote sensing via satellite? | Alas, people have thought of. There are huge uncertainties in translating satellite measurements of relfected incoming |
| 7279 | 2 | 35 | 42 | | | What is soil carbon? | Soil carbon is the carbon contained within the soil, typically biomass that has not yet decomposed. It is the largest |
| 11522 | 2 | 35 | 8 | 35 | 34 | Section 2.4.3.2 is largely based on literature review, but I don't see any summary or explaination regarding to the topic of national commitments. | Thank you. The text has been revised accordingly. |
| 4254 | 2 | 35 | 13 | | | It's not immediately clear why a country with more resource vulnerability would be more averse to a climate change treaty - could this be explained more clearly | Not "resource" but "source." That means that their economic sectors accounting for emissions are not so vulnerable to the burden placed upon them by climate |
| 4914 | 2 | 36 | 29 | | | {Add: p} that promote research, | Thanks, done! |
| 13865 | 2 | 36 | 29 | | | change 'romote' to 'promote' | Thanks. Done! |
| 7280 | 2 | 36 | 29 | | | romote -> promote | Thanks, done! |
| 13866 | 2 | 36 | 34 | | | change 'fostering' to 'reducing' | Thanks, done! |
| 16091 | 2 | 36 | 40 | 37 | 3 | Low prices in ETS has been shown repetitively to be linked to overallocation and low targets, lax banking procedures... This paragraph links the problems mainly with "regulation", certainly a cause of volatility, but of a lower order of magnitude that targets themselves. | Yes. But the overallocation has itself been linked to uncertainties in economic growth and associated emissions, which are factors that influence the relationship between the size of the cap and the market price. We believe that the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4898 | 2 | 36 | 47 | 37 | 3 | Three factors mentioned; the high price volatility within the ETS was also due (to large extent) to those uncertainties which have led to significant annual "overallocations". | The overallocation has itself been linked to uncertainties in economic growth and associated emissions, which are factors that influence the relationship between |
| 13683 | 2 | 36 | 49 | 36 | 49 | Add after "Chevallier 2009": "Vasa and Michaelowa (2011) assess the impact of policy uncertainty on carbon markets. They find that the possibility to create and destroy carbon markets with a stroke of a pen leads to extreme short-term orientation, rent seeking behaviour and high volatility in market prices. In their view, these negative effects can be reduced if climate policy decisions have a long-term nature with clear consequences of non-compliance." Reference: Vasa, A.; Michaelowa, A. (2011): Uncertainty in climate policy – impacts on market mechanisms, in: Gramelsberger, G.; Feichter, J. (eds): Climate change and policy, Springer, Heidelberg, p. 127-144 | Thank you. This is an extremely valuable point. We have added the proposed text. |
| 13262 | 2 | 36 | 8 | 36 | 12 | in 2008, Chile also had tier 2 in their inventories. Chile has done it for the key categoeries of the Agriculture sector | Thank you. That is interesting to know. |
| 17327 | 2 | 36 | 24 | 39 | 44 | Firms behavior is covered for the most part in this session but there is no transition or highlighting of this fact, only the attentive reader will notice. The behavior of Firms/investors/ institutions, is important to all the sectoral chapters. If it can be explained here in a generic form then the other chapters could pick and cross-reference to this session in Chapter 2. Consider highlighting in the introduction of this session that this session makes specific emphasis on firms behavior. | This is a good suggestion, and I have done this. |
| 4711 | 2 | 36 | 24 | | | This section goes into policy issues in general but should be more closely focused for the purposes of this chapter on how UNCERTAINTY and RISK influence policies. | I wish you had made more specific suggestions as to how. We tried very much to focus on precisely this, concentrating on the literature examining how the performance, and ultimately relative desirability, of different policies |
| 14243 | 2 | 36 | 24 | | | The chapter very much invites a discussion of taxes versus cap and trade, where uncertainty is a major driver of the differences in efficiency. In particular, Weitzman (1974), Prices vs Quantities, The Review of Economic Studies, Vol. 41, No. 4. (Oct., 1974), pp. 477-491, Karp & Hoel (2002), Taxes versus quotas for a stock pollutant, Resource and Energy Economics 24: 367–384, Karp & Hoel (2001), Taxes and quotas for a stock pollutant with multiplicative uncertainty, Journal of Public Economics 82: 91–114. If this impact of uncertainty on the choice of the policy instrument is discuessed elsewhere at length, a reference in this section might be useful. | This is important, and yet was an issue addressed quite extensively in the AR4. We do not repeat it here. |
| 6078 | 2 | 36 | 24 | | | The title of this subsection is "Choice and design of policy instruments under uncertainty". This sebsection consists of two interventions, i.e. market price/tax and RDD&D. In a real would economic incentive is just one of the instruments. For example, direct regulation plays an important role in US climate policy and voluntary initiative do the same in Japan (see Chapter 15). In this sense, it will be better to discuss various instruments rather than focussing on carbon tax in the first category. | This is an important point.We have rewritten the introduction to section 2.4.4 to acknowledge it. |
| 6079 | 2 | 36 | 40 | | | In subsection 2.4.4.1 almost solely discuss about EU ETS (and regulatory uncertainties). The description is quite informative and interesting (such as citation from Blyth et al. 2007 in page 37 line 8). That said, the latter part seems to duplicate with the description of Chapter 14 where EU ETS will be discussed. Coordination between two chapters will be necessary. | This section does not limit itself to the single example of the ETS, although that is the cap and trade system that is the most well developed, and hence can generate the greatest amount of data for |

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| 9972 | 2 | 36 | 41 | | | This section should explain that market-based mechanism such as emission trading has several problems. Volatility of emission permit prices affects volatility of product prices as evidenced by fluctuating price developments in the EU-ETS. Therefore, the market-based policy tools of cap-and-trade cannot provide credible incentives for the technological change, as described in (Montgomery, 2005, abstract) and (Baldursson, 2009, page29). These literatures are listed in the No62 line of this table.<br>In addition, CO2 leakage caused by the implementation of the ETS happened actually through transfer of industry from one country to others. Market mechanisms at least under Kyoto-like international scheme, where the condition of all countries' meaningful participation is not met, does not work well, as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No50 line of this table. | It is not the purpose of this section to go into all problems, such as leakage. Issues of permit price volatility is something that the section already covers, as the review suggests that it should. |
| 4616 | 2 | 37 | 11 | 37 | 13 | This is an example where the irreversibility effect and real options work. | Yes. |
| 7282 | 2 | 37 | 18 | | 19 | What about the two full stops around Patino-Echeverri et al? | Fixed. Thanks. |
| 12615 | 2 | 37 | 19 | 37 | 21 | This is a very old reference. Since this time CCS legal and regulatory frameworks have been put in place in Australia and many parts of Europe and USA. I therefore do not feel signling out regulatory uncerntainy as an issue solely for CCS is appropraite. Please see the IEA CCS Model Regulatory Framework and IEA CCS Legal and Regulatory Review for references. | We did not mean to single out CCS, and have nothing in particular about the technology. It is just that Reinelt and Keith happened to study the impact of regulatory uncertainty (i.e. carbon price fluctuations) in the context of investment into one low carbon technology, i.e. CCS. The presence of a legal framework for CCS (covering, for example, legal liability for leakage), which you are right exists now to an extent that it did not in |
| 12658 | 2 | 37 | 19 | 37 | 21 | This is a very old reference. Since this time CCS legal and regulatory frameworks have been put in place in Australia and many parts of Europe and USA. I therefore do not feel signling out regulatory uncerntainy as an issue solely for CCS is appropraite. Please see the IEA CCS Model Regulatory Framework and IEA CCS Legal and Regulatory Review for references. | We did not mean to single out CCS, and have nothing in particular about the technology. It is just that Reinelt and Keith happened to study the impact of regulatory uncertainty (i.e. carbon price fluctuations) in the context of investment into one low carbon technology, i.e. CCS. The presence of a legal framework for CCS (covering, for example, legal liability for leakage), which you are right exists now to an extent that it did not in |
| 7281 | 2 | 37 | 2 | | | not-infrequent -> frequent | Hmm. My sense, as a native English speaker, is that "frequent" has a slightly different connotation from "not-infrequent." The latter does not clearly state that the events could be labeled as frequent, but does suggest that they |
| 7283 | 2 | 37 | 27 | | | What is a risk neutral investor? | A risk neutral investor is one for whom the ranking of alternatives follows their ranking according to expected payoffs. |
| 12911 | 2 | 37 | 36 | 37 | 36 | reference Fuss et al 2012 does not exist. Either it should read Fuss el al (2009) or the reference is missing. | Thank you. We have added the |
| 7284 | 2 | 37 | 36 | | | What is "their paper"? Whose paper? Fan (2010)? | That's right. We clarify. |
| 7285 | 2 | 37 | 50 | | | What is the conclusion by Burtraw et at (2010) for a comparison of a symmetric valve with no cap? | I don't think he made that comparison. |
| 2966 | 2 | 37 | 11 | | | this is the first mention of real options -- an explanation would be helpful. | Real options were explained in section |
| 4915 | 2 | 38 | 10 | | | [Del] (CERs) that can be accounted [sold] for .. OR: that can be acquired from [sold for] | Thanks. I have made the change. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4899 | 2 | 38 | 14 | | 15 | Actually, the long-term price uncertainty was also the consequence of the relatively short period of the ETS (phase2, 2008-12) and the relevant (1st) commitment period under the KP (i.e. the uncertainties about the "continuation" beyond 2012 ..) | Yes, that is right. But this had the effect of increasing the uncertainty with respect to the longer term price of |
| 4916 | 2 | 38 | 20 | | | [Del] document the analysis the analysis underlying | Thanks. Made the change. |
| 13867 | 2 | 38 | 20 | | | remove repeated 'the analysis' | Thanks. Made the change. |
| 13868 | 2 | 38 | 32 | | | The literature already reviewed' … does this refer to section 2.4.4.1? If so, mention that specifically. | Thanks. Made the change. |
| 7286 | 2 | 38 | 33 | | | giving risk -> giving rise? | Right. Thanks! |
| 3201 | 2 | 38 | 45 | | | Define "feed-in tariffs" | Thnks for noting this. I do so very breifly here, matching the brevity of description of othr instruments, such as cap and trade. I assume that the policy chapters, and the glossary, give a more complete definition. I have done this up above, in terms of writing: There are a number of instruments that focus on this directly, by either supporting RDD&D with public funds, by mandating particular technologies, or by guaranteeing the |
| 9495 | 2 | 39 | 3 | 39 | 20 | in addition to the good influence for TIF in Germany, add the bad influence<br>(Economic impacts from the promotion of renewable energies: The German experience/page 6 lines 3-6)(attached on email) | This is a good point, but tangential to our chapter. |
| 9973 | 2 | 39 | 3 | 39 | 20 | This part should explain that FIT in Germany had several problems. For example, FIT policy did not lead technological innovation and caused increase of electricity price, as described in (Manuel, 2010, page6 and 13), (Marc, 2006, page 9 and 11), and (Batlle, 2011, page15).<br><br><Reference><br>[1] Manuel Frondel, Christoph M. Schmidt, Nolan Ritter and Colin Vance (2010). Economic Impacts from the Promotion of Renewable Energy Technologies: The German Experience. Ruhr Economic Paper #156 ( Energy Policy 38 : 4048-4056 ) . Available at: http://repec.rwi-essen.de/files/REP_09_156.pdf#search='Economic%20Impacts%20from%20the%20Promotion%20of%20Renewable%20Energy%20Technologies'<br>[2] Marc Ringel (2006). Fostering the use of renewable energies in the European Union: the race between feed-in tariffs and green certificates.<br>Renewable Energy Volume 31, Issue 1, January 2006, Pages 1-17<br>[3] C. Batlle, I.J. Perez-Arriaga, P. Zambrano-Barragan (2011). Regulatory Design for RES-E Support Mechanisms: Learning Curves, Market Structure, and Burden-Sharing, MIT CEEPR WP 2011-011. Available at: http://www.iit.upcomillas.es/batlle/Publications/MIT%20CEEPR%202011-011%20Regulatory%20design%20of%20RES-E%20support%20mechanisms%20v3%20_%20Batlle%20et%20al.pdf | These are good points, but thery are tangential to our chapter. I presume that the chapter on national climate policies will evaluate the overall effectiveness of different instruments, including FITs. Here, we are merely highlighting how different instruments behave differently with respect to uncertainty. The literature is fairly clear that uncertainty has a negative effect on the performance of cap and trade, but less of an effect on the performance of the FIT. |
| 13869 | 2 | 39 | 32 | | | to be most important' … compared to what else? | Thanks. I have added "of those for which there was reason to be concerned." |
| 7287 | 2 | 39 | 42 | | 43 | substitution of domestically produced renewable energy for imported fossil fuels -> substitution of imported fossil fuels by domestically produced renewable energy | Thanks. |
| 9798 | 2 | 39 | 45 | | | Behavior is often based on shortterm calculations not taking into consideration a lifecycle perspective. | That is right. For that we need a |
| 9186 | 2 | 39 | 45 | 40 | 43 | good text. I will refer to this in my chapter 15. | Thanks. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4900 | 2 | 39 | | | | 2.4.4.3 There are also various buyers'/consumers' (mis)perceptions on the durability (lifetime of efficient operation) of new energy-efficient household equipments (like compact fluorescent bulbs) that also motivates the (un)willingness to replace the existing "old" ones. | Perhaps, although I don't see this as an issue having to do with uncertainty. |
| 6080 | 2 | 39 | 45 | | | I wonder whether the descriptions of this subsection (energy efficiency and behavioral change) have anything to do with uncertainty. The main issue is lack of information. In this sense, this subsection may not be necessary for this chapter. Also double checking with Chapter 10 (Industry) will be necessary. | I think that this section could probably focus more in uncertainty issues. |
| 16917 | 2 | 4 | | 5 | | At the moment this has strong overlap (and considerable duplication) with the Introductory section. My sense is that it works better in the latter role, and that the authors might consider a largely fresh approach to Exec Sum in the Second Order Draft. For IPCC Audience, the present Exec Sum does induce a slight reaction of “so what?” from a policy perspective. | The Executive Summary in the SOD will provide the main insights of the chapter |
| 6367 | 2 | 4 | | | | Througout the executive summary and introduction, the phrase "risk and uncertainty" is used, but neither term is defined. Definitions of these vary, so it's important to identify what is meant herein. I see a definition of "risk" finally appears on p. 47, line 32. | The terms risk and uncertainty are defined at the beginning of the Introduction of the SOD |
| 7218 | 2 | 4 | | 6 | | The executive summary does not contain any results, but only talks about what questions will be addressed. The summary should contain the important meat! Maybe have a science journalist reword it so that it reaches its intended audience (the decision makers?) | The Executive Summary in the SOD will provide the main insights of the chapter |
| 2176 | 2 | 4 | 1 | 30 | 11 | I wonder if we need to incoporate some additonal analysis on value/benefits along side risk/uncertainty in this chapter. If we are talking about policy measures to encourage certain kind of environmental or sustainable behavioral change, then we need to factor in that risk/uncertainty make sense in the context of certain value/benefits. For instance, some recent research published on clean cookstoves show that end users may understand the risks of indoor air pollution associated with traditional cookstoves, but the | Thank you, we now have xpanded the section on risk perception and integrated it more with the methods section |
| 2177 | 2 | 4 | 1 | 30 | 11 | but the value/benefits of using the newer, cleaner cookstoves do not outweigh the risk/uncertainty of switching to the newer cleaner models. | Thank you, we now have xpanded the section on risk perception |
| 7837 | 2 | 4 | 1 | 6 | 5 | There is a lot of repetition in these paragraphs. It is suggested to merge paragraphs and to avoid any repetition. | Sect. 2.1.1 is being rewritten for the SOD and has taken this point into |
| 7838 | 2 | 4 | 1 | 6 | 5 | It is suggested to avoid terms that are not really common but are used only in a specific context such as "myopic" or "heuristics" as such language would significantly reduce the readability. | These two terms have been entering public and policy discourse, and we have added more references to their use |
| 7840 | 2 | 4 | 1 | 6 | 5 | This executive summary reads more like an introduction but not like a summary of the finding of the assessmernt ogf literature. An indication for that finding is that the executive summary does not include any reference to the underlying sections of the report. | The Executive Summary in the SOD will provide the main insights of the chapter |
| 3894 | 2 | 4 | 1 | 6 | 5 | A key criticism of this chapter is that it does not address the problems that (1) there are different views about how the future might unfold, and no objective basis for resolving all those differences, (2) people have different attitudes to risk and so would not all agree about the best course of action even if they had exactly the same expectations for the future and (3) politicans and advisers are self-interested parties with their own agendas. Those who feel most strongly about climate change will take the strongest action, individually, or collectively, but the social planner has no objective basis in this chapter for imposing the preferences on that group on dissenting individuals and groups. What is needed is a discussion of decision-making under uncertainty when information is dispersed, costly to collect, individuals differ, and politicians behave like politicians anywhere. Poor policy advice will result if the problem is posited instead as "assume that there is a social welfare function, assume that all useful knowledge about ways and means and incentives can be collected together by a central planner, and assume that politicians will follow the central planner's sage and altruistic advice". None of these assumptions are valid, yet this chapter (eg on page 5) seems to assume that they are valid and that the real problem is that real people don't behave as they 'should'. | Thanks for this comment. Factors (1) and (2) are amply addressed, albeit in somewhat different terms. The discussion of expert judgment emphasizes that experts don’t - and shouldn't - agree on future scenarios, and points to methods for validating and synthesizing divergent opinions. 2.3 emphasizes that utility is specific to an individual, which is to say, different people have different utilities and therefore different attitudes towards risks. Re (3), we may presume that almost all parties are self-interested. The problem of balancing diverse and diverging stakeholder interests is at the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8479 | 2 | 4 | 13 | | 19 | Importance to consider risk perception in the context of risk assessment, perception and communication (all of which together compose risk management) See for example Guehlstorf "Political Theories of Risk Analysis" Spring 2005 | We agree. The chapter addresses how risk assessment, risk perception and communication impact on risk |
| 7834 | 2 | 4 | 15 | 4 | 16 | Substitute "choice process" by "decision making process". | Text changed. |
| 4740 | 2 | 4 | 20 | 4 | 24 | Proposition to replace those 5 sentences by a picture/grapf | Thanks for the suggestion, Text will be rewritten, using a table. |
| 10782 | 2 | 4 | 20 | | 24 | subject in line 20 seems to be the same as the one in line 24. | Thanks for the suggestion, Text will be rewritten, using a table. |
| 10162 | 2 | 4 | 20 | 6 | 5 | Much of this text is repeated almost word for word under Introduction (2.1.1). It seems a bit unnecessary to repeat the same thing twice, in addition it would make more interesting reading if the executive summary was rewritten using its own words. | The Executive Summary in the SOD will provide the main insights of the chapter. |
| 4741 | 2 | 4 | 25 | 4 | 36 | For the farmer wetness/flood should also be mentioned (not only drought). Furthermore the choice of the crops by the farmer could be lead by market prices (forward, etc.).<br>Regarding the carbon tax, I agree with the statement, however such a tax may create a market distorsion if not implemented in all countries. | The points on the farmer's crop decision and the carbon tax will be taken into account if we use these examples in the SOD. |
| 4695 | 2 | 4 | 25 | 4 | 37 | Seems like these two sections could be combined and are a bit redundant. | Sect. 2.1.1 has been revised in the FOD so the point is not relevant |
| 7835 | 2 | 4 | 26 | 4 | 27 | The following langauge is suggested: .. A faremr making decisions on what crops to plant should consider the likelihood … | Sect. 2.1.1 has been revised in the FOD so the point is not relevant |
| 13778 | 2 | 4 | 27 | | | Change 'himself' to a gender neutral term. | Accepted. |
| 4694 | 2 | 4 | 31 | 4 | 33 | "A government implementing a carbon tax needs to be concerned with the uncertainties associated with its ability to monitor firms' activities and the impact of a specific penalty on firms' actions." It also needs to be concerned particularly with the likelihood that larger level economic forces will lead to the tax not leading to the desired reductions in emissions. | Accepted. The text will be modified accordingly. |
| 6058 | 2 | 4 | 31 | 4 | 33 | This example is not necessarily relevant. Major uncertainty in introducing carbon tax is the uncertainty of its effect as governments do not exactly know the shape of marginal abatement cost curbe. | Noted. We think the reviewer is saying the same thing as we do, only in |
| 7836 | 2 | 4 | 33 | 4 | 36 | Language is much too prescriptive. A less prescriptive wording is sugegsted, e.g.: National governments might consider climate change scenarios and their associated costs and benefits in terms of investments in mitigation and adaptation. | Good suggestion taken into account in the SOD |
| 8229 | 2 | 4 | 37 | 4 | 37 | At first reading I thought this is going to talk about the key uncertainties (the nature). I think this paragraph could be clearer. It should clearly state that the stakeholders, policy makers need to understand the key uncertainties in the absence of any policies and how different policies could reduce these uncertainties.<br><br>The authors cited evidence from studies on cognitive, social, and clinical psychology on risk perceptions of uncertain events (Hume, 2000; 6 Weber, 2006). Are any of these studies related to climate shocks? Or are there any studies based on climate events which can be used to draw lessons in the natural system risk context.<br><br>How do the hypothetical results of Leiserowitz (2006) (cited in page 13, line 28, chapter 2) compare with studies involving people who have experienced or exposed to climate shocks such as hurricanes? Are there some studies those can be compared to make the argument in the paper? □ | Very useful observations. We are not aware of studies of specific climate shocks that use the methodology in the Leiserowitz et al. 2006 paper, but added a suggestion that such studies would be useful in our Future Research section. |
| 6059 | 2 | 4 | 37 | 5 | 4 | Examples cited as "Key uncertainties and risks that matter for climate policy" are not necessarily the proper ones, though they deserve important uncertainties. Key uncertainties and risks should be such as 1) fat tail issue of catastophe risks, 2) relationship between bio-CCS and global food security, 3) uncertainty of immediate participation of all the countries into a global framework under which all the countries assume emission reduction/limitation obligation. | Intro is rewritten |

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| 2246 | 2 | 4 | 4 | 52 | 22 | This Chapter fails to admit that there is no evidence that greenhouse gases have any harmful effect on the climate, so at present the risk is negligible.. The measures listed here are all unnecessary | It is true that we fail to address this issue an omission due to two reasons. First, it is the task of IPCC WG1 to assess the evidence for greenhouse gases having a harmful effect on the climate, and we defer to their judgment. Second, our chapter concerns the effects of a wide range of risks and uncertainties on decisions and policy. Many of these risks |
| 8228 | 2 | 4 | 4 | 4 | 5 | I think there is something missing. Risk and uncertainty of what? Word missing - Earth's climate system? Or the authors intend to say<br>"Risk and uncertainty at various levels – starting from earth's climate system and the effect of GHG emissions to how people react …." | The omission was intentional. Coping with risk and uncertainty in the process of policy-making is an issue that transcends the particular risks or the uncertainties associated with particular systems, such as technological systems |
| 7833 | 2 | 4 | 4 | | | The following language is suggested: This chapter addresses how to interpret …. | The section has been reworded. |
| 3187 | 2 | 4 | 4 | 54 | 23 | The words "risk" and "uncertainty" are used throughout. Give a definition early on, so readers understand what you have in mind. | Good point, Informal definitjions have been established. Following the glossary of the Society for Risk Analysis, "Risk" is gliossed as "The potential for realization of unwanted, adverse consequences to human life, health, property, or the environment;", It can be elaborated ain the fashion of Kaplan and Garrick (1981) in the first article of the first issue of RISK ANALYSIS."uncertainty was defined as "a subjective state of 'partial |
| 13779 | 2 | 4 | 44 | | | change 'impact' to 'affect' [in general, the word 'impact' is improperly used in many cases throughout.] | Wording change made in the SOD |
| 13780 | 2 | 4 | 44 | | | remove word 'on' | Wording change made in the SOD |
| 12517 | 2 | 4 | 7 | | | The discussion does not make clear the difference between "risk" and "uncertainty." Neither does the glossary. It is evident, reading through the draft, that the intended perspective is not the traditional ("Knightian") distinction between event likelihoods where outcomes can be assessed based on previous experience vs. those where that is less or not possible. But it is unclear what other conceptual view is intended. This should be made explicit so that these terms are understood properly in reading the text. | Thanks, according to Frank Knight (1921) "uncertainty" is subjective probability, and this is amply discussed. Please refer to the response to #3370. |
| 11477 | 2 | 4 | 7 | 4 | 9 | Circular logic, lack of clarity in the sentence, "risk and uncertainty" is unnecessarily repeated. | Intro is rewritten |
| 13777 | 2 | 4 | 8 | | | remove 'under conditions of uncertainty' which is repeated from the beginning of the sentence. | Intro is rewritten |
| 11478 | 2 | 4 | 4 | 6 | 5 | The executive summary matches the introduction almost word-for-word. It provides no benefit to the reader because it does not provide alternative explanations for key concepts. The executive summary should be revised to be a more effective summary of the key points of the chapter. | The Executive Summary in the SOD will provide the main insights of the chapter |

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| 8913 | 2 | 4 | | 9 | | I find the proposed framework (Section 2.1.1 including Figure 2.1 plus Executive Summary) quite confusing; maybe it is just a matter of the labeling of the various elements. The first element is 'The decision to be made'. This sounds like the decision is at the beginning of the process. Shouldn't the decision be the outcome at the end of all these evaluations? I would as a first step expect the definition of the decision situation and the selection / construction of decision alternatives. Furthermore, it is difficult to understand the differences between the elements. The descriptions for Element 1 (The decision to be made) and Element 2 (Key uncertainties ...) on page 4f and page 7f sound very much alike, both focus on the risks that are associated with a decision alternative. Again, I would expect that Element 1 focuses more on the alternatives and how they are brought into the decision situation rather than specifically on the risks. Further, the labels for Element 2 (Key uncertainties and risks that matter for climate policy) and Element 5 (Risk and uncertainty in climate change policy issues) are almost identical. What is the difference? Element 5 is at the end of the evaluation process. Thus, I would expect that Element 5 captures the result of the evaluation, for example the decision or a rank ordering of the decision alternatives. | The chapter authors have also come to the conclusion that xection 2.1.1, as written in the FOD, was not the most productive. We are reframing it around a number of very different decision-environments, and likely leaving out the figure that you found so difficult. |
| 4516 | 2 | 4 | | | | Suggest that the chapter assess the topic of uncertainty and risk associated with climate policies, their testing and maturity, and how such risks factor into investment decisions. This application is relevant to discussions in a range of chapters in this report on Mitigation, whereas the current examples give, e.g., in this chapter's executive summary (what farmers might plant) would be more relevant to a discussion of adaptation in the report of Working Group II. This is touched on in 2.4.4.1 but not mentioned in the Executive Summary. | Thank you. The executive summary is re-written and now better reflects these concerns. However, we must be mindful that judgments of 'testing and maturity' come dangerously to the forbdden zone of policy prescription. |
| 4517 | 2 | 4 | | | | The Executive Summary reads more like an introduction to the chapter than a summary of key findings. Suggest the summary be shortened and focus on key findings supported by assessed literature. | The Executive Summary in the SOD will provide the main insights of the chapter. |
| 13258 | 2 | 4 | 7 | 4 | 9 | the sentence is self explanatory, it uses "risk and uncertainty" to define risk and uncertainty. I suggest to end the sentence as follows: "(…) and make choice under no completely controlled conditions or under which some probability of fail is always present." | Introduction is rewritten |
| 4697 | 2 | 4 | 1 | | | Executive Summary could be more specific. As is, it's a bit vague, peraticularly with respect to how to foster better decisions in the face of risks and uncertainty and a-rational decision-making by individuals. | The Executive Summary in the SOD will provide the main insights of the chapter. |
| 12232 | 2 | 4 | 1 | | | The Executive Summary should focus on the key findings of the chapter. And perhaps some of the very well written text in the Summary could be captured in the Introduction. | The Executive Summary in the SOD will provide the main insights of the chapter. |
| 6057 | 2 | 4 | 1 | 6 | 5 | Citation of examples (always farmers, carbontax etc.) are rather redundant. | We are modifying the examples in the SOD and linking them to Table 2.1 |
| 13776 | 2 | 4 | 5 | 4 | 5 | should read 'uncertainty about', not 'uncertainty in'. The system is not uncertain, our knowledge is. | Introduction is rewritten |
| 4838 | 2 | 40 | 11 | 40 | 20 | The is a paper coming in the International Journal of Environment and Sustainable Development that analysed the factors that impact willingness to invest in Norwegian household which empirically shows many of the described effects. The reference is Klöckner, C. A., Sopha, B. M., Matthies, E., & Bjørnstad, E. (in press). Energy efficiency in Norwegian households - identifying motivators and barriers with a focus group approach. International Journal of Environment and Sustainable Development. I will send a copy of the paper via comments@ipcc-wg3.de | Thanks. |
| 4712 | 2 | 40 | 21 | 40 | 34 | Cialdini and colleagues have consistently shown that, faced with System 1 type motivations, people are best motivated to conserve energy by being made aware of what descriptive social norms are (ie, what fractions of "similar others" are conserving energy). By contrast, this section again assumes a "knowledge-deficit" explanation of excessive energy consumption which does not accord with much of the social psych literature's insights. Particularly the claim that: "To encourage households to invest in energy efficient measures, programs need to be developed to highlight the benefits from investing in the energy efficient measure in terms that the household can understand and to spread the upfront costs over time so the measures are viewed as economically viable and attractive." This may be part of the solution but is by no means a complete, or the most effective or cost-efficient, approach. | Interesting. |

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| 7288 | 2 | 40 | 3 | | | about their effectiveness -> about their effectiveness. | Thanks. Full stop added |
| 7289 | 2 | 40 | 43 | | | Kunreuther et al. is missing the year | Have inserted (2011) in the SOD |
| 6783 | 2 | 40 | 44 | 41 | 29 | Add some discusstion about investment diaster reduction will improve adaptation capacity . | This is beyond the scope of our chapter. |
| 12238 | 2 | 40 | 7 | 40 | 7 | It would have been useful to know which nation the survey is from. | It was from the United States, which is |
| 8244 | 2 | 40 | 1 | 40 | 1 | Are there similar studies on developing economies? | When focusing on technologies that promote RDD&D for future pathways for emissions reductions, there is no distinction between developed or developing economies. A technology |
| 8246 | 2 | 40 | 12 | 40 | 13 | There are also studies revealing that consumers not necessarily estimates the fuels economy of cars for example. Bento Antonio M., Shanjun Li and Kevin Roth (2012), "Is there an energy paradox in fuel economy? A note on the role of consumer<br>heterogeneity and sorting bias?", Economics Letters 115: 44-48, Allcott, Hunt (2011). “Consumers’ Perceptions and Misperceptions of Energy Costs.” American<br>Economic Review, Papers and Proceedings, Vol. 101, No. 3 (May), pages 98-104. | Interesting, and worth including. |
| 17328 | 2 | 40 | 32 | 40 | 34 | It will be interesting if the results from the "provision of social norm information" will be explained somehow. Is there something in the literature about "perceptions-reactions-uncertainties" that support/explain this results? | What is the provision of social norm information? |
| 8245 | 2 | 40 | 7 | 40 | 10 | Please specify on which country the study is based. | The study is based on the U.S. However, the findings are applicable to any country with similarly alternative, but |
| 4713 | 2 | 40 | 44 | | | This section should discuss the fact that an important deterrent to adaptation is government policy that removes the incentives to adapt. Funding reconstruction of homes in areas that will be increasingly prone to hurricanes (e.g., New Orleans, Florida) sends precisely the wrong signal but involves considerable expense. To the extent that government policy provides "levees and bulwarks" against the impacts of climate change, the need to adapt vanishes. A more pedestrian version of the same thing occurs when we realize that we can "adapt" to climate change by turning the air conditioner on higher rather than moving to cooler areas, taking off our sweaters, or simply getting used to higher temperatures. | This is important, but is tangential to our chapter for two reasons. First, it isn't an uncertainty issue. Second, it would take a lot of space, which we have in limited supply for a topic that is covered in much greater detail in WG2. |
| 14371 | 2 | 41 | 12 | | | Could add Cline (2011, pp. 85-86), which broadly supports the $100 billion Copenhagen figure for 2020. | OK. Thanks! |
| 8242 | 2 | 41 | 30 | 41 | 42 | While one of the possible negative impacts of climate policy is diminished competitiveness for job creation, it should be noted that climate policy may be beneficial in that it may improve efficiency, spur innovation and create jobs in new market niches such as clean technologies. | That is true, but it is beyond the scope of our chapter. |
| 7290 | 2 | 41 | 32 | | | imply -> implies | Thanks! Done. |
| 2967 | 2 | 41 | | | | more discussion of adaptation would be helpful, particularly the possible use of RDM to deal with uncertainties. | This would be beyond the scope of our chapter. |
| 14836 | 2 | 41 | | | | It is worth citing Naomi Oreskes here, on the implications of doubt (and the actors introducing doubt) | I don't understand. Wouldn't theoretical stuff on doubt fit better into 2.2? |
| 6081 | 2 | 41 | 43 | | | I have a difficulty to understand how this subsection has to do with this chapter that discuss "Integrated Risk and Uncertainty Assessment of Climate Change Response Policies". | It is important to the extent that popular support for policies -- which in democratic societiies is important for the policies' continued success -- is often |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7291 | 2 | 42 | 45 | | 48 | This is not necessarily true in Germany. People seem to be opposed to wind power plants in their neighborhood even though they are generally in favor of wind power. Just not where they live. Further on, there is a huge resistance in Germany to additional long distance power transmission lines, which are needed to transfer wind power from northern Germany (windy) to southern Germany. People believe that proximity to power lines has a negative impact on their health. I don't know of any studies, just newspaper reports. | I share your knowledge of the newspaper accounts. It would be very helpful to have a peer reviewed cite; I have tried to cover the citations that do exist. |
| 4901 | 2 | 43 | 1 | | 23 | Concerning CCS, safety and liability related issues are extensively discussed within the CCS-regulation (CCS-directive) of the EU. | Certainly the safety issues are dealt with by the directive. But that doesn't put the issue to rest, first because mainy countries (e.g. Germany) have failed to fully implement the directive, and |
| 12616 | 2 | 43 | 11 | 43 | 15 | There are many more projects that have had neutral to positive public support than have negative. This section implies that it is 50-50. | Can you provide a reference on this? I would love to be able to write this. We |
| 12659 | 2 | 43 | 11 | 43 | 15 | There are many more projects that have had neutral to positive public support than have negative. This section implies that it is 50-50. | Can you provide a reference on this? I would love to be able to write this. We |

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| 9273 | 2 | 43 | 13 | 43 | 15 | The statement that "No research has been undertaken to date that identifies the drivers of public concern or acceptance" is not correct - please refer to the following publications:<br><br>• Itaoka, K., Saito, A., Paukovic, M., de Best-Waldhober, M., Dowd, A-M., Jeanneret, T., Ashworth, P. & James, M. 2012. Understanding how individuals perceive carbon dioxide: Implications for acceptance of carbon dioxide capture and storage. CSIRO Report EP 118160, Australia., http://www.globalccsinstitute.com/publications/understanding-how-individuals-perceive-carbon-dioxide-implications-acceptance-carbon<br>o Newly published report from CSIRO which looks at individual perceptions of CO2 in Japan, the Netherlands and Australia and relating understanding of CO2 to people's perceptions of CCS, in order to determine how information provision about the underlying properties and characteristics of CO2 influences individual attitudes towards low-carbon energy options, particularly CCS.<br><br>• Ashworth, P. Bradbury, J. Feenstra, CFJ. Greenberg, S. Hund, G. Mikunda, T. and Wade, S., 2010, Communication, project planning and management for CCS projects: an international comparison, CSIRO, Australia, www.globalccsinstitute.com/publications/communication-project-planning-and-management-carbon-capture-and-storage-projects-inter<br>o Very large piece of research that we published in 2010 that took 5 detailed research reports into 5 early CCS demonstrations from around the globe looking specifically at their engagement activities, successes and challenges, communication and project management, then did a comparison of the international projects to come up with a set of key recommendations to improve projects handling of public concern and engagement opportunities.<br><br>• de Best-Waldhober, M., Daamen, D. and Faaij, A. 2008, Informed and uninformed public opinions on CO2 capture and storage technologies in the Netherlands, International Journal of Greenhouse, Gas Control, 3(3): pp. 322-332.<br>o This work is often cited to help explain some of the drivers behind public behaviour.<br><br>• Wade, S. and Greenberg, S. 2011, Social Site Characterisation: From Concept to Application, A review of relevant social science literature and a toolkit for social site characterization, CSIRO, Australia, www.globalccsinstitute.com/publications/social-site-characterisation-concept-application<br>o This has a really good social science literature review with some interesting work on perceptions of CCS and then provides tools to help projects work out the likely drivers behind their own communities drivers of concern or acceptance. | Thank you. The staement you noted was incorrect, and even contradicted many of the citation in the following sentences: it was left over from the ZOD. I have removed it. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9274 | 2 | 43 | 13 | 43 | 15 | The statement that "No research has been undertaken to date that identifies … anticipated risk levels associated with CO2 storage" is not representative of the available evidence. For example, there are a number of technical Front End Engineering Design (FEED) studies from demonstration projects that analyse the risks associated with CO2 storage. For example, please refer to:<br>• Bradbury, J. Greenburg, S. and Wade, S. 2011 Communicating the Risks of CCS, Wade LLC, US, www.globalccsinstitute.com/publications/communicating-risks-ccs<br><br>Further, additional reading on related topics can be found at:<br>• Transalta, 2011, Canadian and Albertan perceptions of carbon capture and storage, Global CCS Institute, Australia, viewed on 09 July 2012: http://cdn.globalccsinstitute.com/sites/default/files/publications/27611/public-perceptions-report-2010-polling-results.pdf<br>o Further discussion of the Transalta results can be found at: http://www.globalccsinstitute.com/community/blogs/authors/staceyhatcher/2012/01/12/insights-public-perceptions-ccs-%E2%80%94-alberta-story<br><br>• Ashworth, P., Jeanneret, T., Stenner, K. & Hobman, E.V., 2012, International comparison of the large group process. Results from Canada, Netherlands, Scotland and Australia. CSIRO: Pullenvale, http://www.globalccsinstitute.com/publications/international-comparison-large-group-process-results-canada-netherlands-scotland-and<br>o This is a comparison of four more detailed reports which provide a lot of detail on stakeholder drivers<br><br>• Eurobarometer, 2011, Eurobarometer Survey on Public Awareness and Acceptance of CCS, Special Eurobarometer 364, DG-Research, http://ec.europa.eu/public_opinion/archives/ebs/ebs_364_en.pdf<br>o CCS was included in one of the EC's big societal survey's – this gives some pretty interesting data on public knowledge of CCS that you can extrapolate information on concerns/ acceptance from | Thank you. The text has been revised accordingly. |
| 12617 | 2 | 43 | 2 | 43 | 2 | This is an extremely old reference. More up to date references for CCS should be used. Since 1997 4 large scale (around 1 million tonnes stored per year) have commenced operation. | Thanks. But I don't see how the existience of storage facilities necessarily changes the validity of the findings of the |
| 12660 | 2 | 43 | 2 | 43 | 2 | This is an extremely old reference. More up to date references for CCS should be used. Since 1997 4 large scale (around 1 million tonnes stored per year) have commenced operation. | Thanks. But I don't see how the existience of storage facilities necessarily changes the validity of the findings of the |
| 11523 | 2 | 43 | 20 | 43 | 21 | The use of the phrase "NIMBY" or Not In My BackYard, is politically charged and inappropriate for a scientific publication because it portrays localism as self-serving and parochial, rather than a caring for one's own habitat. A "sense of place" or "homeland" is very strong in many indegenous/local communites and they have prevented environmental degration. | You are right. I have deleted the term NIMBY. |
| 3315 | 2 | 43 | 27 | 43 | 27 | "Future development pathways" is vague. A more concrete paraphrase to accompany the technicality should be found, if possible. | I can't find the words you are describing. |
| 7292 | 2 | 43 | 28 | | 30 | Sentence unclear | Thanks. Added "those people" after |
| 8414 | 2 | 43 | 41 | 43 | 42 | "This model … the truth". This seems to be simplistic: there is not only one reason behind the public refusal to accept a firm scientific consensus. But it is hard to believe that the industry-sponsored mass disinformation campaigns have no effect at all.<br>The text seems to make a caricature of the problem in order to dismiss the importance of the industrial pressure on politics. | Thank you. |
| 11724 | 2 | 43 | 43 | 43 | 45 | I feel that IPCC itself seems to complain about public opposition by using this citing. It's good to be deleted. | Thank you. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10638 | 2 | 43 | 43 | 43 | 45 | Public opposition to the IPCC consensus on anthropogenic climate change has been attributed to the fact that IPCC sometimes calused serious misunderstandings among decision makers, climate negotiators and mass media, which may hjave misled climate negotiations, espcially with respect to the target of the response strategies. This is what Yamaguchi et al argues in the chapter 11, Epilogue, IPCC and Communication of Climate Change Mitigation A Balanced Approach to Climate Change | Thank you. |
| 9974 | 2 | 43 | 43 | 43 | 45 | This part should be deleted completely because the expression of "industry-sponsored scientists" is too subjective and there is no evidence for the fact. | Thank you. |
| 6082 | 2 | 43 | 43 | 43 | 43 | The citation of Oreskes and Conway 2010 is inappropriate. Firstly the expression "IPCC consensus" is inappropriate and misleading. IPCC's official expression is "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations. It is likely that there has been significant anthropogenic warming over the past 50 years averaged over each continent (except Antarctica)" (refer to Page 5 of SPM of AR4). Secondly there are literatures that disagree to this citation. If Chapter 2 team wish to hold this citation, the team have to cite literature from other camp for the sake of IPCC's neutrality. | Thank you. |
| 14837 | 2 | 43 | 46 | | | It is not clear why the Oreskes and Conway analysis is equated with a simplistic linear model and then dismissed. It is relevant fron the standpoint of the public opinion and commitment of policy makers, even if it is not the sole determinant. | Thank you. |
| 4917 | 2 | 43 | 6 | | 7 | "If storage under the land were prohibited, then the industry would have to 6 turn to the more expensive option of storing under the sea floor." This statement is abs. irrelevant here. | You are right. I am deleting the sentence. |
| 8412 | 2 | 43 | | 45 | | This section fail to consider an important issue, the influence of disinformation campaign organized by industrial lobbies on how uncertainty is considered by policymakers, and how a “manufactured uncertainty” is used as a toll to block or to delay climate mitigation policies.<br>Although it is true that the science-policy interface is indeed complex, many works have highlighted the importance, for the science–policy interface, of the influence of vested interest, and their practice of manufacturing controversy to avoid pro-climate regulations.<br>It is useful that the AR5 and in particular this Chapter describe and underline these tactics, because still today they are important to understand how uncertainty is considered by policymakers, how they shape the debate and how they are effective in slowing new climate legislation..<br>As an example, some of the deniers’ tactics used are:<br>• manufacturing uncertainty by raising doubts about even the most indisputable scientific evidence.<br>• promoting scientific spokespeople who misrepresent peer-reviewed scientific findings or cherry-pick facts in their attempts to persuade the media and the public that there is still serious debate among scientists that burning fossil fuels contribute to global warming and that human-caused warming will have serious consequences.<br>• attempting to shift the focus away from meaningful action on global warming with misleading charges about the need for “sound science.”<br><br>Like Big Tobacco before them, many Big Oil lobbies have been enormously successful at influencing governments and Parliaments, thus blocking regulation on climate. Documents highlighted in many reports provide evidence of oil industry corporations’ cozy relationship with government officials, which enable them to work behind the scenes to gain access to key decision makers. In some cases, industrial proxies have directly shaped the global warming message put forth by federal agencies. | These are very good points, which revisions to the section are broadly addressing. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8413 | 2 | 43 | | 45 | | I suggest to rewrite the entire paragraph framing it in a more complete, and to update and broaden the references. I suggest to add the following references.<br>Gelbspan R. (2004) Boiling Point, Basic Books<br>Hansen J. (2010) Storm of my grandchildren. Bloomsbury; see Chapter 1, 2 and 3<br>Hoggan J., Littlemore R. (2009) Climate Cover-up, Greystones<br>Mann M. (2012) The Hockey Stick and the Climate Wars, Columbia University Press; see Chapter 7 and the following<br>Michaels D. (2005) Scientific evidence and public policy. Am J Public Health, 95, Suppl 1, S5–7.<br>Mooney C. (2005) The Republican war on science. Basic Books<br>Union of Concerned Scientists (2007) Smoke, Mirrors & Hot Air.<br>Union of Concerned Scientists (2012) A Climate of Corporate Control.<br><br>Other important aspect are discussed in this Nature editorials:<br>Science scorned. Nature editorial, Vol 467, 9 September 2010<br>Climate of suspicion. Nature editorial. Vol 463, 21 January 2010<br>Climate of fear. Nature editorial. 464, 11 March 2010. | These are very good points, which revisions to the section are broadly addressing. |
| 3316 | 2 | 44 | 4 | 44 | 13 | The title -"Preferences and perceptions" here is also vague, and perceptions are not even mentioned in the explanation. | Thank you. |
| 3202 | 2 | 45 | 1 | | 6 | "civic epistomologies" and "linear model" too much jargon | Thank you. |
| 8415 | 2 | 45 | 3 | 45 | 4 | The conclusion of this paragraph is based on the works of only one author (Jasannoff, 2010) and for this reason the conclusion seems again too simplistic; although it could be true that the “linear model” is not adequate, the importance of industry lobbies in confusing policymakers and blocking climate legislation could not be dismissed so easily. | Thank you. |
| 7293 | 2 | 45 | 4 | | | What is linear model? | Thank you. |
| 6886 | 2 | 46 | 1 | | | We'd like to add a word of caution regarding the possible "reinterpretation" agreed Guidance Note on Uncertainty. | We rather refered to some sort of 'spelling-out' for WGIII and will change |
| 13870 | 2 | 46 | 11 | | | Jonassen and Pielke (2011) provide a comprehensive survey of disparities in the application of uncertainty metrics in AR4. Jonassen, R.G. and Pielke, Jr., R., 2011, Improving Conveyance of Uncertainties in the Findings of the IPCC, Climatic Change, Special Issue: Guidance for Characterizing and Communicating Uncertainty and Confidence in the Intergovernmental Panel on Climate Change. Volume 108, Number 4 / October 2011 745-753. DOI: 10.1007/s10584-011-0185-7 | Thanks for the reference. The uncertainty box is extended a bit to include this information. |
| 6887 | 2 | 46 | 17 | 46 | 19 | We'd like to add a word of caution regarding the possible "reinterpretation" agreed Guidance Note on Uncertainty. | We rather refered to some sort of 'spelling-out' for WGIII and will change |
| 6379 | 2 | 46 | 25 | | | What is M11? Mastrandrea et al. 2011? | yes, indeed; somehow, the definition of the acroynum had been eliminated. It |
| 4617 | 2 | 47 | 35 | 47 | 35 | This is the first time in the chapter that the word irreversibility is mentionned and this in a context which differs from the one for the main argument | We shall refer to it earlier. |
| 7294 | 2 | 47 | 4 | | | Case -> In case | Will be implemented! |
| 7295 | 2 | 48 | 43 | | | Fig. 3 -> Fig. 2.3 | Thank you. Correction has been made. |
| 7296 | 2 | 48 | 45 | | | Fig. 3 -> Fig. 2.3 | Thank you. Correction has been made. |
| 7297 | 2 | 49 | 14 | | | Fig. 4 -> Fig. 2.4 | Thank you. Correction has been made. |
| 7298 | 2 | 49 | 21 | | 22 | Fig. 3 -> Fig. 2.4 | Thank you. Correction has been made. |
| 3066 | 2 | 5 | | | | “Myopia” is advocacy, not science, and discredits the report. A serious case has been made (by Lomborg, and others) that the possible benefits of emission reductions are not justified by their costs. | We disagree. The concept of myopic behavior has been shown to characterize decision making under uncertainty as |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13781 | 2 | 5 | 10 | | 11 | This example mixes reference to 'risk' and to 'probabiliby.' This leaves out the 'consequence' part of risk without explanation. | This § will be re-written and the reviewer's comment be taken into |
| 13782 | 2 | 5 | 11 | | 15 | A better example is short-term coastal investment that ignores long-term loss of that investment due to sea level rise | This is another nice example that illustrates a focus on short-term horizons |
| 8231 | 2 | 5 | 11 | 5 | 15 | In the example provided on the coastal village taking the wrong decision, two key components may lead to taking a bad decision: 1) uncertainty and risk about future benefits of protecting against sea level rise, and 2) preference for present vs future welfare and risk aversion, which are determined by the discount rate chosen to discount long term benefits. In this case, it seems like it is discounting (preference for present over future) which impacted their decision rather than uncertainty and risk. If the example is about risk and uncertainty, it should be made clear that the coastal village took a bad decision because of uncertainty and risk over future benefits rather than due to how those were discounted. As such, the sentence "A coastal village may decide not to undertake measures for reducing future flood risks due to sea level rise because they focus on the next few years" could be replaced by "A coastal village may decide not to undertake measures for reducing future flood risks due to sea level rise because most benefits, which occur in the long term, are more uncertain than the required short-term investment costs". | The example in the SOD is revised to reflect these points |
| 3899 | 2 | 5 | 11 | 5 | 12 | Is the coastal village a real example or a hypothetical one, and what is the basis for assuming that the villagers are using the wrong discount rate and the unamed persons assessing what the 'long-term discounted benefits' really are using the right discount rate? | The example is hypothetical and has been revised so that discount rates are not discussed |
| 3900 | 2 | 5 | 15 | 5 | 17 | As posited, this would be rational behaviour by firms, being neither myopic normisperceiving risks. | Good point. The example has been moved to the discussion of Decision Tools for Making Better Choices in the |
| 6060 | 2 | 5 | 15 | 5 | 17 | This is not necessarily a proper example. This may not apply to developed countries. | Examples are not direct related to the developed world. Most people live in developing countries. Nevertheless, |
| 3901 | 2 | 5 | 17 | 5 | 19 | Again this would be rational behaviour by governments. The imperative of an incumbent government is to get re-elected. This imperative is illustrated by the common (smug) saying that perceptions are more important than reality in politics. | Government behavior with respect to postponing mitigation measures may be rational for the reason stated due to the wait and see attitude of the public |
| 8230 | 2 | 5 | 2 | 5 | 4 | The sentence should also note that uncertainty and risk impact policy development also on the adaptation side. | We will augment the text accordingly. |
| 4696 | 2 | 5 | 25 | 5 | 41 | This section on decision tools basically relies on rational models, failing to pick up on the psychological/not-economically-rational aspects of decision-making that the previous section alludes to. | Intro is rewritten |
| 18444 | 2 | 5 | 25 | | 35 | Same text repeated on page 8, from line 34 to line 44 | The Executive Summary in the SOD will provide the main insights of the chapter |
| 7839 | 2 | 5 | 27 | | | It is suggested to use throughout the paragraph the same term for the same content. Models and tools are not synonyms; therefore it is suggested to substitute "models" by "tools". | Agreed. We will implement the suggested changes. |
| 14822 | 2 | 5 | 33 | | | "… while governments debating the merits of a carbon tax may turn to cost-benefit analysis." This implies that CBA can be used to help determine the optimal tax, by optimizing mitigation costs against the benefits of reduced impacts. This is a poor example of trying to match a decision type with its appropriate decision tool. The uncertainties associated with the magnitude of climate impacts, the inherently value-laden judgements, the intergenerational dimension, the fact that this is a commons problem that requries mitigation action with costs exceeding the immediate benefits... all suggest that CBA is an inadequate tool for setting a tax rate. Perhaps CEA, though. | Text has been modified. |
| 12518 | 2 | 5 | 40 | | | Add after “management” -- “game theory, group process,” | Intro is rewritten |
| 3902 | 2 | 5 | 42 | 5 | 42 | The text should make it clear that its normative proposition applies to policy advisers. Political decision-makers will of course adopt policies that are likely to help them get re-elected. | The text in the Introduction now reads “Policies should be designed…” to |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14523 | 2 | 5 | 47 | | | As part of broader treatment of risk management, this chapter might focus more on decision structuring, framing, and the setting of goals and objectives. Towards that end, the authors might use a more general statement of objectives here, rather than a specific set of policy proposals focused on greenhouse gas emissions and concentration targets. | The role of goals and objectives is noted in the Introduction under Problem Formulation and is discussed in more detail in Sect. 2.2 where concepts of |
| 4742 | 2 | 5 | 5 | 5 | 19 | Does this paragraph state that politics have too short term vision (as a long term is expected/requested?). The role of decision makers is to reconcialiate short term and long term vision, and have an adequate communication on it. For instance industrial need such a long term vision in order to invest in the most appropriate technology in the industrial process. However most of the time there is a gap between financial viability and economical viability (due to this lack of long-term vision or/and un-match of short-term and long term visions) | Interesting points on short term and long-term vision that will be taken into account in the SOD |
| 18443 | 2 | 5 | 5 | | 19 | Same text repeated on page 8, from line 12 to line 26 | The Executive Summary in the SOD will provide the main insights of the chapter |
| 3895 | 2 | 5 | 5 | 5 | 10 | This review of the literature does not establish that it is irrational (ie sub-optimal) for people to use rules of thumb or 'simplistic heuristics in choosing between alternatives. Time is scarce and analytical resources need to be directed at where the costs of being wrong at likely to be the most serious. If there is a literature that purports to establish that people systematically and commonly en masse repeatedly make the same bad decisions, failing to learn from experience or to consult experts, or to use warranties and insurance policies to manager isks, that should be cited here since it is novel and controversial, as far as individuals are concerned. (Such behaviour - the failure to learn from one's own mistakes - is one definition of insanity.) Another difficulty with this theory is that it negates the basis for any public policy based on the assumption that people will respond to it rationally. On the other hand, politicians in democratic socieities have perhaps the strongest incentives to be myopic -as illustrated by the UK Economist magazines famous phrase - a week is a long time in politics and Harold Wilson on a turning circle would rival a London taxi'. It would be odd if the paper discusses short-termism in private behaviour but not in pubic political behaviour. | We could not agree more with all of your comments, and now have much more explicit treatment of the behavioral reality vs. rational-economic fiction of decisions and actions at ALL levels of analysis, from consumers to policy makers. See our new Table 2.1. We also now preview that such arguments will be made in the section you are responding to. |
| 3896 | 2 | 5 | 7 | | | The representations of individual behaviour in economics (eg welfare economics and public choice theory) are positive, not normative. The Arrow-Debreu model is not a theory of how people should behave. | there are differences in the way these terms are being used by different communities. Normative is defined by wikipedia as follows: Normative - Wikipedia, the free encyclopedia en.wikipedia.org/wiki/NormativeNormative has specialized contextual meanings in several academic disciplines. Generically, it means relating to an ideal |
| 3898 | 2 | 5 | 9 | 5 | 10 | Farmers who take the wrong decisions (as evaluated by themselves) because they are ill-informed about the risks are not behaving inconsistently with any positive model of optimising behaviour in economics. | Point noted. |
| 18441 | 2 | 5 | 9 | | | TO READ-Decision Makers tend to make myopic action plans that utilize simplified methodologies. | This sentence in the SOD will be modified to reflect this suggested change |
| 17700 | 2 | 5 | 5 | 5 | 18 | Economic agents tend to use the known Keynes saying…. "In the long run we are all dead" | Point noted. |
| 7299 | 2 | 50 | 3 | | | add exact citation for source of Figure | The section has been edited. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5227 | 2 | 52 | 19 | | | It could be stated that the aim of the metrics is to help the climate policy by providing a clear indicator which measures the greenhouse gas emissions in commesurate units (e.g. CO2 equivalents) for the goal-setting and follow-up of the climate policy. Thus the metrics should be formulated so that it serves the climate policy. The ultimate objective on the UNFCCC (Article 2) is twofold: stabilization of ghg concentrations and limiting the speed of change (sufficient time-frame to adapt). Thus this two goals cause challenges for metrics especially concerning relevant policy time horizon. This discussion could be given here. | The intention of the metrics is stated in the intro of the IPCC Uncertainty Guidance Notes Mastrandrea et al., 2011: 'These guidance notes are intended to assist Lead Authors of the Fifth Assessment Report (AR5) in the consistent treatment of uncertainties across all three Working Groups. These notes define a common approach and calibrated language that can be used broadly for developing expert judgments and for evaluating and communicating the degree of certainty in findings of the |
| 5228 | 2 | 53 | 37 | | | Please add after "approach" the words "and in the case of GTP100 the cost increase is clearly greater" (Ekholm et al.) EKHOLM, T., LINDROOS, T.J., SAVOLAINEN, I. Robustness of climate metrics under climate policy ambiguity. Submitted for publication in Climatic Change. | We will read this paper and decide whether to include it in the next draft. |
| 15470 | 2 | 58 | 22 | | | This section was more technical than the previous sections that described the other tools. This made it harder to understand. Suggest either simplifying or adding more explanations. | This section has now been simplified. |
| 15471 | 2 | 59 | 28 | | | Reading between the lines, it sounds like there is a limited number of studies that use this tool. Also the uncertainities on what it can and can't do are greater. This should be mention in the text. | Thank you. The text has been revised accordingly. |
| 8116 | 2 | 6 | 10 | 6 | 15 | The phrase suggests a (single) causality of risk and uncertainty on the one hand and choices on the other. It neglected the complexity of choices and the fact that risk and uncertainty play often minor roles in decision making. | We will augment the text to some extent along those lines. |
| 13785 | 2 | 6 | 10 | | | change 'impacts' to 'affects' | Wording change made in the SOD |
| 13786 | 2 | 6 | 10 | | | remove word 'on' | Wording change made in the SOD |
| 11482 | 2 | 6 | 10 | 6 | 11 | Again, this sentence does not make sense, risk and uncertainty at the end is redundant | Intro is rewritten |
| 13784 | 2 | 6 | 11 | | | remove 'under conditions of uncertainty' which is repeated from the beginning of the sentence. | Intro is rewritten |
| 13787 | 2 | 6 | 12 | | | change 'impact' to 'affect' | Wording change made in the SOD |
| 13788 | 2 | 6 | 12 | | | remove word 'on' | Wording change made in the SOD |
| 10160 | 2 | 6 | 12 | 6 | 15 | The second sentence is more or less a repetition of the first sentence. | The Introduction in the SOD deals with |
| 11483 | 2 | 6 | 16 | 6 | 30 | These are all good examples, but perhaps consider including an examples that describe the concerns of indigenous/local communites? The arcitc and alpine regions of the world are places where these impacts are being strongly felt. | Accepted. Appropriate examples will be added as suggested. |
| 14524 | 2 | 6 | 18 | | 19 | This chapter uses many examples for climate-related decisions from the IAV community. That is good, but I suppose there should be at least some acknowledgement that these decisions are also addressed in WGII. More interesting would be a discussion of how IAV and decisions focused on limiting the magnitude of climate change are similar and different. | The text will be modified as suggested. |
| 4743 | 2 | 6 | 2 | 6 | 2 | Not only economical, but also financial is important … as the financial issue is the first indicator for an investor | Financial considerations are subsets of economic considerations. In terms of public policy, the focus of the social planner is on the economics of the policy. We have included the financial as |
| 4903 | 2 | 6 | 25 | | | {Add} greenhouse gas {}emission reduction goals | Thank you. The word 'emissions' has |
| 4904 | 2 | 6 | 28 | | | {Add} next {}session of the Conference of the Parties | Thank you. We have made the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4905 | 2 | 6 | 30 | | | National delegates to the COP are negotiation about ?? | Thank you. The word 'negatiation' has been changed to 'negaotiating' |
| 11484 | 2 | 6 | 30 | | | Should be negatiating rather than negotiation | Thank you. The correction has been |
| 7219 | 2 | 6 | 30 | | | negotiation -> negotiating | Thank you. The correction has been |
| 13789 | 2 | 6 | 32 | | | This is not a bullet item. It should be given as a new paragraph | Thank you. The bullet has been deleted. |
| 11485 | 2 | 6 | 32 | 38 | | This paragraph should not be a bullet point | Thank you. The bullet has been deleted. |
| 6365 | 2 | 6 | 32 | 6 | 38 | Final bullet should be unbulleted paragraph as it describes the bulleted points above. | Thank you. The bullet has been deleted. |
| 14525 | 2 | 6 | 33 | | | Are you concerned with “uncertainties associated with climate change” or “uncertainties that affect climate-related decisions”? This chapter text seems to sometimes focus on the former and sometimes on the latter. I think you want to focus on the latter. | We agree with you that we want to focus on the latter. The former, of course, is a subset of the latter, which can make it easy to get confused. We are attempting |
| 4609 | 2 | 6 | 6 | | | The Introduction clould be shorter | We have revised the Introduction but given our objectives of highlighting the purpose of this chapter we have not condensed it but tried to make it more |
| 4698 | 2 | 6 | 6 | | | A propos of above, there should be a line between the "Risk perception…" and "Decision tools…" boxes. That is the connection that isn't being made here. | We have kept these two boxed separate to highlight the relevance of both normative and descriptive analysis for |
| 6882 | 2 | 6 | 22 | 6 | 23 | While this is an example, this is formulated as a projection incl. an attribution to a cause -- Reference to WGI (Chapter 13), WGII and/or SREX needed to provide the necessary evidence supporting this general statement. | Absolutely right. We are removing this and the other examples from the FOD, and instead basing them on actual |
| 5388 | 2 | 6 | 32 | 6 | 38 | This part should be not included in the bullets (no bullet for this part) | Not relevant given the revised |
| 4699 | 2 | 6 | 39 | | | Exec summary should not be cut and paste of this section -- they should differ. | The Executive Summary in the SOD will provide the main insights of the chapter |
| 13783 | 2 | 6 | 8 | | | should read 'uncertainty about', not 'uncertainty in'. The system is not uncertain, our knowledge is. | Intro is rewritten |
| 4041 | 2 | 7 | | | | The model depicted in Figure 2.1 aims to illustrate the interconnections (broadly speaking) between some of the main elements of decision-making under uncertainty. However, the model appears as uni-directional and too simplistic/reductionist, with no reference(s) or mention of how this model relates to what is now published in the wider literature on decision-making and policy formulation of 'wicked' societal problems such as climate change (highly complex, and hardly ever linear as depicted). Perhaps this section should just discuss these elements in the narrative, rather than illustrating them along a linear progressive axis/proceess (which is misleading). | Both the figure and the chapter have changed a lot in response to this and many other helpful reviewer comments, and now hopefully reflect the complexity of climate mitigations and the literature on complex decisions much better |
| 2155 | 2 | 7 | | | | The approach in this chapter starts with a step (or box in Figure 2.1) of “the decision to be made.” I presume that the authors have other steps preceding this step in mind including defining the context or the objective. For the farmer, used as an example in this chapter, an objective might be to maximize yield or return on investment or some other objective. The objective drives the decision to be made and the alternatives requiring consideration. Ayyub (2003) offers several methods to help users, such as the contributing factor diagram method that starts with defining an answer variable. The ISO definition of risk as the “effect of uncertainty on objectives” requires this definition of objectives as a starting point.<br>Reference: Ayyub, B. M., Risk Analysis in Engineering and Economics, Chapman and Hall/CRC, 2003. | Figure 2.1 starts with Problem Formulation where goals and objectives are discussed |
| 8390 | 2 | 7 | | | | This figure needs to be more clearly explained and defined. What do arrows mean? What is the role of the boxes? | The Problem Formulation box in Fig 2.1 notes the importance of formulating goals and objectives as an input into the descriptive and normative analyses and |
| 4906 | 2 | 7 | | | | Fig 2.1: I guess that "(normative analysis)" to be added to the 4th box | Done |

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| 16918 | 2 | 7 | | 7 | | I can see the structuring value of Figure 2.1 but it does seem a little odd to have the prime structuring Figure without an obvious specific "place" for the actual decision-maker; also am not clear on relationship of the first two boxes (try running a "shall I insulate my house?" decision through this …). It might be useful to compare against Triandis' theory of decision making, as also elaborated and applied to climate change in DECC (2011). DECC (UK Department of Energy and Climate Change) (2011) An introduction to thinking about 'energy behavior': a multi Model Approach. http://www.decc.gov.uk/assets/decc/11/about-us/economics-social-research/3887-intro-thinking-energy-behaviours.pdf Last Accessed September 4, 2012 | Fig 2.1 has been modified so that the Problem Formulation box considers the institutional arrangements and the relevant decision makers noting their goals and objectives. |
| 8480 | 2 | 7 | | | | What is "better" in this context? Highly ambiguous and political - can imply efficiency, efficacy, political utility or vote maximization - needs more precision. | Intro is rewritten |
| 13790 | 2 | 7 | | | | Box on 'Decision Tools' could also list 'Normative Analysis' in parentheses in same form as box on 'Risk Perception' | Wording change made in the SOD |
| 7222 | 2 | 7 | | | | more specific examples, e.g. communities in Japan that built high enough wall against tsunamis vs. those that did not. | This example would fit better in WGII but we will consider it. |
| 8117 | 2 | 7 | 1 | 7 | 1 | Not only tools but also procedures should be integrated in this framework. | Intro is rewritten |
| 8710 | 2 | 7 | 10 | 7 | 30 | The preparation of technical manuals containing simple and cheap technologies to be applied as adaptation measures to climate change can help communities to make decisions about the implementation of more efficient strategies. For this, it is necessary that the manual is written in accessible language to people at all levels of schooling. As an example, we can mention the book prepared by the Bank of Brazil Foundation (Fundação Banco do Brasil http://www.fbb.org.br/), with the title Water and Climate Change - Social Technologies and Community Action (the book follows as additional material attached) which contains numerous technologies supported by the founding members and aims to bring these technologies to a greater number of communities in order to make the means of production and consumption of these communities more sustainable and adapted to possible problems caused by climate change. | While this subject is not direclty relevant to the chapter, we are conscious of the need to use language that is accessible to the reader. |
| 7221 | 2 | 7 | 14 | | 17 | very similar to lines 20ff | The revised Introduction addresses this |
| 11487 | 2 | 7 | 19 | 7 | 19 | Change 'Figure 1' to "Figure 2.1' | The Executive Summary in the SOD will provide the main insights of the chapter |
| 4627 | 2 | 7 | 2 | 7 | 3 | I find figure 1 less than compelling. Any decision made under uncertainty (or risk, the terms are essentially interchangeable) has two components: the technical nature of the risk, and the individual's behavioral response to risk. The technical nature of risk might be determined objectively, as in games of chance, or subjectively as in most other situations. Even when there is a large amount of (objectively agreed on) relevant data, most assessments of technical risk involve subjectivity. This is particularly true when events are in the distant future, when forecasts by their nature are less accurate. Most work on estimating forecast error (which determines technical risk) is based on models that are stochastic and linear-in-parameters. Climate models are nonlinear deterministic models for which estimating the forecast error is usually done by perturbing initial conditions and this is not the only source of forecast error. Behavioral response to risk is innate to the individual and is almost certainly influenced by the nature of the event. For example, a person may be more risk averse in emotional settings than in making business decisions. While it is possible to determine a person's risk preference function, it is not necessary to do so if the individual is simply asked to choose between a pair of risky scenarios. When an individual's risk preference function is established it is possible to determine biases in decision making compared with what a rational decision-maker would do, though for future events the rational decision depends critically on the personal discount rate. The only way there is a feedback loop in this setting is if the decisions made by an individual or an aggregate of individuals do not result in the outcomes desired by policymakers. In other words, when estimates of optimal action based on estimates of technical risk and individuals' response to risk do not actually occur, then a policymaker is likely to change the "rules of the game" e.g., by changing the tax or subsidy structure, or changing the regulatory mix, to push decision-makers in the desired direction. | The rationale for Fig 2.1 is to highlight how behavioral considerations need to be coupled with normative analysis to develop risk management strategies for the problem formulation phase The revised Introduction makes this point clearer. Now that the initial box is labeled Problem Formulation the feedback can come from various inputs to the risk management process. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11479 | 2 | 7 | 2 | 7 | 3 | Relationships between the elements of in this diagram are not clear. Arrows do not seem to indicate causality, nor do they seem to represent a processes of analysis or decision-making. The figure presents a model which is quite linear, although in reality, different factors will be influencing each other. For instance, Figure 2.1. seems to have a break in its logical flow when it reaches the last element. Facing a decision is to be made, the decision maker evaluates key uncertainties and risks that include, on the one hand, risk perception and behavioral responses, and on the other, decision tools under risk and uncertainty. The logical continuation would be the outcome of this decision making process and that is the decision itself or at least some measure or policy. However, the last element restates risk and uncertainty, and therefore, the diagram resembles a tautology. Furthermore, the chapter does not reveal any additional insights as to relationships between these elements. | Figure 2.1 has been relabeled and revised in the revised Introduction so that the first box is Problem Formulation and it should be clearer to the reader that both Descriptive and Normative analyses feed into the Risk Management process with feedback to the Problem Formulation phase. |
| 11480 | 2 | 7 | 2 | 7 | 3 | It is unclear why "Risk perception and behavioral responses…" are combined. It would be useful to discuss these topics separately (later in the chapter) and illustrate them as distinct elements here. | This section heading was specified by the IPCC scoping conference. The chapter does discuss them as distinct |
| 14527 | 2 | 7 | 2 | | 4 | Do you want to use the word “climate policy” or “climate-related decision"? The former is much more narrow category than the latter. For instance, the recent increase in U.S. auto fuel-efficiency standards is certainly a climate-related decision, though less often explicitly identified as a “climate policy.” | We focus on climate policy, but the definition of climate policy that we have used so far is the one from the AR4, and is quite expansive. While there is no glossary entry for "climate policy," the Executive Summary of the AR4 WGIII CH3 states: "The literature on climate change continues to reflect the wide variety of national policies and measures that are available to governments to limit or reduce greenhouse gas (GHG) emissions. These include regulations and standards, taxes and charges |
| 14526 | 2 | 7 | 2 & 7 | | 4 & 19 | One of the most important initial steps in a risk management process is identifying and, when possible, agreeing on goals. This figure and text ought to be revised to include this crucial step. A clear statement of goals is important for individual decision-making. It is even more important for climate-related decisions, many of which will be group or organizational decisions. | The Problem Formulation box in Fig 2.1 notes the importance of formulating goals and objectives as an input into the descriptive and normative analyses and |
| 7220 | 2 | 7 | 3 | | | label the arrows or leave the figure out | We are leaving it out. |
| 7223 | 2 | 7 | 42 | | | What is the difference between cost-effectiveness vs. cost-benefit analysis? | We have two separate sections explaining each of the two concepts. 2.3.2 and 2.3.3. These concepts are |
| 8118 | 2 | 7 | 7 | 7 | 19 | Quite a few examples in this chapter are too simplistic and misleading. This is only one example: 1. For farmers it is daily business to make decisions about which plants should be planted next season. 2. The grow conditions of plants on a seasonal basis are most dependent on the weather and almost not dependent on climate change. 3. Other variables like soil quality, marked price and cultivation technique are much more relevant as climate change. So, for an individual farmer, the seasonal planting decision does not have to be influenced by climate change. Only irreversible or long-term decisions like investments or policies are sensitive to climate change. This is only an exemplary comment that all examples have to be proved on their realistic relevance for the scope of this chapter. | Thanks, some examples have been changed or improved, see SOD. Weather changes with CC and climate variability. CC may change soil quality and cultivation techniques |
| 16919 | 2 | 7 | 7 | | 19 | Linked to the above: The key problem here is not so much the range of decisions, but the range of decisionmakers. My sense is that it may be important to separate out (1) private decisionmakers, (2) government decisionmakers on internal policy decisions, and (3) decisionmakers and influencers in international negotiations (which collectively one might hope tries to converge towards some kind of global strategy). The objectives, and processes, are quite different in each case. | The points regarding the range of decision makers has been addressed by Table 2.1 in the revised Introduction. This taxonomy is designed to link Chap. 2 with the other chapters in WGIII. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11486 | 2 | 7 | 7 | 19 | | This part repeats page 4 line 25 to line 36 | The introduction has been rewritten. |
| 13791 | 2 | 7 | 9 | | | Change 'himself' to a gender neutral term. | Thank you. Correction has been made. |
| 8232 | 2 | 7 | | 7 | | Each item depicted in figure 2.1 has been described individually in section 2.1.1 but the links between each of them have not been described well enough in order for the reader to understand clearly what Figure 2.1 illustrates. | We have clarified Fig. 2.1 in the SOD so the links between the boxes are clarified |
| 6303 | 2 | 7 | 7 | 7 | 8 | In describing "the decision to be made," it is essential that the problem be properly scoped and justified, before a "set of alternatives" are identified. So many times, decision makers proceed to identifying alternatives to a problem that has been scoped in a particular way that already delimits alternatives, so scoping the problem properly is vital and should be noted here. | Figure 2.1 has been revised in the SOD so the first box is Problem Formulation |
| 11150 | 2 | 76 | 11 | | 15 | States that no research has been undertaken to date that identifies the drivers of public concern or acceptance, as well as the anticipated risk levels associated with CO2 storage. It is a bit unclear to me if this statement refers to no research being done in Barendrecht or in general, but in both cases the statement is false. Barendrecht has been researched extensively and has been reported on in several publications. Generally, a plethora of research exists on the drivers of public concern or acceptance of CCS on national level as well as on the local level (case studies), using methods ranging from focus group discussions to information choice questionnaires which aim to measure public opinion development when people are adequately informed about CCS. Recently, a special issue of Energy&Environment was devoted entirely to this topic (volume 23, numbers 2 & 3, 2012: ISSN 0958-305X) including up-to-the-minute views on key issues facing CCS today. Stuart Haszeldine gives his take on what happened with the Longannet project; Vattenfall likewise gives its view on the cancellation of its proposed CCS project in Germany; other perspectives are provided by Greenpeace, the Green Alliance, the Global CCS Institute, the Indian government and leading consultants. Academic contributions from social scientists stress the importance of values, justice, communities and place. Other contributions include: site selection, water demand of CCS, CCS in the media, direct carbon dioxide capture from the air compared to CCS and using CCS to teach science in schools. Furthermore, research efforts have resulted in recommendations, toolkits and guidelines on communicating CCS. A list of references will be sent as ancillary material entitled IPCC AR5 WGIII refs CCS.docx. | Thank you. The text has been revised accordingly. |
| 11151 | 2 | 76 | 19 | | 20 | Here, concerns over local risks and impacts are labeled NIMBY concerns. The term ‘not in my back yard’ (NIMBY) is a well established policy belief. As a result of this belief, project proponents often call public protest ‘emotional’ or ‘irrational’ thereby implying that no valid arguments are used or that the opponents are acting selfishly. Policy makers do not always use these labels consciously to frame arguments as invalid. Rather, it appears that the NIMBYism belief is so widespread that it may implicitly influence the words chosen to describe public opposition. However many disagree with the idea that NIMBYism accounts entirely for the gap between positive public attitudes and negative behaviour towards specific projects, a.o. Devine-Wright, P. (2009). "Rethinking NIMBYism: The Role of Place Attachment and Place Identity in Explaining Place-protective Action." J. Community Appl. Soc. Psychol. 19(6): 426-441. Research on public protest against wind farms for example indicates that the visual impact of wind turbines is the dominant factor in explaining opposition against them, but also suggests that public animosity towards a wind farm is partly reinforced by the planning procedure itself: Breukers, S., & Wolsink, M. (2007). Wind power implementation in changing institutional landscapes: An international comparison. Energy Policy 35, 2737-2750. Top-down, hierarchical, and technocratic approaches to decision making may lead to feelings of injustice and inequity within local communities. These reasons should not be confused with the notion of NIMBYism. | Thanks for these references. We are removing the term NIMBY. |
| 8121 | 2 | 8 | 12 | 8 | 16 | Please provide agreed evidence for these statements. Another perspective is that normative models of choice tend to be simplistic and not suitable to represent a real complex problem situation. | The evidence for these statements is provided in Section 2.2, as we say in line 27 on p. 5 in the FOD. We preview now more explicitly in the paragraph you refer to that heuristic and other non- |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11488 | 2 | 8 | 15 | 8 | 17 | This argument demonstrates an overestimation of the knowledge of "experts" in so far as it fails to describe how those experts are identified. The broad claim that decision makers are myopic and use simple heuristics requires qualification. | We are simply describing observed regularities, but have tried harder to avoid unwanted connotations of terms |
| 11489 | 2 | 8 | 16 | 8 | 17 | The notion that farmers underestimate risk of drought is derived from priviliged societies in which crop insurance protects farmers from disaster. In most of the world, such insurance is not available, and farmers are unlikely to underestimate such risk. Their options for adaptation, however, are constrained, and they may not (from a behaviorist point of view) demonstrate their calculation of drought risk. This example seems unusual and misleading. | These are just possible examples, not general statements that apply to all contexts. We have tried harder, however, to add more examples relevant to non-western and developing country |
| 8119 | 2 | 8 | 17 | 8 | 18 | As said above, for farmers the risk of drought on a yearly basis is almost independent from climate change. | Our chapter in general is pointing out that risks and uncertainties arise from many sources, not just the climate |
| 13794 | 2 | 8 | 17 | 8 | 18 | This example mixes reference to 'risk' and to 'probabiliby.' This leaves out the 'consequence' part of risk without explanation. | thank you, we substituted "probability" for "risk" here. Chapter 2 in general makes the point that risk is being used in different ways by different groups, but that risk needs to incorporate both the |
| 13795 | 2 | 8 | 18 | 8 | 22 | A better example is short-term coastal investment that ignores long-term loss of that investment due to sea level rise | Yes, this is another good example, thank you. |
| 4907 | 2 | 8 | 35 | | | probabilities .. are uncertain. ?? | Thank you, the sentence was reworded. |
| 8120 | 2 | 8 | 38 | 8 | 40 | Imprecise: models do not reduce costs directly. Model results can raise the quality of decisions and this may lead to increasing profits. | Agreed. We will implement the suggested changes. |
| 6061 | 2 | 8 | 39 | 8 | 42 | The difference between investing in irrigation system and merit of carbon tax is unclear. Namely, why cost effectiveness criterion applies to the former and cost benefit criterion applies for the latter. If it says "communities deciding on which irigation system they invesr", it is reasonable that cost effectiveness criterion applies as society has always decided to invest to irrigation system. Whereas, cost benefit criterion should be applied to decide whether to invest in irrigation system or not. | Text has been modified to reflect clearer examples |
| 9790 | 2 | 8 | 45 | 9 | 2 | Already here and later on in section 2.3 resilience management should be considered as a major methodology. The International Organization for Standardization is currently preparing a standard on this topic and thus companies will use this structure later on for establishing their own tools. | Intro is rewritten |
| 8916 | 2 | 8 | 7 | 8 | 7 | Section 2.1.1 is the current section; I assume this reference is wrong? | Noted |
| 13792 | 2 | 8 | 7 | | | change 'impacts' to 'affects' | Wording change made in the SOD |
| 13796 | 2 | 9 | 16 | | | change 'impact on' to 'affect' | Thank you. The correction has been |
| 11491 | 2 | 9 | 17 | 9 | 17 | Change 'Figure 1' to "Figure 2.1' | All tables and figures have been correctly labelled, and captioned. |
| 6063 | 2 | 9 | 21 | 9 | 21 | "Implementing carbon market" may be replaced with pricing the carbon. | I disagree with the reviewer here. The implementation of a carbon market is not only to put a price on carbon, but may also include other benefits such as redistributing the emissions threshold through bilateral trading of quotas. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8481 | 2 | 9 | 24 | | 26 | Important to consider the spectrum and difference between policy (as strategy) and policy instruments (as implementable tools) May also be helpful to note the different types of policies and policy instruments via a basic typology (see for example the work of Ted Lowi, and Four Systems of Policy... in particular) | Thank you for this helpful comment. In the SOD we are trying hard to clarify this point. The core communication element that we are emplying is a matrix that maps the climate policy space according to different types of choices, and different sets of actors making choices. Among the choices to be made is the choice of policy instrument. An instrument, of course, is a tool, and a piece of furniture built with hand tools |
| 14528 | 2 | 9 | 24 | | | I am not sure it's helpful to define "policy" in terms of "strategy." | The dictionary I looked at defined policy as a consistent approach to dealing with problems in order to achieve a particular outcome or set of outcomes. That made sense to me. I have a policy of getting up at 6:00, in order to make sure that my kids get to school by 8:00. "Strategy" is one way of describing this, and not a bad way. What it does do is allow the word "policy" to be construed expansively, and not limited to particular |
| 9112 | 2 | 9 | 27 | 9 | 29 | Growing proportion is tied to complex international flows of goods. Schulz shows an extreme example from Singapore where almost everything is imported (Schulz, N. B. (2010): Delving into the carbon footprints of Singapore — comparing direct and indirect greenhouse gas emissions of a small and open economic system, Energy Policy, 38, 4848–4855.) | This is an interesting article, showing how in a place like Singapore the direct emissions generated locally account for less than half of the the total emissions generated by the people's consumption. But it is quite tangential to our chapter, and even to the point being made in this sentence, since the Schulz paper |
| 6368 | 2 | 9 | 35 | | 37 | Should say "even more difficult to predict than they had previously been thought to be." The point is that the uncertainty existed previously, but was unacknowledged. So prediction only appeared easier earlier. | Intro is rewritten |
| 13797 | 2 | 9 | 36 | 9 | 37 | The difficulty is inherent. The perceived uncertainty may change with this new information. | Intro is rewritten |
| 8122 | 2 | 9 | 38 | 9 | 38 | These general statements should be avoided. Handling uncertainty is quite normal and not unique for handling climate change risks. Besides rational reasoning, other factors like culture, history and so on are relevant for sound decision making. The chapter should focus only on situations sensitive and relevant for climate change! | We agree that all of these factors play a role, but the chapter's role as a framing chapter is also to make the general point that uncertainty and risk DO influence the processes by which people make |
| 13798 | 2 | 9 | 38 | | | Change 'presence' to 'perception' | Thank you. The change has been made. |
| 13800 | 2 | 9 | 38 | 9 | 45 | One's access to and understanding of decision-making tools also affects the process. | Thank you. We have incorporated this |
| 7224 | 2 | 9 | 39 | | 41 | the sentence does not parse. | The section has been edited. |
| 13799 | 2 | 9 | 40 | | | Remove first 'that' | Thank you. Correction has been made. |
| 11492 | 2 | 9 | 40 | 9 | 41 | Missing word: "outcomes that … from their choices"; and missing "?" question mark. | Thank you. Correction has been made. |
| 11493 | 2 | 9 | 43 | 9 | 45 | Grammar: "intent of possibly change their decisions' - needs correction. Missing "?" mark | Thank you. Correction has been made. |
| 7225 | 2 | 9 | 43 | | | change -> changing | Thank you. Correction has been made. |
| 7226 | 2 | 9 | 43 | | | whey -> when | Thank you. Correction has been made. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9113 | 2 | 9 | 47 | 9 | 49 | Construction related (embodied included) emissions have been shown to cause a large share of the emissions when a region goes through a rapid growth phase, e.g. Minx, J.C.; Baiocchi, G.; Peters, G.P.; Weber, C.L.; Guan, D.; Hubacek, K. A “carbonizing dragon”: China’s fast growing CO2 emissions revisited. Environ. Sci. Technol. 2011, 45, 9144–9153. | This reviewer recommends the inclusion of this sentence with its reference. I believe the contribution is relevant, but I am not sure of how to address its |
| 6062 | 2 | 9 | 9 | 9 | 10 | It is unclear why the chapter considers from the "social planner's perspective". If this means policy makers perspective, the subject to be taken up in dealing with concentration tagget should definitely be catastrophic loss and its fat tail issue on probability density function of climate sensitibity. | We will be clearer in the SOD why we ventilate the social planner's perspective. The idea is, indeed, that it gives at least one version of a plausible choice for policy maker that observes the known system dynamics most important for the decision problem at stake. Targets have |
| 4628 | 2 | 9 | | | | As a general comment I would say that too little is made of the problem of making forecasts. Estimating the technical nature of risk in climate forecasts is an immense challenge. The word “forecast” occurs about six or seven times, and three of these are references to seasonal forecasting or weather forecasting which have no relevance in making climate forecasts. Given the long time horizon for most climate forecasts, we cannot take the step usually taken by forecasters of comparing forecast and actual outcomes. The various computer models of climate, which like all quantitative models contain a high degree of subjectivity, can collectively give an impression of the forecast distribution. But these models are generally not stochastic in the way most econometric models are. And even econometric models tend to underestimate the forecast error. In short, forecast error in climate models is of unknown magnitude and not likely to be better estimated in the near future. We have just started to apply standard forecasting techniques to decadal forecasts (of global temperature).<br>This section is where some of these problems could more forcefully be pointed out. | Correct. There are two approaches in the chapter, the independent U&R perspective and the climate perspective. Although forecast is not related to climate research it may be used within the chapter as part of U&R assessment. |
| 14823 | 2 | 9 | | | | This section must not only enumerate different types of uncertainty, but distinguish between then and explain their characteristics: profound and unquantifiable and entangled with values, or straightforward and quantifiable?<br><br>It should also say something helpful about which are most important for climate policy. Arguably, one would be the profound uncertainty associated with the unknown magnitude of the downside risk of unmitigated CC. This completely defines the climate problem and structures the nature of the response. | The distinction made between different types of risk and uncertainty in this section is by no means the only one, and other distinctions including the ones you point to are clearly important, and are being made in Section 2.3 on tools. |
| 4700 | 2 | 9 | 23 | | | Perhaps distinguish between reducing risk as reducing the probability of the bad outcome occurring vs. reducing risk as reducing the impacts of the bad outcome. That is, planting drought-tolerant plants differs from insuring yourself against a drought while planting NON-drought-tolerant plants. | In this section we are focused on the broad range of sources of uncertainty and risk that impact climate policy. The distinction on the goals of uncertainty or |
| 6064 | 2 | 9 | 23 | | | When dealing with uncertainties and risks, ordinary ones and others that include uncertainties that may lead to catastrophic damages (shown here as fat tails or tippint points) should be discussed separately as these are really serious issue of risk management under uncertainty. Also inevitable global warming and the necessity of adaptation, R&D or geoengineering should be explained, if briefly. Also another uncertainty with respect to immediate participation to global framework of all the countries as well as uncertainty of global economic situation that is an important driver should explicitly be included here. | In this section we are focused on the broad range of sources of uncertainty and risk that impact climate policy. Fat tails are mentioned in the climate impacts and damage costs paragraph, and then also in Section 2.3 on tools to deal with uncertainties and risks. One of the additional uncertainties you describe |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11524 | 2 | Overall | | | | All of the examples in this chapter are based on the knowledge and knowledge-systems of Europe, North America, and Australia. This chapter lacks any examples from other areas of the world where the on-the-ground realities of climate change, perceptions of climatic risk, decision-making processes, and epistemological conventions are different. This chapter lacks applicability for most of the Earth's population, particularly those who are most vulnerable to climate change impacts. At the very least, the authors need to acknowledge that diverse knowledge systems exist, and that these will serve decision-making processes in the parts of the world that they have not investigated. | Accepted. The text will be modified to acknowledge that diverse knowledge systems exist and CAs will provide additional material in this regard that will be incorporated in the text. |
| 11525 | 2 | Overall | | | | The implications of the term "policy" needs to be elaborated, because it seems to exclude decisions made by individuals. The difference between policy makers and social planners is not clear. The inconsistent use of these terms often reveals an emphasis on top-down approaches to climate change mitigation and adaptation yet ultimately climate change response will be undertaken by individauls and their communites. | Than you very much -- this is a crucial point. Moving into the second roder draft we are now clearly considering the actions of individuals, and drawing a clearer distinction between prescriptive literature (based on a set of priorities assumed to lie with a social planner) and a descriptive literature. At the same time, we have also been quite clear to use a definition of the word policy that |
| 17311 | 3 | | | | | Gender issues: | No action; these are addressed briefly in section 3.11 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17355 | 3 | | | | | Comments on Chapter 03<br><br>Finn Arler, Aalborg University, Denmark<br><br>First of all, it is worth underlining from the start that the chapter is full of good points and well-considered arguments. There are several points and arguments I would like to deal with in more detail, though, but due to lack of time I will only make a few quick points. The first two comments are related to the concept 'community', which, in general, plays a very downplayed role in the chapter. The third one is just a hint about the absence of discussions of the concept 'complex equality'.<br><br>1. The way the distinction between Polluter Pays, Beneficiary Pays and Community Pays Principles is presented (p. 14), appears somewhat confusing. It seems as if the three principles are alternatives, whereas in fact they are rather supplementary principles, at least in relation to the climate change problem.<br><br>It begins with the polluter/emitter, who is expected to pay. There are various reasons for exemptions, e.g., if the emitter had no knowledge, and could not be expected to have knowledge about possible consequences, but let us put these exemptions aside for now. If the emitter is also a beneficiary, this strengthens the responsibility. Beneficiaries, who are not polluters (or belong to the polluting community), are not asked to pay. For instance, foreign producers may benefit from the technological progress made by the polluters, foreign tradesmen may benefit from the wealth of the polluting society, etc., but these beneficiaries are seldom if ever asked to compensate victims. This means that the Beneficiary Pays Principle is not truly an alternative to the Polluter Pays Principle.<br><br>If it is difficult to identify the individuals, who are responsible for the pollution, or if a specific community (a nation) has accepted pollution/emissions within their jurisdiction (typically because the whole community is expected to benefit from the activities leading to emissions), it makes sense to make the community as a whole responsible - but then it is as the polluter (who is often also a beneficiary) rather than instead of the polluter.<br><br>There is one difficult case, though, namely the descendants of the original polluters. They are not necessarily polluters themselves, but are beneficiaries from previous generations' emissions. Notice again that we are not talking about people, who benefit from the wealth created by the previous polluters, but who do not belong to the polluters' community. Nobody expects these people to pay (although one could expect them to be timid about blaming the direct descendants of polluters).<br><br>The question is only, whether the people, who belong to the same community (nation) as the previous polluters, should pay, i.e. by compensating for damages caused by the pollution. Seen from an extremely individualist point of view, they shouldn't. They haven't done anything themselves, and cannot be blamed. If current people separate themselves as radically as this from their ancestors, however, it is difficult to see why they should be entitled to | No action; these are good points but this part of the chapter is minor and probably shouldn't be expanded. |
| 10230 | 3 | | | | | Figure 3.6 is v2.0 McKinsey cost curve, but we would advise using the latest published version which is v2.1. We would also advise using the 2030 curve rather than the 2015 one shown in Figure 3.6 as this is the year on which our analysis focuses. Please find the v2.1 2030 chart on page 8 in the publication "Impact of the financial crisis on carbon economics: Version 2.1 of the global greenhouse gas abatement cost curve" found at the following link: http://www.mckinsey.com/client_service/sustainability/latest_thinking/greenhouse_gas_abatement_cost_curves. The labels on Figure 3.6 would then of course need to be changed to 2030 from 2015 | Noted; will be addressed in SOD |

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| 3330 | 3 | | | | | The chapter is lacking a discussion of the main normative obstacles to responding to climate change on the model of Gardiner (2011) and section IV of Thompson, A. and Bendik-Keymer, J. (2012) Ethical Adaptation to Climate Change (MIT Press). Such obstacles -such as the pure intergenerational problem or institutional fragmentation of agent responsibilities may be some of the best and most important places for any ethical consideration of climate change to begin. In general, chapter 3 does not critically examine the structures of authorty or legitimacy that we have inherited in a pre-climate forcing (or aware of CF) world. This makes the discussion lopsided: focused on going-forward tools that may not effect the underlying forms of power that have given rise to systems of law and legitimacy that hinder or promote climate forncing. | Noted; will be addressed in SOD. We intend to include more on the literature on cooperation, which includes the classic prisoners dillema. |
| 4121 | 3 | | | | | Please review chapter 4 sections 4.2.2, 4.2.3, 4.7.2, and 4.7.3. If you feel that these sections contain redundant and/or inconsistent duplications of chapter 3 discussions, please advice chapter 4 authors on how to revise their sections. | No action; presumably issues in chapter 4 will be highlighted by reviewers. |
| 4129 | 3 | | | | | It would be useful to highlight the relation of your chapter to the AR4. What has happened since? How were key concepts and methods framed in the AR4 and how do you extend on this assessment? | No action; this is tough for a framing chapter, particularly considering that AR2 was the last AR that considered economics in depth (although |
| 4130 | 3 | | | | | Your chapter covers many important issues but it is not always clear how they relate to each other. Individual sections seem very disjunct. It would be helpful for the reader of you developed a storyline that links all issues (which is challenging given the excessively broad scope of your outline) and explains why they are assessed in this order. Moreover, each section should state how it relates to subsequent chapters because your primary role as a framing chapter is to establish transparency over concepts and methods that are used in different parts of the report. | Noted; will be addressed in SOD |
| 4131 | 3 | | | | | It would be useful if you could state at the beginning of your chapter how its contents relate to chapter 2. Chapter 2 also discusses CBA, CEA, etc. to some extent. Why and how does your assessment of these concepts and methods differ from chapter 2? | No action; we are not focusing on uncertainty. |
| 4132 | 3 | | | | | Please respect the page limit (65 pages) for the Second Order Draft of your chapter. | Noted; we will make the best effort to shorten the length of the chapter as we |
| 4144 | 3 | | | | | Please review chapter 5 section 5.10 and make sure that the concept of co-benefits is consistent with yours. | Noted; we are revising our co-benefit discussion. Suggest Chapter 5 refer to the SOD and make sure things are |
| 4486 | 3 | | | | | See comment #20. | No action; comment unclear - no page or section reference numbers |
| 4491 | 3 | | | | | A general comment on the chapter: The text tends to posit a narrow range of possibilities for the issue being discussed, lists without much analysis the arguments on various sides of the (narrow) framing, and then proceeds to continue the discussion as though the extremely serious problems even in the narrow discussion do not exist or somehow have been settled. Such a format works better for discussions of scientific issues than for discussions of ethics and morality. The chapter does say in several places that it is not intended to be prescriptive, but it might be emphasized that "the literature" by no means constitutes the last word on the various issues being discussed. | No action; comment unclear |
| 2208 | 3 | | | | | <no comment here as cells could not be enlarged to fit the text> | No action; comment unclear - no page or section reference numbers |
| 15290 | 3 | | | | | Table 3.4 may be seen as a summary of the present knowledge. However, the Table contains results from rather old studies and it is later described in the chapter that there are possibilities of significant underestimations. I therefore suggest that the table is deleted or replaced by a true summary of the present knowledge. | Noted; will be addressed in SOD |

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| 9289 | 3 | | | | | The relationship between the discussion of prioritarianism in section 3.3.3 and that in section 3.4 (p.21) is not clear. One can distinguish between telic and deontic forms of prioritarianism. It is clear that in section 3.4 it is the telic form that is under discussion, since prioritarianism is there stated by way of a value function. But I am not sure which is intended in section 3.3.3. I guess that it may be a deontic form, since it appears in a section titled "justice/equity/responsibility" and a subsection titled "intragenerational justice: distributive justice", and since the author does not anywhere explicitly say that the reason we e.g. "have a reason to give some priority to benefitting people who are not well off" is because doing so leads to a better distribution. If so, it would be helpful to make this clear, and in particular to make clear that the doctrines called "prioritarianism" in these two sections are not the same. If not, it would be helpful to make clear the intended connection between the talk of priority/reasons/ought-statements in section 3.3.3 and the value function given in section 3.4 (or revise the chapter structure - there is some danger of duplication here). | Will be addressed in SOD |
| 16928 | 3 | | | | | Fankhauser S, R.Tol, and D.Pearce, 'The Aggregation of climate change damages: a welfare-theoretic approach,' Environmental and Resource Economics, Vol.10. 1997 pp.249-66 | No action; comment unclear - no page or section reference numbers |
| 11992 | 3 | | | | | General comment: Please address not only the right to live of people but all species. Many cultures respect that already today and do not talk of animals as "resources" but as relatives. You mention for example Bhutan and Brazil's constitution but also American Indigenous people and Aborigenes have a more balanced view. Alternatively, you should define on what basis you consider humans superior to Elephants, Dolphins, flies etc.. | No action; we cannot make such prescriptive statements |
| 4258 | 3 | | | | | This table seems to exclude more recent examples which attempt to assess the social costs of catastrophic climate change e.g. Http://www.economics-ejournal.org/economics/discussionpapers/2011-40 by Ackerman and Stanton | Noted; will be addressed in SOD |

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| 13413 | 3 | | | | | GENERAL COMMENTS<br><br>The treatment of historical responsibility could be strengthened by stating the share of cumulative emissions of developed countries (eg since 1850 or 1950), giving some estimates. (The range is usually 70-75 per cent). This could be included in the first paragraph of page 12 of a new paragraph after that.<br><br>There is need for better balance or clearer conclusions on whether developed countries have responsibility/obligations to take measures to assist poorer countries with their climate actions and their development efforts, because of the developed countries' overwhelming contribution to cumulative emissions. In some places (especially on page 13-14), the treatment of this issue appears to be weighted towards arguments against responsibility because of ignorance etc. More space should be given to the counter-arguments by writers such as Shue and Gardiner.<br><br>The recent work on climate equity and climate justice in the literature on greenhouse development rights, and on the equitable access to atmospheric space in the context of the carbon budget, has not been reflected in this chapter, which is a significant omission.<br><br>The section on sub-section on technology transfer (3.12.6.1) is poorly treated. There is too little space dedicated to it, although as a framing chapter, this chapter 3 is supposed to deal with the basics of this topic which is so important for the solution to the climate change crisis, and also specifically to enabling developing countries to contribute to the global solution. It is also critical not only to the economic issue but to the "ethical" issue, as developing countries consider technology transfer to be central to any global agreement on climate actions. The very small space given to this central issue in this framing chapter was due to a misconception that this chapter would not deal with this issue, whereas the Wellington Accord clearly designates this chapter to deal with the framing of this issue. The zero draft had a much longer treatment of the issue, including on technologies in the public domain and patented technologies, the issue of IPRs in the context of access to affordable technology and the principles and mechanisms of international cooperation for technology development and transfer. Unfortunately most of the zero order text has been eliminated. Worse, what remains is often a distortion of the meaning and balance of what was in the original draft and in the zero order draft.<br><br>In general, issues of interest to developing countries' researchers and policy makers have not been sufficiently addressed in the chapter. A much more lively and relevant review of the discussions and literature on social, economic and ethical concepts, including on the recent significant expansion of work on equity, climate ethics and climate justice, should have been done in the chapter. | No action; this would be normative and policy-prescriptive, which is not the intention of the report |

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| 8571 | 3 | | | | | Considering the centrality of debates about economics and ethics I understand why the IPCC has chosen to include this in its 5th Assessment. These are crucial issues, and are likely to remain central in domestic and international policy discussions. In addition, as someone whose research is focused primarily on the relationships between economics and ethics in climate policy, I recognize that this is an extremely difficult area to integrate in a single chapter. I fully recognise the challenge the authors have accepted in agreeing to lead this chapter. However, I am deeply concerned about this chapter and am unconvinced that it represents a constructive addition to these ongoing conversations, and it may even run the risk of reigniting long-standing frustrations about the way neo-classical economics has been used in the climate change context. I think that the core problems in the chapter revolve around the lack of recognition for the boundaries of economics - it is afterall, one one among many ways of seeing the world - and the lack of integration between the first part of the chapter, which is focused on ethics, and the bulk of teh chapter, which ignores ethics almost completely in its focus on econonmics. While I realize this may have been unintentional, the overarching tone of the chapter is something along the lines of, "we have to talk about ethics so we will in broad terms, and then lets get that over and get into the meat of the problem and really focus on economics". This is totally understandable, but is not an integration of ethics and economics and is not particularly helpful for readers who may be coming into these debates looking for a useful synthesis of current discussions in the broad literature on ethics and economics in climate policy. Finally, I was startled that no-where in this entire chapter did the question of rights, or a rights-based approach to ethics, emerge while this has been included in literature in this area and has been used as a point of reflection about some of the limitations of neo-classical economics in this context. I realize you can't cover anything, but ignoring an entire branch of ethical thought about this while some comparatively less central areas of economics are covered in detail seems odd, especially as a rights-based framework presents a radically different alternative to CBA or other economic approaches to valuation. Overlooking this area detracts from the authority and legitimacy of the chapter. I really hate to say this, but in its current form I remain unconvinced that this chapter should even be included in the IPCC, although I realize this is probably not an option at this stage. It requires an enormous amount of non-facile work in order to make a legitimate claim that it has represented a reasonable discussion of the ethics of climate change, much less an integration or thoughtful dialogue between ethics and neo-classical economics. Some of the latter sections are better than the earlier ones, and in several situations (such as the discussion of WTP) the latter section is clearer, more balanced and generall more coherent. In my detailed comments I have suggested removing teh earlier sections to avoid duplication, or at the very least, bracketing the earlier less balanced sections with clear references pointing readers to these stronger sections. Overall sections 3.4 through 3.7 are the weakest. I would strongly recommend serious reconsideration of these sections, as included in my more detailed comments, one constructive strategy for better framing these sections would be to include clearer and strong paragraphs at the start of each section that clearly indicate the limitations of the assumptions used in the section (ie. all of these are non-transparent in their sole use of neoclassical eocnomics as the default appropriate strategy for climate policy decision making, an assumption that does not resonate with the stated goals of the chapter and which is cognitively ill at ease with several other sections - such as 3.11.2) | Noted; will be addressed in SOD. This is a very thoughtful point. And we certainly do need to make sure what we have makes a contribution. However, our goal is not to integrate economics and ethics. These are separate topics with some overlap. |

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| 17804 | 3 | | | | | While I like very much this chapter - however in the context of this book it would then have an added value if the various indicators or metrics would be applied across the sectorial sectors and the others - this would then substantially contribute also in the formulation of sustainable development goals. The chapter has to my opinion still an impoprtant bias - it has the major hand of economy - in it and a major philosophy on how using wellbeing - and possibley link to an economic metrix - nevertheless in some instances, places countries areas not even the minimum has been existed in estimating simply the number of death attributable or the number of injuries attributable etc etc - thus a careful revision and shortening of this chapter is required and a transposal accross the other chapters in the metrix used - or a summary table from the sectorial chapters in this chapters - providing the linkage of this general more philosophy to the various mitigation sectors. There are many more issues to be mentioned here from health sciences, and social equity studies - which seem to have been omitted and rather been fragmented - if thought of- accross the chapter. | No action; comment unclear |
| 10686 | 3 | | | | | The table 3.3 and accompanying discussion misses at least one new set of metrics in the literature: the Peak Commitment Temperature (PCT) and Sustained Emission Temperature (SET). See Smith S. M. et al. (2012) Equivalance of greenhouse-gas emissions for peak temperature limits. Nature Climate Change. | Noted; will be addressed in SOD |
| 5129 | 3 | | | | | To shorten the chapter, I suggest curtailing efforts to provide a CBA primer; sections on policy intruments and criteria for comparing them could be combined into one streamlined chapter. A good deal of cross-referencing with the chapter could be cut if the overall schema of the chapter was clearer. The discussion about common and civil law could be presented very briefly. | Noted; will be addressed in SOD |
| 15375 | 3 | | | | | This section starts to lose the tight organization and terse exposition. It is repetitive of much of the earlier material, the author notes this. The discussion of IAM is lengthy but not well-informed. It states broad generalizations based on a couple of biased surveys, and could have simply looked at the actual publications describing the models and results to see how wrong Terry Barker and others were. A list of IAM's that are being discussed and a table comparing their content and basic methodology needs to be included. Right now this seems too much like a set of off the cuff generalizations with random examples – the danger of the approach I applauded in the first part of the chapter. DICE, RICE, PAGE and FUND are good models, but the IAMC includes many more. Leave it to chapter 6. | Noted; will be addressed in SOD |
| 10848 | 3 | | | | | In this section, it would have been good to mention and discuss that most economic models of mitigation will somehow implicitly assume an "exchange rate". Discussing how that is done, reporting on the values obtained, etc, would be extremely beneficial to the metric community. | Noted; will be addressed in SOD |

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| 15378 | 3 | | | | | This section absolutely must include a discussion of Mark Jaccard's work on consumer behavior in order to deal with the issue of "consumer misperception" in a way that is compatible with earlier discussions of prescriptive and market based policies. There are a number of problems with the position stated here. 1. Unless policies actually remove the specific market failure at a cost less than the foregone gains from moving to a perfect market, they will not necessarily improve welfare. [For a citation, see just about any paper by Stavins or Jaffe and Stavins on energy efficiency]. Specifically, has there been any analysis of the full implications of using corporate average fuel economy or appliance efficiency standards to remedy an information problem? 2. The observation that consumers suffer "buyer's remorse" in the particular form of wishing their newly purchased vehicle had better fuel economy does not imply that a. a government imposed standard will make them any better off, given the lack of information regulators have about individual preferences and circumstances and the frequency of "voters' remorse". b. Buyer's remorse is not confined to new car purchases. Therefore either the rationale for regulating vehicle choices applies to every other instance of buyer's remorse (I am particularly subject to it when I eat out, so shouldn't there be minimum standards for restaurant food? Oh, that's right, New York City does regulate restaurant food) c. Since buyer's remorse violates the basic axioms that characterize preferences that lead to a consistent ordering (or utility function) it is far from clear how to define any welfare criterion based on consumer preferences – is there not an argument that decisions under uncertainty (which includes all purchase decisions in some degree) should always be represented in terms of ex ante preferences rather than hindsight re-evaluations? | AGREE action will be taken |
| 3372 | 3 | | | | | 3.10.1 mentions 5 metrics for evaluating climate change effects, citing Schneider (2000). But then only one metric, economic cost, is further explored in 3.10.2. Why are the other metrics not specified? These other metrics seem to be particularly relevant for exploring the co-benefits of mitigation action, and are utilized in the sectoral chapters.This issue is, in my opinion, at the core of the AR5. | Noted. |

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| 16933 | 3 | | | | | IPCC is so loaded with costing models and gurus that I will refrain from commenting on the specific model results, but I am a bit puzzled about the purpose of this section. One point that I think could usefully be made is that however “costs” are defined and models run, the costs of mitigation are set within both vastly larger determinants of economic growth – they are a difference in percentage growth rates of some small and highly uncertain fraction of a percent. Morever the determinant sof long-run growht remain something of an economic puzzle, but we know that innovation is important. Another way to make the point is that a scatter plot of EMF-22 results of 2050 GDP vs CO2 across all models and scenarios shows almost no discernible relationship (Grubb, Hourcade and Neuhoff, Chapter 11).<br>However, the discussion on the McKinsey curve unfortunately seems to illustrate the extent to which disciplinary bias risks denigrating this chapter. Apparently the McKinsey curve is “highly controversial” (a statement repeated) whereas models that assume the baseline is perfectly optimal, that all actors are rational optimising agents with perfect foresight, that there is no endogenous technical change, etc etc, are not controversial. This is really not the intellectual standard one would hope for, even in a First Order Draft.<br>The same applies even more to the discussion on “negative cost” measures, where the comments also contradict both the theory ("System 1") implicit in the FOD Chapter 2, and the evidence in much of the rest of the AR5 draft chapters (most obviously, buildings). The “negative cost” issue is well over twenty years matured, with a huge literature, and this text reads like first reactions from an economist who has read nothing about it. The evidence incidentally, spans not only technological assessment but applied policy evaluation (there is plentiful material in the other AR5 chapters, to which I could add our own analysis in Grubb, Hourcade and Neuhoff, Chapters 4 and 5, which review respectively the theory and the empirical evidence from policy evaluation). Again moreover this is duplicating old debates and discussions in the IPCC; the chapter should at least acknowledge that the McKinsey estimate of “negative cost” potential was substantially smaller than the IPCC AR4’s own estimate (c. 3.5 vs 5 GtCO2 from the buildings sector respectively).<br>Finally, I am not convinced it is fair to criticise the McKinsey curve for its proprietary nature. The 200-page report they published was far more detailed than many academic papers, and a scan of their website seems to me to show a considerable degree of transparency and debate. The core point however is just that McKinsey curve is the only consistent study to aggregate bottom-up assessments globally into a cost curve, the main alternate being the IPCC's own AR4 assessment which was presented in a different way, and suggested a bigger First Domain (and smaller Second Domain) potential. □ | Noted; will be addressed in SOD |
| 18347 | 3 | | | | | Please link your discussion of different modeling approaches to relevant section in Chapter 4 (4.5.3.1) to avoid redundancies and sharpen specific chapter-relevant focus. | Noted; will be addressed in SOD |
| 10685 | 3 | | | | | It is good to see some discussion of alternative emissions metrics here, which are the subject of a fair amount of academic research and political discussion (see Plattner, G-K. et al. "IPCC Expert Meeting on the Science of Alternative Metrics", IPCC 2009) but have been underplayed in previous WG3 reports. But the discussion here contains much high-level theory and little relevant application. For instance, how do the metrics relate to the 2 degree limit (and 1.5 degree limit) specifically? Plus it would be very useful for readers to see how the use of different metrics would affect estimates of aggregate CO2e emissions, both for historical trends and future pledges. Even if this is just done using the GTP100, which is perhaps the most commonly cited alternative to the GWP100, it would be a big step forward. | Noted; will be addressed in SOD |
| 11357 | 3 | | | | | I think that this section provides a good overview of metrics from the economic perspective -- I like the way that the discussion starts from the general economic frameworks and then the individual metrics are drawn. | Thank you for your comment. |

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| 16934 | 3 | | | | | Damages: Surely in a chapter on social, economic & ethical dimensions, the most important points to make are that the quantified estimates cited are rendered controversial by all the issues discussed previously in the chapter around aggregation, plus the discounting / intergernational debate, the missing values, etc. I also find it bizarre to discuss these issues without referring for example to the more qualitative risk studies, for example Downing's risk matrix (Watkiss and Downing, 2007).<br>AR5 is the first IPCC assessment that could take full account of the post-Stern debates on climate impacts and valuation. This chapter does not do these justice. One overview is given in the first chapter of Grubb, Hourcade and Neuhoff, 'Planetary Economics: the three domains of sustainable energy development.', Taylor and Francis (Chapter 1) | Noted; will be addressed in SOD |
| 16641 | 3 | | | | | What are the practical draw-backs from applying weights this way? | No action; comment is too vague; no line number or page number. |
| 12790 | 3 | | | | | You may also like to cite experimental studies, with regard to leadership e.g. see Arbak, Emrah; Villeval, Marie-Claire (2007): Endogenous Leadership Selection and Influence. Hg. v. Centre National de la Recherche Scientique. Centre National de la Recherche Scientique. Écully (Working Papers, 07-07), or Potters, Jan; Sefton, Martin; Vesterlund, Lise (2007): Leading-by-example and signaling in voluntary contribution games: an experimental study. In: Economic Theory 33 (1), S. 169–182) | AGREE action will be taken |
| 5128 | 3 | | | | | The section on behavioural economics and culture (apart from offering a curious blend of topics) was the strongest for me, as it uses concrete examples, eschews high theory, and helps broaden discussion. | NOTED Thank you for your comment. |
| 3373 | 3 | | | | | In contrast to the general approach of chapter 3, this section is written in a bottom-up manner, detailing examples. It does not give concepts and categorizations of behavioral issues. This section could learn from chapter 2, and offer a categorizing, thus enabling also the sorting of examples, which are not mentioned in the text. | NOTED general action will be taken |
| 12789 | 3 | | | | | The relevance of subjective justice perceptions is important, here: a fair burden-sharing rule is more likely to be accepted and followed (Third Assesment Report, WGIII). So the stability of an agreement could be improved if the agreement is in line with the individual perception of fairness. | NOTED general action will be taken |
| 5323 | 3 | | | | | As mentioned already in the remarks to chapter 1 and in the comment on Chapter 2, section 2.4.3: The authors seem to ignore possible switching cost and other hidden cost incurred by the consumers through adopting new technology. | AGREE action will be taken |
| 4113 | 3 | | | | | Please discuss this section with chapter 2 authors. | AGREE action will be taken |
| 4507 | 3 | | | | | It seems biased to give such prominent treatment to cultural constructs such as buen vivir and Gross National Happiness without giving equally explicit to the "stewardship" model of human/environment interactions as developed by Evangelical Christians (as in, for example, Katherine Hayhoe and Andrew Farley, A Climate for Change). Other major religious traditions also stress obligations to future generations and other species. | DISAGREE Buen Vivir and GNH don't have anything to do with a religious point of view, they enhance an alternative (non western) cultural attitude! So I don't |
| 15457 | 3 | | | | | The chapter contains a section on social and cultural issues (3.11.2), as part of an effort to seek alternative efforts to traditional mitigation strategies. Similar alterantive ways of understanding issues of vulnerability and adaptation should also be discussed briefly, so that problems of universaalism and specificity are acknowledged and addressed. A good source for "Asian' perspectives, containing a critique of some of the dominant universalizing tendencies, is in "Human Security and Climate Change in Southeast Asia", eds., Lorraine Elliott and Mely Caballero-Anthony. Routledge Security in Asia Pacific Series, 2012 | NOTED but adaptation and vulnerability are treated in WGII |
| 5325 | 3 | | | | | I also do not know why this section is important for the IPCC report. The section also ignores all the critical literature on social capital. To name two important critical contributions:<br>Robert Solow (2000) "Notes on Social Capital and Economic Performance," in Dasgupta, P. und I. Serageldin (ed.: Social Capital, a Multifaced Perspective, The World Bank, Washington D.C.., pp 6-10.<br>J. Sobel (2002): "Can we trust Social Capital?" Journal of Economic Literature 40, 139-154. | NOTED general action will be taken. |

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| 3374 | 3 | | | | | It is not well motivated why technological change is such an important concept that it deserves its own subsection. | No action; this section is given and agreed by the WGIII Plenary |
| 9010 | 3 | | | | | This section on learning by doing does not mention that learning by doing in many developing countries is unduly constricted by the international property rights regime. If the issue about technogical transformation for climate change is one of acceleration, then the IPR regime could be an obstacle to this objective. See United Nations (2011a). World Economic and Social Survey 2011: The Great Green Technological Transformation. Sales No. E.11.II.C.1. | Will be addressed in SOD |
| 9009 | 3 | | | | | The section confines itself to literature on technological change of specific products and sectors. It cites studies that say that "innovation responds quickly to price changes" (p. 70 , lines 30-31). The kind of technological change required to respond to climate change is system-wide, both on the production and consumption side. It is important to cite problems that must be faced when system wide technological change, not just individual sectoral change, is required. For example: Wilson, Charlie, and Arnulf Grübler (2010). Lessons from the history of technology and global change for the emerging clean technology cluster. Background paper prepared for World Economic and Social Survey 2011. Wilson, Charlie (forthcoming). Historical scaling dynamics of energy technologies: a comparative analysis. This publication studies the problems of system-wide technological changes in response to climate change: United Nations (2011a). World Economic and Social Survey 2011: The Great Green Technological Transformation. Sales No. E.11.II.C.1. A survey of the more development-oriented literature would have identified the system-wide challenge required in technological development. | Will be addressed in SOD |
| 12531 | 3 | | | | | There are recent noteworthy developments in “experience curve” assessment. I am providing separately a recent summary paper, “Experience Curves and Solar PV” (2012-09-03-nwec-experience-curves-and-solar-pv.pdf) with additional references. Suggested additional language in this section: “A new paper sponsored by the Santa Fe Institute (Nagy et al. 2012) summarizes a meta-evaluation of estimation methods including cost per cumulative production (“Wright’s Law”), cost per annum (“Moore’s Law”), cost per rate of annual production (“Goddard’s Law”); time-lagged variants of the single factor approaches; and hybrid or multifactor estimators combining the single factor approaches (based on work by Nordhaus and Sinclair, Klepper, and Cohen). Forecast skill for each of the methods was assessed with a hindcasting approach across 62 technologies in four categories (chemical, hardware, energy and other), with time series ranging from 11 to 39 years. The analysis concludes that the traditional experience curve approach (Wright) performs quite well across technologies and different time scales, and is significantly better overall than the other approaches, although Moore is very close over shorter time ranges. The robustness of the results for the experience curve approach is striking.” Bela Nagy, J. Doyne Farmer, Quan M. Bui and Jessika E. Trancik, 2012. Statistical Basis for Predicting Technological Progress, arXiv:1207.1463v1 [physics.soc-ph], http://arxiv.org/abs/1207.1463 . | Will be addressed in SOD |
| 18359 | 3 | | | | | Please link this discussion to the relevant sections in Chapter 13 (13.9.3) and 16 (16.5) to sharpen chapter specific focus and avoid redundancies. | Will be addressed in SOD |
| 12532 | 3 | | | | | This discussion should be expanded. There is considerable literature and research on open source technology and intellectual property, and this is an important development pathway for mitigation and adaptation measures for climate response. | Noted for reorganizing section in SOD |
| 9011 | 3 | | | | | This section on international cooperation for technology transfer and development could be strengthened by referring to a vast literature (there are only two citations right now). For example, there are suggestions and citations for needed actions at the international level in Chapter VI entitled "Building a Global Technology Development and Sharing Regime in United Nations (2011a). World Economic and Social Survey 2011: The Great Green Technological Transformation. Sales No. E.11.II.C.1. | Good point, but this issue is addressed in more detail in chapter 13 |

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| 6983 | 3 | | | | | Some suggestions: (1) moral responsibility for CC - individual, collective, or both?; (2) criminal justice and CC; (3) ethics of geoengineering; (4) the role and nature of feasibility constraints in moral arguments about CC; (5) triage; (6) methods in ethics for assessing different post carbon futures. | No action; too general for research need |
| 16642 | 3 | | | | | Shorten this discussion. Many of the technical details can be left out. | No action; comment must be referring to another section, as this section is only |
| 11007 | 3 | | | | | While ethics permeates the discussion of climate policy, its role appears to be largely one as rationalizing interest-based positions. Further the research tracing the roots of ethical behavior to evolutionary biology suggests that, insofar as ethics influences behavior, it often favors behavior that is more 'tribal' and less universal and more emotive and less rationalistic than is suggested by the discussion. | No action; this comment appears to misunderstand the discipline of ethics. |
| 16630 | 3 | | | | | Delete the sentence that starts with "[t]his is to assume…" | No action. Disagree with comment |
| 5125 | 3 | | | | | This appears to be the result of a numbering problem; the section is almost completely redundant. Following the intro and overview in the current 3.1, this section should be omitted and 3.3 on adjusted up. | Cross-referencing has been corrected. The section is essential for describing |
| 9343 | 3 | | | | | Section on procedural justice should conclude with some discussion on how and in what context it can be applied to issues of climate change 9as thesection on distributive justice) | Will be addressed in SOD; will add an example, if possible |
| 2577 | 3 | | | | | Section too theoretical. Would be good to have cases of litigation against national governments in favor of climate law, compensations etc. If possible, with tipologies of settlements | Will be addressed in SOD |
| 9014 | 3 | | | | | Section 3.3 and the executive summary highlights the legal principle of wrongdoing for determining responsibility. It ignores literature among philosophers and ethicists, such as Gardiner (2010) and Shue (1996, 2010), which argues that wrongdoing is not necessary to assign social responsibility. See: Shue H. (2010). Deadly delays, saving opportunities: creating a more dangerous world? In: Climate Ethics Essential Readings. S.M. Gardiner, S. Caney, D. Jamieson, H. Shue, (eds.), Oxford University Press, Oxford; New York pp.146–162. Available at: http://site.ebrary.com/id/10399387 | Thank you. We added a sentence and a cross-reference |
| 13009 | 3 | | | | | The more general philosophical issues about the traction of normal concepts of responsibility should probably be mentioned (see, for example, Jamieson, 'Ethics, Global Warming and Public Policy' 1992; Sinnott-Armstrong, 'It's Not My Fault'; Gardiner, 'Is No One Responsible for Global Environmental Tragedy' 2011). | Thank you, we added a discussion of the responsibility of individual persons. |
| 4482 | 3 | | | | | This section leaves all the issues hanging. The entire IPCC exercise is pointless if the obligation of present to future generations is not recognized. The discussion of the various definitions of "harm" is unduly abstract. | No action; disagree. This section is simply meant to outline the rest of the |
| 2114 | 3 | | | | | On line 37, it is claimed that both options of applying prioritarianism to emission rights are problematic. So is the conclusion of this section that prioratarianism about emissions is implausible? If so, is there a recommended alternative? | Agreed. We changed the wording. |
| 4487 | 3 | | | | | As above, legal systems pertain to existing nation-states. The international law of torts is, to put it mildly, undeveloped. These arguments having to do with different concepts of torts seem like scholasticism (in the bad sense), given that there is no encompassing international legal authority, and there is not likely to be one in the forseeable future. (And would such a single world-wide authority really constitute movement in the direction of greater justice? It is not at all clear that it would.) | No action; international law beyond scope of chapter |
| 2121 | 3 | | | | | The discussion is 3.3.7.1 & 3.3..7.2 could be better structured. As it stands, there is considerable repetition and overlap between the different "components". | Will be addressed in SOD |
| 9015 | 3 | | | | | This section involves a sophomoric discussion of welfare functions, and issues of aggregation across individuals and across time. Nevertheless, it devotes enormous space and word count to additively separable forms, without evaluating the relevance of these approaches to ethical and social decision-making on climate change. This section is thus a chief example of the irrelevant and wasted literature review in this Chapter. The discussion on page 19 with the figures on distribution of invididual well-being across time does not refer to any existing peer-reviewed article. This section ignores the literature on historical responsibility and agreed international principles such as the right to development and equitable access to development. | No action; disagree with comment |
| 3608 | 3 | | | | | Connection to climate change mitigation issues too loose and abstract because lacking concrete examples in the text. Please add more application examples! | Some examples have been added. But the applications of general theory are not |
| 16632 | 3 | | | | | The paragraph that starts in this line needs a connection to the previous paragraph or a transition/subtitle. | No action; comment unclear; no line |

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| 13011 | 3 | | | | | Clare Palmer's interesting (2011; in the Arnold volume) argument about the problems facing some ecological analyses may be worth a citation. | Added |
| 2207 | 3 | | | | | A recent and relevant source for this entire section is John Nolt, “Nonanthropocentric Climate Ethics,” WIRES Climate Change 2, 2011, pp. 701-711. (http://wires.wiley.com/WileyCDA/WiresArticle/wisId-WCC131.html). | Reference added |
| 3329 | 3 | | | | | I find this expression, "non-human values" equivocal and potentially confusing. "Values concerning non-humans" or something of the sort would be better. | It's now defined. |
| 4489 | 3 | | | | | Recommend dropping this entire section. | No action; sections are set by IPCC |
| 6975 | 3 | | | | | D.o. | No action; no comment |
| 8489 | 3 | | | | | As Hochschild (1981) notes in "What's Fair?", there are multiple "domains" of equity and equality, including social, political, economic, health, environmental, etc. Citizens may not hold equal or consistent orientations to equality (of opportunity, or condition) across those domains. | It's not clear how this point is relevant. |
| 6976 | 3 | | | | | D.o. | No action; no comment |
| 16634 | 3 | | | | | A version of this paragraph should be close to the beginning of the section and deleted from its current position. | No action; comment does not provide paragraph reference |
| 16930 | 3 | | | | | Aggregation of costs and benefits<br>This section might usefully start with an important caveat along the lines in my general comments: aggregation approaches reside within and are constrained by a moral framework of norms and rights. To take a blunt and highly personal example: my father is very ill with Alzheimer’s disease. He needs constant care, adds nothing to the economy, consumes a lot of resources of the UK National Health Service, and is clearly no longer enjoying life. Any conceivable cost-benefit analysis would suggest that his life should be terminated. The State, fortunately in my view, has absolutely no right to do so; nor do I, or anyone else. The cost-benefit aggregation of welfare is only an acceptable basis of decisionmaking within carefully described boundaries.<br>The problem of climate change most fundamentally is that it does involve the logical equivalent of transgressing the Westphalian principle of Sovereignty, but with no agreed basis on the acceptable implications of this. The idea that the welfare of Tuvalu, or those living in the Bangladeshi delta, can be aggregated into irrelevance is not accepted by those who live there (the issues of WTA vs WTP metrics is core here: see section 3.10). Unless this section starts by acknowledging this limitation, it will alienate those who feel vulnerable, and make them believe that cost-benefit is a codeword for trampling on and ignoring their rights and interests.<br>I am not sure if the brief dive into maths helps, or will alienate some readers.<br>Finally, in a different vein, fundamental issues in Aggregation also surfaced in the Stern review and subsequent debates, most notably involving Dasgupta’s critique around consistency in equity weighting (eg. Dasgupta 2007). Note that Dasgupta concluded that with high levels of inequality aversion and uncertainty ‘no optimum policy exists .. consumption discount rates cannot be defined and social cost-benefit analysis of projects becomes meaningless.’ | The chapter has been reorganized in response to this comment and others like it, to make the limitations more explicit. |

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| 16932 | 3 | | | | | I don't understand the purpose of the section on "The Paretian Approach" in this section. In some circumstances (e.g. many of those pertaining to 1st Domain processes) Pareto improvements are possible. The dilemmas of aggregation are then avoided because one set is Pareto superior to another. This is essentially the economic terminology for the broader principles of First Domain effects. Since this chapter is about clarifying ecnomic principles, it might be useful to clarify the economic processes that correspond to First, Second and Third Domain (eg. see Figure 2.3 in Grubb, Hourcade and Neuhoff, Chapter 2). However, the whole point is that the three domains are not substitutes, but complementary. Domain 1 / Pareto improvements are not alternates to cost-benefit, but simply reflect different dimensions of the element; consequently, I am not sure how they fit logically in this section. (Grubb, Hourcade and Neuhoff, Planetary Economics: the Three Domains of Sustainable Energy Develpoment, Chapter 2 (submitted, and sent to IPCC Secretriat), Figure 2.3 Three Economic Processes) | Noted. |
| 9016 | 3 | | | | | This section discusses issues of aggregation among individuals and across time, a discussion that is neither new nor made relevant to the question of climate change in the section. It talks about the issue of proper discount rates but does not reflect that discount rates could differ among individuals and countries not only due to tastes but also due to differences in incomes, wealth, and level of development. It devotes some space to th relationship between market rates of interest to the discount rates but must recognize the fact that ethical judgements and considerations of equity must play a decisive role in any setting any weighting between current and future generations. It would also be useful and more accurate if the discussion in this section could recognize Ramsey's original own deep doubts about the mechanics of aggregating across generations and relatively weighting their marginal utiliites. | No action; we have considered the point but feel is not valid. Discounting aspects are explicitly treateds in section 3.6 |
| 3609 | 3 | | | | | Connection to climate change mitigation issues too loose and abstract because lacking concrete examples in the text. Please add more application examples! | A few more examples have been added. But the theoretical underpinnings of |
| 7362 | 3 | | | | | This discussion adds little to the analysis and is unncessary. | No action; others attach importance to |
| 4635 | 3 | | | | | Section 3.6 makes the case forcefully that "there is no consensus on the pure discount rate". Economists who work in the area of benefit-cost analysis hardly need to be told this fact. However, they and non-economist policy-makers could use help. Can the section be summarized beyond "use a rate between 1.4% and 7%" or "many analysts suggest a rate of around 2%"? While it would be easy to repeat the benefit-cost analysis at different discount rates, and many of us have done this, someone at some point has to come up with a specific rate. This is also true if one tries backing in to the analysis by calculating the discount rate at which two projects would return the same net benefit. | No action; the report should recognize disagreement. Please go to specific authors for specific numbers (our table 3.1). Cannot create a consensus that does not exist. |
| 13000 | 3 | | | | | Discounting is one of the most important issues in climate ethics and economics. Unfortunately, the treatment here is much too brief (e.g., see the second assessment report), and appears to take almost no account of the ethical questions and objections surrounding discounting (see, e.g., chapter 8 of Gardiner, A Perfect Moral Storm). I would recommend an expansion and a particular focus on the ethical concerns. | No action; space limited. |
| 18596 | 3 | | | | | 3.6 discusses discounting and discount rates – but to what extent is this really relevant? Isn't the problem that some alternatives (or sorts of behaviour) are unacceptable from an "ethical" perspective to at least some individuals? What are we trying to discount? The balance between consumption or investments or how to distribute something that is ultimately restricted over time? Is discounting a relevant way to handle fundamental choices in society? | No action; NPV is the standard tool. This section tried to elicit the ethical element behind this concept, with applications to the distant future. |
| 3610 | 3 | | | | | Connection to climate change mitigation issues too loose and abstract because lacking concrete examples in the text. Please add more application examples! | Need to discuss use of concrete examples throughout chapter |
| 13007 | 3 | | | | | I'm surprised that there is no mention here (or elsewhere in the chapter) of the claim in the literature that there is a strong overlapping consensus at least on the claim that the richer, more developed countries should take the lead and accept heavier initial burdens (e.g., Shue 1999, Singer 2002, Gardiner 2004, 2011). Even if one disagrees, it seems relevant to discuss this alleged consensus. | No action; no change implied, adequately addressed (see lines 31-32 on page 32) |
| 8490 | 3 | | | | | It may be helpful to place this section earlier in AR5 | Will refer to TSU, not sure we agree |

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| 18736 | 3 | | | | | This section heavily focuses on economic approaches to the assessment/evaluation of policies and institutions. While the overview of criteria appears balanced as far as the contribution of mainstream economics is concerned (e.g. in terms of challenges faced and approaches used), it is extremely narrow in disciplinary focus and fails to incorporate the valuable (and, in the real world, highly relevant) contributions of other disciplines. One example is law, which is the means by which policies become operational in most cases and, as a discipline, by definition deals with interactions between sets of rules, principles and rights and duties. Accordingly, interactions between policies can only be fully understood when their potential legal conflicts with existing or future procedural and substantive rules are also factored in, as these can either result in the inapplicability or only partial applicability of the policy, or significantly hamper its implementation (or result in other consequences, such as litigation or liability for damages/compensation). By the same token, the success or failure of policies is often strongly affected by how well these harmonize with the existing legal framework, and how conducive that framework is to their effective implementation. For instance, procedural or institutional rules (which body has what power to play which role in the operationalization of a policy) can be decisive for the real-life application of a theoretically superior policy. Unfortunately, there has been very little jurisprudential scholarship specifically on evaluation of climate change policies, and hence it is difficult to pinpoint seminal research (see, e.g., Hollo, Erkki et al. (eds), Climate Change and the Law, Dordrecht: Springer, 2012); rather, it is necessary to understand the legal system in its entirety (and conversely grasp related scholarship very broadly) to fully capture the role of this discipline in evaluating climate policies. The same would apply to other disciplines that can contribute to the assessment of policies, such as e.g. behavioral psychology and its study of the behavioural factors that motivate or hamper change in human behavior e.g. to reduce emissions. Also, A brief acknowledgment of the epistemological challenges of the main criterion (environmental effectiveness: how to establish causality in complex physical and socioeconomic systems? How to define the environmental outcome that serves as the benchmark of effectiveness when mitigation policies typically pursue so many different and not always compatible environmental and other (social, economic, innovation etc.) objectives? Etc.) and the inevitable contingency, i.e. proneness to value judgments of all other criteria would seem helpful here, as it is barely discussed in ch. 3. Social science and humanities literature has begun looking at the limitations of the criteria developed in neo-classical economics, but is still scarce. See Mehling, Michael (2002): “Betwixt Scylla and Charybdis? Effectiveness in International Environmental Law.” 13 Finnish Yearbook of International Law 129-182; Erkki J. Hollo, Kari Kuusiniemi, Eriika Melkas and Michael Mehling (2002), “Legal Aspects of Climate Change: Instrument Choice and the Kyoto Mechanisms,” in Understanding the Global System: The Finnish Perspective, edited by Jukka Kayhkö and Linda Talve, pp. 177-182. Turku: FIGARE, 2002 | Noted to be considered in revising |

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| 9005 | 3 | | | | | This section constitutes the nub of the fundamental weakness of the Chapter 3. The main line of reasoning of the section is correct that the "major differences between developing and developed countries' conditions and circumstances lead to differences in suitability and performance of policy instruments" (p. 38, lines 24-25). This should have been the touchstone for the policy discussions in the chapter since by nature climate change is a inter-state, and more accurately a global North-South, policy issue. There is only one reference in the whole section and this presents a stark contrast with the other sections which have numerous, overlapping citations. There exist many references that could have been referred to, just to cite two examples consider the following: (2009b). United Nations World Economic and Social Survey 2009: Promoting Development, Saving the Planet. Sales No. E.09.II.C.1.; and United Nations (2010a). World Economic and Social Survey 2010: Retooling Global Development. Sales No. E.10.II.C.1. The bibliography of these publications point to a vast policy evaluation literature pointedly ignored in this chapter. In many of these alternative uncited analyses, price mechanisms are seen to be either less effective or unacceptably inequitable. The text in this section gives an example of this in: "the use of certain market mechanisms, such as carbon trading schemes, may not be suitable or effective, or require significant efforts for creating the institutional prerequisites" (page 38, lines 36-38). | Will be addressed in SOD |
| 11010 | 3 | | | | | key point is that there are tradeoffs among the criteria by which policies may be evaluated. Shaping policies to make them politically acceptable within a given institutional setting makes them less efficient. Also, policy makers' knowledge is imperfect. Note 23 accurately observes that political factors have often been more important than economic ones. But the draft has almost nothing to say about what those factors are. In fact institutions and the uneven distribution of power within societies results in very uneven weights in the welfare of groups within a society. Whether the selectorate is broad or narrow with respect to the ruling coalition on the one hand and the population as a whole on the other is likely to profoundly affect policy choice. Further, policy instruments differ in the "political visibility" of costs and benefits. Compared to Pigouvian taxes, command and control regulations offer less easily perceived costs and more easily perceived benefits. At least in countries with broad rationally ignorant selectorates there is a bias toward the choice of less economically efficient command and control. | Good point; we took this into account in revising section. See new sentences in 3.9.1.4. |
| 4500 | 3 | | | | | It would seem appropriate in this section to cite the critique(s) of conventional integrated assessment models, such as Ackerman et al. (2009) which already is listed in the bibliography. There is by no means a consensus that existing integrated assessment models accomplish the objectives listed in this section. | We now refer to this paper in this paragraph. |
| 17913 | 3 | | | | | The explanation of co-benefits are inconsistent with agreements made in Wellington implying that LAs also use the term denoting climate benefits (and costs) from policies targeted at other policy objectives. The explanation additonally omits the possibility that climate policies often have an impact on pollution abatement costs and move the intersection points of marginal abatement costs and marginal social damages of pollution - thereby potentially yielding net gains for society. According to Pitcher (2000, p. 131), this is due to the fact that "policies to control greenhouse gas emissions have joint products; they also end up reducing emissions of other gases, or have impacts that are germane to other areas of concern…it is no longer possible to assign unique costs to the various outputs". Please take into account the definition and conceptual issues discussed with the Co-Chairs and the TSU prior to LAM3.<br>Hugh Pitcher (2000) Extending Integrated Climate Assessment Models to Include Ancillary Benefits: Problems and Prospects. In OECD, "Ancillary Benefits and Costs of Greenhouse Gas Mitigation". Proceedings of an IPCC Co-sponsored Workshop, Washington D.C., USA. | We revise explanation of co-benefits, in a whole new section. |
| 17914 | 3 | | | | | From the last short paragraph of the sub-section, it does not become clear whether the term co-benefit extends to these "other national objectives" (line 14). For chapters 4 through 12 and 15, these other objectives play an important part in the co-benefit/co-cost discussions. Please liaise with the relevant chapters in the cross-cutting meeting to determine a viable labor division and synthesis of results with respect to the co-benefits/co-cost assessment across chapters. | We now refer to the new longer section on co-benefits |

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| 15361 | 3 | | | | | This section agrees with me on the prior comment, but sweeps all the prior issues about the Pareto principle under the rug. | No action; no change implied |
| 15363 | 3 | | | | | This section is nice, points out how choice of an ethical system can be self-serving. Once it is possible to show that a particular ethical system leads to a specific distribution of wealth among parties, then those who gain from such an outcome have every reason to advocate that particular system. Therefore, a systematic comparison of ethical arguments to outcomes for parties making those arguments would be very enlightening, especially if combined with an analysis of whether those parties reveal their adherence to the same ethical arguments in their other dealings and decisions. For example, suppose some parties advocate an ethic that implies that a class, of which they are a member, should pay compensation to another class. Do those parties now provide a higher percentage of their GDP as aid to the class deserving compensation as part of climate policy? | No action; no change implied, confirming |
| 15364 | 3 | | | | | The discussion on prescriptive policies versus market-based policies in this section needs to be applied in each of the policy chapters (e.g. chapters 13-16). | No action; needs addressing in chapters 13-16 |
| 15365 | 3 | | | | | This is weak; many examples of modeling of cap and trade with regulatory measures show that the prescriptive measures move more costly actions down the supply curve and push out less costly, so that the same emissions are achieved at higher cost. This clearly applies to CES, RPS, CAFÉ, and LCFS. See: Jan Imhof. “Subsidies, Standards and Energy Efficiency”. The Energy Journal. Vol. 32 (Special Issue 1). October 2011. | Will be addressed in SOD |
| 15366 | 3 | | | | | This is weak; many examples of modeling of cap and trade with regulatory measures show that the prescriptive measures move more costly actions down the supply curve and push out less costly, so that the same emissions are achieved at higher cost. This clearly applies to CES, RPS, CAFÉ, and LCFS. See: Jan Imhof. “Subsidies, Standards and Energy Efficiency”. The Energy Journal. Vol. 32 (Special Issue 1). October 2011. | No action; duplicate |
| 15368 | 3 | | | | | This overlaps with international and regional chapters – though much clearer, it needs to bring in perspective on on-the-ground adaptation, how institutions shape economic outcomes of policies, and realism in assessment of aid and possibility of delivering on the ground improvements without harm. | No action; Chapter 3 deals with concepts, and Ch 13, 15 (for instance) deal with evaluative aspects as such. |
| 15372 | 3 | | | | | This needs to start with Acemoglu, Shirk, etc to discuss how Limited Access Order policies are designed to maintain the rulers in power in a limited selectorate by distributing patronage – climate becomes another example. And even in more advanced economies the same holds – see Lane and Montgomery, Weingast on nuclear power, Cohen and Noll, etc. See: Daron Acemoglu, “Why not a political Coase theorem?” Journal of Comparative Economics. Shirk, Susan L. China: Fragile Superpower. New York: Oxford University Press, 2007. Lane, Lee L. and Montgomery, David, Political Institutions and Greenhouse Gas Controls (November 5, 2008). Reg-Markets Center Related Publication No. 08-09. "Congressional Influence over Policymaking: The Case of the FTC" (Barry Weingast, Randall L. Calvert, and Mark J. Moran), in Mathew D. McCubbins and Terry Sullivan (eds.), Congress: Structure and Policy (Cambridge University Press, 1987), Ch. 19. Linda R. Cohen, and Roger G. Noll (With Jeffrey S. Banks, Susan A. Edelman, and William M. Pegram). The Technology Pork Barrel. Washington, D.C.: The Brookings Institution, 1991. | No action. We feel that this political discourse would take us too far afield from climate policy, especially in a short section of a chapter that cannot cover all such considerations. |
| 15373 | 3 | | | | | This section provides a clear statement of the efficiency criteria normally applied in economic studies. I do not think it does as good a job of stating distributional criteria criteria. The ethics section makes it clear that distributional criteria embody ethical judgments, that they are not self-evident, and that different ethical systems would support different criteria. Thus any simple summary of distributional criteria is likely to be oversimplify. | Good point. We now clarify that the point of measuring distributional effects is then to insert them into a SWF. We added a parag that refers back to SWF in section 3.4.5 |

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| 15374 | 3 | | | | | The treatment of co-benefits is generally good. However, it leaves out the critical qualification that a comprehensive C-B is required to estimate co-benefits properly, and that if optimal controls are put on each of the sources of co-benefits, by the envelope theorem the co-benefit terms disappear from the first-order conditions. Thus the degree of co-benefits depends on the sign and magnitude of the deviation from optimality in controlling other externalities and the assumption that optimality cannot be achieved. If optimality can be achieved for all externalities, then the only significance of co-benefits is that the objective function in cost-benefit analysis is not separable, and the optimal value for all externalities must be solved for simultaneously. | We now refer to the new longer section on co-benefits in SOD. |
| 9336 | 3 | | | | | the chapter attempts to cover several aspects of the literature on ethics and economics but then ends abruptly; it does not provide the linkages which are important to policy makers: for example, a mix of policy instruments is indicated but when is it preferable to use legal instruments as compared to economic instruments? also, the quantitative CB approach is privileged, sometimes at the cost of repitition (pointed out later in a specific content. In particular, a discussion on deliberative approaches could be added. a last section to bring the pieces in the discussion to a logical end with choices for decision makers under different situations could be added. | Noted; will be addressed in SOD. More examples to be included in SOD. |
| 17292 | 3 | | | | | This is an innovative, timely and important contribution to the Fifth Assessment Report and IPCC assessment as a whole.<br><br>The executive summary is well written and internally consistent.<br><br>The chapter as a whole is in better shape than several other First Order Drafts. | Thank you for your comments. |
| 16623 | 3 | | | | | Try shortening to about half its current length. | Noted; we will make the best effort to shorten the length of the chapter as we |

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| 8787 | 3 | 0 | | | | The apparent ignorance of the authors of some of the earliest and still most salient literature on ethics and climate change (Jamieson D (1992) 'Ethics, public policy, and global warming', Science, Technology and Human Values, 17(2), 139-53 - Also in Light A and Rolston III H (2003) Environmental Ethics: An Anthology, London: Blackwell and reprinted in Jamieson D (2003) Morality's Progress. Oxford: Oxford University Press) and more recent literature (e.g. Garvey J (2008) The Ethics of Climate Change: Right and Wrong in a Warming World, London: Continuum, Gardiner's work referred to in Chapter 4 of the WGIII AR5 FOD) is shall we say surprising. Jamieson (1992) is all the more salient since Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) demonstrates the epistemological assumptions of economistic approaches to climate change are false - we cannot robustly predict costs to be used in CBA. That the ethics of utilitarianism is given prominence is not surprising, though disappointing given Jamieson (1992). That only deontological forms of ethics are the only others given any prominence (with the partial exception of Buen Vivir and GNH) is again unsurprising; however, it is unforgiveable given Jamieson (1992). It is all the more unfortunate as evidence is available that the utilitarian ethics that underpins conventional economics is the principle ethical starting point of only a minority of the global population - albeit the most influential proportion. In summary economic approaches to climate changes are irrational and undemocratic. I have completed a currently unpublished book manuscript that directly addresses making climate and sustainable development policy in the light of inability to predict the Earth System with a virtue epistemology and ethics approach being a central response. Evidence of the democratic distribution of ethical assumptions and discussion of the application of virtue to sustainable development issues include, http://www.earthcharterinaction.org/invent/images/uploads/echarter_english.pdf, Palmer M and Finlay V (2003, n.b. page xi, Faith in conservation: New approaches to religions and the environment, Washington DC: The World Bank, http://go.worldbank.org/3L9IDQNFO0 or http://www.arcworld.org/books_resources.asp. Accessed 9 May 2011); Connelly J (2006) 'The virtue of environmental citizenship' in Dobson A and Bell D (Eds.) Environmental Citizenship, Cambridge, Mass.: MIT press; Sandler R and Cafaro P (Eds.) (2005) Environmental virtue ethics, Lanham, Md.: Rowman and Littlefield ; Inglehart R, Basanez M, Deiz-Medrano J, Halman L & Luijkx R (2004) (eds.) Human Beliefs and Values: A Cross-Cultural Sourcebook based on the 1999-2002 values Surveys, Mexico City: Siglo XXI; and to an extent BBC World Service polls http://www.bbc.co.uk/pressoffice/pressreleases/stories/2007/11_november/05/climate.shtml, http://www.bbc.co.uk/pressoffice/pressreleases/stories/2009/12_december/07/poll.shtml and http://www.bbc.co.uk/pressoffice/pressreleases/stories/2010/01_january/17/poll.shtml. | Will consider these references |
| 8790 | 3 | 0 | | | | It is surprising that this chapter does not mention work such as that by Okereke (an author of Chapter 4) on justice and climate change. | Will consider this reference |
| 8793 | 3 | 0 | | | | The coverage of the literature that the authors choose to discuss is adequate, though limited by being framed by their assumptions being largely restricted to consequential and deontological ethics and predictive epistemology. | No action. We feel that the text adequately addresses this issue. |
| 12239 | 3 | 0 | | | | General comment: There seems to be some inconsistancy on the level of detailes between the different sections. Making the text more consistent in respect to these aspects will make the text easier to read and the information easier to grasp. | Noted; smoothing out the choppiness among the various section is a goal for SOD |
| 12240 | 3 | 0 | | | | General comment: Some of the information might be redundant, and can be removed, e.g.line 1 - 2 on page 14, and line 18-19 on page 41. | No action - Line references do not appear correct |
| 12241 | 3 | 0 | | | | General comment: The complecity is varying substantially between sections. It seems like the different authors in this chapter had completely different readers in mind. F.ex. The reader who needs the specification: "A policy is more cost-effective if it achieves a given pollution abatement at lower cost." (page 41 line 18-19) will find it hard to understand section 3.10.3 or 3.10.5. | Noted; smoothing out the choppiness among the various section is a goal for SOD |

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| 12242 | 3 | 0 | | | | General comment: This chapter is a bit too detailed. If the text were restricted to explain the main conclusions and dilemmas under each headline it will be easier to read and the main points under each headline will come across a lot clearer. | No action. Our goal is to assess the literature; detail is inevitable. |
| 12243 | 3 | 0 | | | | General comment: Some of the sub-subsections have introductions of the kind: "This subsection summarizeses..." (e.g. 3.10.4 and 3.11.1), while others don't. We'd recommend that this type of introduction is restricted to sections(3.X) and not used on sub-subsections. | Good point; will try to address use of introductions to sections in revision. |
| 4919 | 3 | 0 | | | | One general conceptual problem related to the analysis of the ethical aspects is that the impacts of the expected worse future climate conditions (for next generations or for some regions) are considered as a possible basis e.g. for compensatory duties etc. It is admitted that it is not easy to define what is the wrong (worse) climate and what is the basis to which the future well being (worse off) could be compared, however, another critical problem associated with climate change is identified (according also to the former IPCC ARs and the UNFCCC as well) with the rate/speed of the change because of the limited ability to adapt to it (i.e. the problem of the "time frame"). | No action; good point but not clear what action is being requested. |
| 10689 | 3 | 0 | | | | Some parts of the chapters are written more like a review and not as an assessment. I suggest that the authors put more emphasis on the assessment aspects. | Noted; good point which we will keep in mind in our revision. This is a framing chapter however, which makes the |
| 10714 | 3 | 0 | | | | I'm not sure if chapter 3 is the best place, but somewhere in WGIII the various alternatives for design of multi-gas policies (as embedded in the UNFCCC) should be discussed; i.e. whether a gas-by-gas approach, a basket approach (like in the Kyoto Protocol) or a multi-basket approach is chosen. There are some papers in the literature on this. (see brief disussion of this - and references - in section 8.7.1.5 of WGI). | No action - Chapter 3 is not the best place for this issue to be addressed |
| 10715 | 3 | 0 | | | | Section 3.10.3 on metrics could be better integrated in the chapter with stronger links to applications in the chapter (and probably also in other parts of the report). | The section is already too long; but will try to link it better |
| 12998 | 3 | 0 | | | | The second half of the chapter (from 3.6 onwards) seems disconnected from the first half, especially in that the ethical aspects seem to be displaced by the narrowly economic. Also, more could be done so that the first two chapters anticipate the first half of this chapter. Indeed, there is some question about why chapter 3 does not come earlier, given that value claims are already being made in chapter 2. | Will work to smooth things out in SOD. We agree that our chapter might appropriately go before the current Ch 2 but that is a decision for the IPCC. However, ethics and economics are two somewhat separate issues addressed in |
| 13008 | 3 | 0 | | | | I'm surprised by the relative lack of discussion of some normative perspectives, such as human rights and the capabilities approach. | We cover the rights of nature. This chapter is not intented to be prescriptive. |
| 8820 | 3 | 0 | | | | This is a clearly written chapter that provides an overview of social, economic, and ethical concepts relevant for assessing climate change impacts and policies. Most of the comments provided below reflect my own experience in the decision sciences and what I perceive to be a general tendency in the chapter to overly rely on the insights and prescriptions of economics, to the extent that important insights from other social sciences are at times neglected. | Thank you for your comment. |

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| 16927 | 3 | 0 | | | | This chapter has an almost impossible task. Unlike most others, which are focused on topics specifically related to climate and energy, or the literature mostly of recent years (eg. Chapter 2), the chapter 3 outline appears in effect to be asking to interpret Millennia of thought on social, economic and ethical concepts, as they might pertain to climate change. This is an awesome task. The authors have my sympathies.<br>Unfortunately the chapter in its current form does not even get close. The present draft seems to suffer from a partisan emphasis, a lack of awareness of numerous key debates and perspectives, and a fatal lack of intellectual integration.<br>Because of the central importance of the issues, this is sad because it represents a huge missed opportunity. Shedding objective clarity on these issues could be tremendously helpful, and help the governmental audience to understand some of the most fundamental obstacles to global cooperation, and thereby help to overcome them. Unfortunately, in its current form the chapter risks doing the opposite, and may risk undermining the entire AR5 (WG3) report in the process. The last time the IPCC formally attempted to address such broad, cross-cutting and sensitive issues of ethics, valuation etc was in the Second Assessment Report. The resulting controversy almost destroyed the institution. Some governments, led by India, threatened to walk out, and ended up rewriting the PSM and demanding changes in the underlying chapter on 'cost-benefit' in ways to which the Authors of that chapter formally objected. In end, it should be noted, it was the authors that subsequently seemed to shift their position (without overtly admitting it), when they later clarified what they had stumbled over and concluded that economics could not be expected to come up with a global 'cost of damages' answer (Fankhauser, Tol and Pearce, 1997).<br>The Third Assessment report did discuss a number of the principles to try and clarify at least what went so wrong, and I would strongly suggest that this chapter starts from the points reached out in the TAR (the Technical Summary seems to contain a useful road into this)..<br>The present draft shows no awareness of this history and little better understanding of the issues. This, combined with the partisan coverage, lack of awareness of key debates, and a lack of intellectual integration, at present could place the AR5 in similar difficulties. It must be addressed.<br>Though I am aware of this historical knowledge, my own research expertise is not really aligned with the scope of the chapter. Having spent ten years at the UK's leading economics faculty, to some extent I must share the bias towards western economic thought that this chapter displays. A colleague of mine (Sonia Klinsky) who did her PhD at UBC on the topic of climate and justice has submitted detailed comments on the content of this chapter, which seem to me compelling.<br>Consequently I confine my specific comments to two main areas: section 3.5 on aggregation of costs and benefits (the topic on which the Second Assessment blew up); and 3.10 on metrics of costs and benefits.<br>However I offer the following broad cross-cutting thoughts for the authors to consider.<br>(1) There can be genuinely incommensurate ways of assessing a problem, when moral frameworks clash. A classic example in philosophy (I may have details wrong) is if three children are playing and one finds a musical instrument. They may have completing claims to ownership: one found it first; one may be able to play it, and thus gain most value from it; the third may recognise it as something his father lost the previous year, and hence claims family rights. There is no "objective" right answer. A decision may be reached through negotiation (which could include, for example, sharing). The outcome of such negotiation may indeed reveal preferences including | Noted; we are sensitive to the value of a statistical life issue, which was a problem for some in the SAR. Integration with Chapters 2 and 4 is nice but logistically difficult. |
| 4257 | 3 | 0 | | | | This chapter doesn't seem to consider health co-benefits explicitly-- in fact health as a topic sems to be absent | No action; health is not the focus of this chapter. |

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| 8143 | 3 | 0 | | | | This is an extensive chapter that is well-written and covers a lot of material on topics related to procedural and distributive justice, social welfare functions, cost benefit analysis (CBA), time and discounting as well as technological change. The challenge is to integrate these concepts so the reader sees how they are connected. One way to do this is construct some illustrative examples related to mitigation and/or adaptation (e.g. carbon policy, investment in energy efficiency measures) that will enable you to:<br><br>• Link concepts of distributive justice and the construction of a social welfare function more closely<br>• Tie CBA more closely with discounting over time<br>• Show how technological change relates to the above conceptual and methodological issues<br>• Highlight concepts of behavioral economics that should be considered in designing and evaluating different policy instruments<br><br>In our FOD Chap. 2 we provide a set of examples in the Introduction (Sect. 2.1) that we weave into our discussion at various points of the chapter. Feel free to use any of these examples or variations on them if that would be helpful in this regard. We then introduce System 1 and System 2 behavior that forms the basis for Kahneman's book Thinking, Fast and Slow and illustrate how it impact on Perceptions and Behavioral Responses to Risk and Uncertainty (Sect. 2.2) and Tools for improving decisions related to uncertainty and risk in climate change (Sect. 2.3). Some of this material may be relevant to linking concepts of behavioral economics and descriptive models of choice in your chapter. I elaborate on these points in the Specific Comments. | Good suggestion. In fact, such examples (as are in Ch 2) are intended for the SOD. |
| 11530 | 3 | 0 | | | | This is an extensive chapter that is well-written and covers a lot of material on topics related to procedural and distributive justice, social welfare functions, cost benefit analysis (CBA), time and discounting as well as technological change.<br>In our FOD Chap. 2 (attached) we introduce System 1 and System 2 behavior that forms the basis for Kahneman's book Thinking, Fast and Slow and illustrate how it impact on Perceptions and Behavioral Responses to Risk and Uncertainty (Sect. 2.2) and Tools for improving decisions related to uncertainty and risk in climate change (Sect. 2.3). Some of this material may be relevant to linking concepts of behavioral economics and descriptive models of choice in your chapter. □ | No action; duplicate |

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| 11014 | 3 | 0 | | | | The current draft of Chapter 3 fails to take advantage of the new institutional economics (NIE) and positive political theory (PPT) literatures. These fields of study discuss many central issues of economic development and the links between political institutions, economic institutions, and technological change. The relationships studied are important potential influences that require consideration in the new IPCC scenario building process. Further, the NIE and PPT literatures throw much light on the question raised in Chapter 3 about how national institutional matrices will influence the institutional and political feasibility of using various mitigation policies and policy tools. A revision of Chapter 3 appears to be the most logical place in AR 5 to remedy this neglect.<br>The NIE literature suggests that societies' institutions differ greatly in the degree to which they permit entry into political and economic activity. These differences are stable over long periods of time. They appear to affect per capita GDP growth rates as well as the rate of technological change. There are multiple implications for future patterns of economic development as well as for the feasibility of both mitigation and adaptation.<br>Institutions constrain policy choice and policy performance. These constraints are likely to be important to both mitigation and adaptation. A few of the well-established links between national institutional matrices and political behavior include the following. 1) The timing of major contests for political power has a major effect on policy makers' discount rates. 2) The range of organizations for which government provides third-party contract enforcement affects the prevalence of collective action problems. 3) Large N selectorates reinforce rational ignorance, while small N selectorates bias the political process in favor of providing private rather than public goods. 4) Institutional matrices often create "veto gates" at which actors are empowered to block implementation of proposed policies; societies differ greatly in the number and distribution of such veto gates. 5) Institutional change, like technological change but through different mechanisms, tends to be path dependent.<br>Accounting for these and other institutional constraints suggests a new criterion for policy choice which is quite relevant to climate policy analysis. "…[A]n extant mode of organization for which no superior feasible alternative can be described and implemented with expected net gains is presumed to be efficient. (Williamson, Oliver E. "The New Institutional Economics: Taking Stock, Looking Ahead." Journal of Economic Literature Vol. XXXVIII, September 2000: 595–613) Consideration of institutional factors also largely explains the lack of progress toward mitigation noted in Chapter 15 of the AR 4 Working Group 3 report. | No action. These are good points, however, the chapter cannot cover all of economics. |
| 17150 | 3 | 0 | | | | In general, good, sound and balanced chapter - with plausible justification for treatment of ethical issues in AR5 in general. | Thank you for your comments. |
| 17151 | 3 | 0 | | | | Fact-Value dichotomy (e.g., the possibility of value-free economics) assumed throughout ch 3, even though much literature heavily criticizes this view (Putnam, H.: The Collapse of the Fact/Value Dichotomy and Other Essays. Cambridge Mass.: Harvard University Press, 2002. Or: Douglas, H.: Science, policy, and the value-free ideal. Pittsburgh: Univ. of Pittsburgh Press, 2009. Or: Caldwell, Bruce J.: Beyond Positivism. Economic Methodology in the Twentieth Century. Revised Edition. London: Routledge, 1994). Example: p. 8, l. 12: "Positive questions are essentially value-neutral". ------ As a result of this misconception, ch 3 fails in addressing (at least mentioning) implicit (opaque) value judgments in economic, technological and other studies related to mitigation options - as another highly important task of ethics in climate policy. Already on the level of data selection for empirical analysis, even more on the level of parameter choice in Integrated Assessment Models, and concerning the scope of studies in general (what do they not take into account? Why?). Literature (for example): Beckerman, Wilfred: Economics as applied ethics. Value judgements in welfare economics. Houndmills, Basingstoke: Palgrave Macmillan, 2011. Or: Ackerman, Frank/DeCanio, Stephen J./Howarth Richard B./Sheeran Kristen: Limitations of integrated assessment models of climate change. Climatic Change, 95 2009, 297-315. | No action; this is a mistaken comment. There is no suggestion that economics is value-free. |

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| 17152 | 3 | 0 | | | | Unclear throughout ch. 3: Relationship between ethics and economics. It should be made clearer that the normative presuppositions and objectives of (welfare) economics (such as "efficiency") are obviously "values" (in your terminology). These values should be (explicitly) framed and reflected in ETHICAL terms therefore. They cannot be derived from mere economic concepts. In other words: the role of economic arguments (e.g., compared with the role of social, ecological, and other arguments) in the evaluation of climate policy options can only be determined by ETHICAL considerations. Moreover, ethical considerations (should) already integrate all relevant knowledge from economics, etc. Thus, one cannot play off ethical arguments against economic ones, as sometimes suggested by the authors and by many economists (e.g., when assuming a trade-off between ethics and efficiency, even though efficiency is one normative target among others - and not even a very important one). These issues remain unclear/ unresolved in the Executive Summary (no explanation of relationship between welfare economic approach and ethical considerations of justice and values), in the Introduction (for instance, p. 8, l. 14f: "using economics and ethics to answer questions of what should be done"), etc. Chapter 3.7 discusses parts of the ethics-economics relationship, but with a much too narrow focus: ethics is reduced to equity (and assumed as being independent from efficiency, which is disputed among economists). | Noted. We think we are fairly clear on the normative aspects of economics. We will try to integrate the sections better in the SOD |
| 17153 | 3 | 0 | | | | Missing in ch 3: mentioning that climate political (or WG III AR5) PROBLEM FRAMING is always value-laden (what counts as "problem", etc) and therefore implying lots of ethical questions. | No action; comment unclear |
| 17154 | 3 | 0 | | | | Missing in ch 3: ethics of dealing with risks and uncertainties. Even though risks and uncertainties are discussed in other chapters of WG III AR5, it should at least be mentioned in ch 3 (which is about ETHICS!) that these aspects are among the biggest ethical challenges related to climate policy-making. | No action; this issue is more appropriate for chapter 2 |
| 6952 | 3 | 0 | | | | The title of the chapter is 'Social, Economic, and Ethical Concepts and Methods'. However, only 10 or so pages of the 76 pages of content address ethical and moral issues, whereas economics gets around 46 pages. This imbalance does not reflect the many developments in the philosophical literature on CC of the last 10 years. Key debates that are not surveyed (or mentioned) relate to: the attribution of moral responsibility for CC to individual or collective agents (or both, or none); moral justifications for the precautionary principle; the ethics of geoengineering; the role and nature of political representation. | No action; we feel this issue is adequately addressed |
| 18586 | 3 | 0 | | | | Many questions confronting society with regard to climate change are issues of economics and ethics, rather than natural science. This chapter (intends to) frame the ethical and economics dimesions of climate change. True but what is the conclusion. To draw science-like conclusions on ethics? | No action. Comment unclear; no page or section reference numbers |
| 18587 | 3 | 0 | | | | What ought to be done is the subject matter of ethics. | No action. Comment unclear; no page or section reference numbers |
| 18588 | 3 | 0 | | | | True, but what are the implications? To try to sort outsome sort of science-like conclusions on ethics? The intention is unclear and the delivery is vague. | No action. Comment unclear; no page or section reference numbers |
| 18589 | 3 | 0 | | | | CBA is mentioned and discounting is discussed but as a reader it is hard to read out conclusions/learnings. It would be interesting to add case studies and clarify the consequences of different levels of discounting. | No action. Comment unclear; no page or section reference numbers |
| 18590 | 3 | 0 | | | | A long discussion on different principles for responsibility ends in nothing (more than it is hard) and than turns into a discussion on legality/legal principles. Will this really be helpful? | No action. Comment unclear; no page or section reference numbers |
| 18591 | 3 | 0 | | | | Legal rights? For whom? In what sort of context? Now the discussion turns into civil or common law principles. | No action. Comment unclear; no page or section reference numbers |
| 18592 | 3 | 0 | | | | “Cosmopolitan democracy” | No action. Comment unclear; no page or section reference numbers |
| 18593 | 3 | 0 | | | | What is the long reasoning aiming at? Reaching “divine justice” or action on mitigation? | No action. Comment unclear; no page or section reference numbers |
| 18594 | 3 | 0 | | | | Coming up next is a division of values into non-human and human. | No action. Comment unclear; no page or section reference numbers |
| 18595 | 3 | 0 | | | | And so “wellbeing” is analyzed/discussed | No action. Comment unclear; no page or section reference numbers |

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| 18597 | 3 | 0 | | | | Policy instruments are understood as the key means or operational forms for achieving policy objectives and policy targets. Policy instruments are often understood to have the effect of guiding social considerations targeted by public policy, providing incentives or disincentives and information. | No action. Comment unclear; no page or section reference numbers |
| 18598 | 3 | 0 | | | | A long discussion end without any sort of firm conclusions. | No action. Comment unclear; no page or section reference numbers |
| 18599 | 3 | 0 | | | | The subject is now turned into an overview of policy instruments (no direct link). Should it be coupled to later chapters? (13 – 15?) | No action. Comment unclear; no page or section reference numbers |
| 18602 | 3 | 0 | | | | The problem is not the analysis/the overview (restrictions and flaws was clearly declared from the very beginning) but how the material has been used sometimes. | No action. Comment unclear; no page or section reference numbers |
| 18603 | 3 | 0 | | | | MACCs and wedges are also discussed in other chapters (at least in chapter 6 and 7) but neither the basic descriptions nor the conclusions seem to be aligned. | No action. This chapter set up the framework; other chapters will be |
| 18607 | 3 | 0 | | | | The chapter goes through a lot of interesting material but where does that lead us? | No action; comment unclear |
| 18608 | 3 | 0 | | | | Is an ethical response to climate change an issue that can be answered by science. If so, when? The intention goes, in my eyes, far beyond what can be delivered. Ethical conclusions will be drawn by societies/communities in the form a “value systems/paradigms”. They can be informed by science but hardly formed. | No action. Comment unclear; no page or section reference numbers |
| 8998 | 3 | 0 | | | | The Chapter takes the tone of an undergraduate textbook to review what its authors consider to the relevant literature on social, economic, and ethical concepts and methods. Large word counts are taken up by mostly well-known approaches that are irrelevant to policy making at the international level on issues related to climate change. The self-stated claim of the chapter is "not to attempt to answer normative questions" (line 17 page 8). The authors intend the chapter to be a "resource for policymakers and researchers who are trying to solve normative questions. In that sense, the chapter is policy-relevant but not policy-prescriptive". The chapter as written privileges market-based policies that are effective mainly in developed countries. Because of this bias, much of the literature it surveys is irrelevant to its self-stated intention. The incomplete treatment of literatures creates an imbalance in favor of normative approaches that work best in to developed country contexts which have operating - though perhaps poorly regulated - private markets. There is a need to recognize more of the development-oriented literature. | Noted. We recognize the importance of developing country perspectives. We are also trying to move away from textbook treatments. |
| 9013 | 3 | 0 | | | | There is no coverage of the recent and growing literature on carbon budgets in the the chapter. If there is anything that is new since AR4, it is this literature and should be incorporated in the chapter | No action. We don’t think this is necessary in framing chapter. Perhaps more appropriate for one of the policy |
| 9017 | 3 | 0 | | | | Drawing on the literature, it is important for the survey of the intellectual property literature to balance the coverage between the conditions under which monopoly property assignment of intellectual property has a positive and the conditions under which this approach has a negative impact on innovation and dissemination of technologies. When the current developed countries were poor, the enforceable intellectual property protection regime was mainly at the national level. The survey should reflect the variety of aspects under which developing countries are at a disadvantage in undertaking climate change technological transformation. | Noted; will be addressed in SOD. CA provided paragraph addressing this comment. However, there is little evidence that IPR has been a barrier to diffusion of climate-friendly technologies. |

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| 12777 | 3 | 0 | | | | Within this chapter justice issues are looked at from different points of view as well as as an interdisciplinary perspective. Therefor it is often not easy to follow which perspective is taken. To support the reader you may like to consider restructuring the chapter (e.g. according to the dimensions of justice; see Executive Summary, line 26, or bundling of ideas acording the differentiation: Intragenerational justice: egalitatrian principle, CBDR, Need ..., Intergenerational justice and historical responsibility...or: present the main idea, then introduce the single building blocks, ways of measuring the blocks...). You may also like to check who the readers are (Are readers able to follow, can the reader make links between the statement. You may also like to consider which statements can be grouped because they depend on the same main presuppositions (e.g. with regard to uncertainty or dicount rate). You may find some ideas for structuring the arguments in Chap. 4 and in Chap. 3 on page 46. Actually, at this stage, it does not make much sense to give comments on the chapter as there is far too much confusion. Especially this concerns 3.1, 3.2, 3.3 (3.3.6 and 3.3.7.1 are much better organised, in section 3.3.7.2 and 3.3.7.3 the main point is the missing references), 3.4.3, 3.4.4. (3.4.5 is easier to follow, however, at some places it might also be worthwile to think about the placement of the arguments, to be more focused on the climate problem), 3.4.6 (provide better links to climate problem and referecnces, consider shortening), 3.5.1 (reconsider the structure of arguments and for whom it is written, ll 20-28 are fine, however the link to justice considerations is missing, (3.5.2 is easy to follow, 3.5.3. also easy to follow, however, focus should be on the main point), 3.6, 3.7. (link to welfare theory is missing), 3.8 (high potential for shortening, e.g. 3.8.2.1 to 3.8.2.3, statements could be better linked with the other sections of chapter 3), 3.9.1.2, (3.10 and 3.11 easier to follow, still, some arguments should be reconsidered and more focused, the sections can also be shortened, (3.12. is fine). You may also like to consider whether it might make sense to strictly differentiate between the normative concepts of justice and the individual perceptions of what is fair and may like to use the term fairness for the subjective perspective (with regard to the climate context see e.g. Ittner, H., Ohl, C. (2012), International negotiations on climate change: Integrating justice psychology and economics – a way out of the normative blind alley? In: Kals, E., Maes, J. (Hrsg.), Justice and Conflicts: Theoretical and Empirical Contributions. Springer, Berlin, Heidelberg, ISBN 978-3-642-19034-6, 269-282). | No action; section titles were given |
| 7898 | 3 | 0 | | | | Although in chapter 3 many aspects are discussed that are also dealt within chapter one, links and cross references are missing and should be included. | No action; Ch 1 is an overview so it is inevitable that there will be overlap. |
| 7899 | 3 | 0 | | | | Some sub-chapters are rather isolated. For instance, the key claims of section 3.3. are largely ignored by the other sub-sections. Also, several points that are made in sections 3.11 and 3.12 challenge assumptions the analysis in sections 3.5, 3.7, and 3.10 are based on. Cross references should be included and/or discussions moved to other sections. To provide just one example: in section 3.12 it is argued that technological inovation should be modelled endogenously; studies projecting costs of mitigation that are cited earlier assume innovation to occur exogenously. This difference should be noted and discussed. | No action; we note these particular differences in the text. |
| 7900 | 3 | 0 | | | | With the exception of section 3.3 the chapter omitts almost all contributions from the field of climate ethics. This is surprising given the titel of the chapter. Another surprise is that although there have been hardly any contributions to climate ethics from a utilitarian or welfarist perspective so far (notable exceptions are Broome 1992, 2012 and Lumer 2002), most of chapter 3 deals with these approaches while duty and/or justice based perspectives are ignored (see references mentioned in the following, in particular in comments 60 and 82). Two salient concepts, C&C (Meyer 2000) and GDR (Baer et al. 2009), are mentioned only once and are discussed nowhere. | Will be addressed in SOD |
| 7901 | 3 | 0 | | | | Important issues that are discussed in the literature (sometimes at great length) are not dealt with, such as: wich stabilization levels can be justified on ethical grounds, mitigation duties of high emitting countries, responsibilities to finance adaptation / provide compensation to those (most) vulnerable to climate change, and duties of individual persons. | No action; these are policy-prescriptive issues, inappropriate for IPCC |

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| 16622 | 3 | 0 | | | | Chapter 3 does a great job in gathering the main social, economic, and ethical concepts and methods surrounding climate change. However, many sections the chapter fail to provide insight on how the concepts and methods included in the chapter or a particular section can be used in practical policy-making. Addressing this issue would make the chapter more engaging and will provide a common thread to the ideas included in the chapter. I would like to point out that by and large most of the relevant information is already included in the the chapter. That said, the organization of the chapter would greatly benefit from a short introduction to each section that highlights the relevance of the material in the section for the reader—how this material can be useful in policy making—and examples of how the concepts and methods in the chapter have been implemented in the literature (and maybe in policy if proved successful).<br>For the section introductions, in many cases there is a paragraph in the section does serves this purpose but it is located at the end of the section (or subsection). I recommend that the authors move these paragraphs much earlier in the section.<br>Also, in some sections, many applied examples are already mentioned in the references but need to be highlighted. I recommend that the authors do so. In other sections, the theory is presented with some practical objection that make it difficult implement. In these cases, I recommend that the authors point out the kind of advances in the theory that would make the policy implementable or workarounds/simplifications that have already been applied but may have some shortcomings. | A very good point which we will try to address in the SOD. |
| 3139 | 3 | 0 | | | | There is some overlap between this chapter and chapter 2 (e.g. on CBA and other approaches to aggregating costs and benefits) that could help both chapter streamline if resolved.<br><br>This chapter has a very different feel from WG1 and WG2 chapters and much of WG3. there is little/no discussion of "what's happened since AR4." I don't have a problem with that, but perhaps it is useful to have some text at the outset indicating that the kinds of issues addressed here haven't in past had much attention in IPCC. Thus most of this is "new." | No action. There hasn't been an economics and ethics chapter since at least AR2. Furthermore this is a framing chapter. Thus it seems inappropriate to just focus on what has happened since AR4. |
| 5120 | 3 | 0 | | | | The chapter title includes "social', but the exec summary truncates to economics and ethics; suggest including some high-level framing in terms of social interactions (decisions and behaviours) and obligations (living together despite differing values). This framing would help to draw a tighter bead on the "legal" aspects of the chapter (justice and rights) | No action. Although social is in the title, the outline is focused on economics and ethics, which is reflected in the text. We do address social issues, particularly in |
| 5126 | 3 | 0 | | | | I regret that I have now run out of time for more detailed commentary on the chapter; however, I have read it through carefully and while I conpletely understand the material and respect the selection of sources, I remain unclear about just what the chapter is meant to achieve. No doubt this is my failing and not the authors'. Nevertheless, the chapter appears quite fragmentary; there are certainly good overviews of relevant matters in economics and justice, but the connecting tissues are missing. Much of the content is quite abstract, and I cannot see it as aiding a decision maker any more than consulting a good text would. Given what is in place in the chapter, it seems to me that it needs to be reframed as an overview of the way economics think about policies to address climate change (including the implications from technology change) accompanied by a normative critique. The critique would draw on what tends to be missing or underemphasised in economic thinking, as well as what different policies imply under different considerations of ethics and justice. | Will be addressed in SOD. But we will not be able to refocus entire chapter to talk about the use of economics. |
| 5127 | 3 | 0 | | | | I do not follow the order of the chapter. Why, for example, is aggregation of costs and benefits at section 3.5 and the metrics of costs and benefits at 3.10? The secion on technology change seems almost an afterthought. | Noted. The sections are not easy to organize logically. We have tried reordering them a number of times and there seems to be no easy solution. The |

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| 3612 | 3 | 0 | 0 | | | Problem of Chapter 3 is that it partly lacks the connection to the concrete climate issues important in this report. Chapter 4 is indicated as too long as it now already surpassed the allocated number of pages. The description of different issues, such as equity and burden sharing (4.7.3.2) or the indicators or equity (4.7.4.1) are presented more suitable. It may be considered to integtrate these sections into Chapter 3 rather than deleting them in Chapter 4. | No action; Chapter 3 is already too long -- cant move sections from Chapter 4. |
| 14310 | 3 | 1 | | | | In addition to cost benefit analysis, other approaches deserve a much broader discussion. Cost effectiveness and the rich literature on the "tolerable windows approach" (guard rail approach) or the safe landing approach should be discussed as well. For the guard-rail approach please refer to "T. Bruckner, K. Zickfeld: Emissions Corridors for Reducing the Risk of a Collapse of the Atlantic Thermohaline Circulation, in: Mitigation and Adaptation Strategies for Global Change 14, 61-83, 2008" and the references therein. | No action. This might be more appropriate in the policy chapters. |
| 3371 | 3 | 1 | | | | It is a little unclear what the "social" in the city refers to, and where it appears in the text. | No action; we address social issues in |
| 4918 | 3 | 1 | | | | Ch.3 Social, Economic, and Ethical Concepts and Methods | No action; comment unclear |
| 4932 | 3 | 1 | | | | MISPRINTS etc. | No action; comment unclear |
| 16667 | 3 | 1 | | | | This is supposed to be a chapter about ethical concepts. A great deal of ethics concerns individual behavior and motivation. None of that literature is reviewed in this chapter. It should at least be acknowledged that this is a very partial review of the terrain and a great deal of the usual concerns of ethics are being left out. For two papes that bring questions of individual responsiblity to bear on climate change see Dale Jamieson, “When Utilitarians Should be Virtue Theorists,”Utilitas 19,2 (June, 2007):160-183; and “It’s Not My Fault: Global Warming and Individual Moral Obligation” in Perspectives on Climate Change: Science, Economics, Politics, Ethics, ed. Walter Sinnott-Armstrong and Richard Howarth (Elsevier, 2005) | Will be addressed in SOD |
| 16676 | 3 | 1 | | | | The 10 pages that should be dropped should NOT be the ethics since that is what is new and addressed only chs 3 and 4. Some of the economics is discussed elsewhere in the report and that is the natural place to look for cuts. If I had to cut I guess I would look to 3.8, 3.92, and 3.10 | Thank you for your comment. |
| 9381 | 3 | 1 | | 111 | | The whole chapter is very close to welfare-ethics and to utilitarianism. Yet, it lacks a more comprehensive portray of the ethics of climate change. This would include: ethics of risk, human rights approaches, cosmopolitan interpretations of justice, interpersonal and international obligations which result from that normative framework, Aristotelian approaches which include theories of human flourishing, basic-needs-accounts, theories of ecological justice and approaches to environmental ethics which address the value of natural goods to non-human entities, finally theories which discuss climate as a public good. Moerover, the general scope of ethics is not so much the issue of how exactly burdens and profits shall be outweighed against each other (even though this is of course an important question) and how human well-being can be quantified, but rather: Which claims can be justified both regarding the chance to a decent life for all persons (Aristotelian, Kantian approaches) and regarding a vulnerable nature which suffers from climate-change (environmental ethics). | Will be addressed in SOD |
| 15216 | 3 | 1 | | | | There are some repeated topics and descriptions. It needs to be restructure the chapter. | Noted; will be addressed in SOD |
| 13013 | 3 | 1 | | 111 | | In my view this chapter is poorly structured and very uneven, not only in the clarity of the writing, but also in the degree to which the material is general or specialized, and accessible to lay readers or rather technical. I suspect that this is because it is an amalgam of work by different authors.<br>One way of improving the structure of the chapter might be to bring section 3.7.3, which now begins on p.31, up to the front, to serve as an introduction to the major ethical issues. It is much clearer, less technical, and more relevant than much of the material that now comes before it.<br>Although this would help, I’m not sure that the problem of the chapter’s structure and uneven writing and uneven level of detail in the different sections is remediable unless someone does a total rewrite. | Will be addressed in SOD |
| 9190 | 3 | 1 | | | | it should be noted the costs presented here is assuming that the governmental intervention is cost effective - often it is not the case. As such these are minimum cost estimate. | No action; comment unclear |

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| 11566 | 3 | 1 | | 77 | | General comment: the chapter is called "Social, economic, and ethical concepts and methods". The chapter focuses nonetheless primarily on economic concepts. Little is said about the social and socio-economic concepts and about the difference between economic and other methods. Furthermore, the chapter does not take into account new movements within the academic literature on rational choice, social dilemma theory, public goods and institutional theory. Especially, it is extremely problematic that the chapter does not discuss the work of Elinor Ostrom. Furthermore, it would be more beneficial if the chapter is presented more in the style with chapter 4 that is dilemma and problem driven. The Ostrom approach would be consistent with the conclusions of chapter 4 and 13. | No action. Ostrom is discussed (see p40) and section 3.11.3 |
| 6471 | 3 | 1 | 1 | 77 | 30 | The entire chapger is ethically problematic from the standpoint of acknowledging that according to some ethical theoriies, conflcts between values are resolved not through efficiency arguments but by acknowledging duties, responsibillities, and obligations entailed by deontological arguments including but not limited to human rights based theories. The chapter may remain as wrritten but to solve this problem but it must strongly and expressly acknowledge that rights based theories and other ontological aruments hold that welfare maximation goals may not ignore or jsutify failure to abide by ethcial obligatio This could be remedied by a stement in the preamble thatsays Some ethicists hold that deonotologiasl theoires on which rights to be protected from climate change harms are based may not be modified by utilitarian or welfarte maximizzation techniiues that undermine clear obligations to prevent harm to human life and ecological systems on which life depends. Ethicsists hold that conflicts beteen utilitarian or cosequentiist climate change policy guidence should be reolved on the basis of the strength of ethical aruments not on consequentalist grounds. | Will be addressed in SOD |
| 9385 | 3 | 10 | | 14 | | The debate on justice is very much focused on the future-generation-perspective and the past-generation-perspective (inter-generational justice). Even though this is important, cosmopolitan frameworks also argue for obligations to help persons in need independently of causation of harm; this means that the temporal dimension is not the most important perspective. | No action; we disagree. We believe this issue is adequately covered in the sections 3.3.3 and 3.3.5 discuss issues of intra-generational justice and the |
| 10701 | 3 | 10 | 1 | 10 | 7 | The Ad hoc group for the modelling and assessment of contributions of climate change (MATCH) produced several papers that are relevant for the issues discussed here; see http://www.match-info.net/ | Will consider these references; may include grey literature |
| 11551 | 3 | 10 | 1 | | | "Developing countries will suffer disproportionally more from climate change". Yes but it depends on the response capacity of the country, cf. Chapter 4. | Will be addressed in SOD |
| 3920 | 3 | 10 | 1 | 10 | 1 | This 'suffer proportionately more' sentence seems to be conflict with the discussion latter in the chapter on the non-identity problem. | Agreed. We change 'people in developing countries' to 'developing countries' and delete the parenthesis. However, it should be noted that we have this "conflict" only if we do not |
| 9338 | 3 | 10 | 11 | 10 | 14 | wWho is morally responsible for achieving justice? important question?Who is morally responsible for achieving justice? important question? Any positions in the literature on this? Could be highlighted | No action; we disagree as we ask the question in the next lines and discuss it |
| 4481 | 3 | 10 | 18 | 10 | 24 | This paragraph is confused. In what sense can past generations "owe" something to the present generation? The past is history, and persons who lived in the past have no capacity to act in the world any longer. Also, it is unduly narrow to cite only Rawls in the context. The nature of our obligations to future generations runs through all the major religious traditions, including the natural law tradition. Rawls represents only a tiny sliver of the literature on this vast subject. | No action; we disagree. In the text we say: "justice considerations apply to intergenerational relations if". Justice considerations to not apply to the relations between past and currently living people. But it makes sense to say that currently living people stand under imperfect duties towards past people. |
| 2111 | 3 | 10 | 18 | 10 | 19 | Awkward sentence. | Agreed. Deleted sentence |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7907 | 3 | 10 | 19 | | | Intergenretional justice is not central in rawls Theroy of Justice. Early contributers to the debate about obligatrions to future generations are Parfit (1984), the contributions in Sikora/Barry (1996, reissued), Partridge (1990), and Howarth (1992). | Noted. In our assessment Rawls's discussion of the Savings Principle is an important contribution. At the same time |
| 2110 | 3 | 10 | 2 | 10 | 3 | Ungrammatical sentence. | Agreed. Change to 'There is'. |
| 3923 | 3 | 10 | 25 | 11 | 13 | Some of these intergenerational propositions seem to be proposing not only that abortion is ethically unacceptable but that a failure by each and every woman to conceive to the biological maximum is violating a fundamental human right. Where in this chapter do the authors guide policy makers as to how to use their own values to make decisions about such ethical matters? Another problem is that the reference in line 32 to 'minimal duties of justice to future generations' in a global emissions cap context ignores all the non-emissions benefits each generation passes on to future generations in material and non-material forms. Again, on current projections future generations will be more wealthy than today's generation, so what is being proposed appear to be a transfer from the poor to the rich. Again it would be helpful if the executive summary included its guidance as to ethical answers to these questions. | No action; disagree with comment. The duties are "minimal" as fulfilling them is required for protecting future people against violations |
| 4921 | 3 | 10 | 26 | | | I understand that the focus (based on cited literature sources) is on future temperature as a key factor determining the quality of life, however, in context of (anthropogenic) climate change not only the present emissions affect the life conditions of future generations, but also the changes concerning the sources of these emissions, primarily the rate of utilization of the (finite) fossil fuels (rate of depletion of these resources), the longer-term "benefits" from these activities (e.g. modern or less modern energy or transport related technologies infrastructures; there is a hint to the latter, i.e. better technologies in line 40). As concerns the fossil fuel resources, some also raise the idea of setting caps on the (rate of) use of these resources. | No action; comment unclear |
| 13002 | 3 | 10 | 27 | 10 | 32 | One might mention that the classic source for these kinds of arguments is Henry Shue's papers from the 1990s. | Agreed, added references |
| 7908 | 3 | 10 | 28 | 10 | 34 | Here, the perspectives seems to shift from a rights-based approach to an approach resting on the good life. Please clarify if our observation is correct and if so, provide reasons for this shift. | Agreed, changed accordingly. |
| 17159 | 3 | 10 | 3 | 10 | 8 | Putting so much emphasis on the asymmetry obviously implies a highly disputed value judgment, namely that historical emissions are a huge moral problem. This view is rejected by many authors (and by some governments). Therefore, for being non-policy-prescriptive, the authors should put less emphasis on this asymmetry. By the way: this is again a perfect example for how value-laden problem framing always is... | No action. Disagree that the asymmetry as stated commits us to the view that "historical emissions are a huge moral problem". In 3.3.4 the assessment of the |
| 3921 | 3 | 10 | 3 | 10 | 3 | Is there an ethical basis for the idea that those who are descendants of those who inflicted, unknowingly, a latent harm on future generations in one particular respect, while creating a middle class out of the poor more generally, now have particularly responsibility to those who might have no realistic hope of escaping poverty except by piggy-backing on the know-how and access to resources and trading opportunities of the 'West'? Remember that the chapter aims to help policy makers determine such ethical matters, using their own values. It would be useful if the executive summary contained its guidance in such respects. | No action; the issue is covered in 3.3.4 |
| 6958 | 3 | 10 | 34 | 10 | 34 | The reference to Rawls here is, I think, misleading: it gives the impression that he explicitly addresses the question of a global cap on emissions. | Agreed! Reference was moved |
| 9339 | 3 | 10 | 38 | 10 | 40 | why is this sentence within parentnesis? | Agreed, parenthesis deleted |
| 4480 | 3 | 10 | 4 | 10 | 4 | There is no basis for asserting that the developed countries face "potentially modest damages from future climate change." The statement might be true if the effects of climate change were known to be only minor, but the developed countries are also vulnerable to potential global catastrophes brought on by climate change. | Agreed. Will change 'potentially' to 'relatively' |
| 6957 | 3 | 10 | 4 | 10 | 34 | insert 'relatively' before 'modest' | Agreed. |
| 11009 | 3 | 10 | 41 | | 43 | The draft at this point intimates the larger question. What valid basis exists for setting ethical principles by which to judge the behavior of nations and generations in a radically diverse world? | No action; we disagree: The comment poses a good question, but it is unrelated to this paragraph and cannot |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3922 | 3 | 10 | 8 | 10 | 14 | Again it would be useful if the executive summary provided the chapter's answers to the question of what ethics has to offer in answering these questions. | No action; we disagree as this would be too difficult to do. However in 3.7 we |
| 14839 | 3 | 10 | 17 | | | This section is confusingly presented, with an underemphasis and under-elaboratino of the main point and overemphasis on counter-points that maybe academically interesting but teribly pertinent or widely held. The first one and a half paras could be elaborated, and the remainder addressed more concisely or eliminated. | Will be addressed in SOD |
| 15637 | 3 | 10 | 6 | | | "historical and causal responsibility" - not clear how these two terms are being distinguished. If causal refers to current (as opposed to historical) emissions, then the statement is no longer correct. | Agreed. Deleted "historical and" |
| 11196 | 3 | 10 | 17 | | | suggest add s people (the last word of the heading), ie rights of future peoples | No action; we disagree as we do mean |
| 15638 | 3 | 10 | 38 | | 40 | The view that future generations may well be better off should contain some proviso about the possibility of catastrophic climate change. | We disagree: No need to do this. When we mention one possibility, we don't |
| 7311 | 3 | 104 | 1 | 104 | 2 | "Plourde CG (1972) A model of waste accumulation and disposal " reference. This reference is VERY old. Please consult ref's in Chap 10.AR4.WGIII. and subsequent literature on drivers for waste generation and disposal practices, including the "de-coupling" of waste generation from the primary drivers of population and prosperity, esp. in highly developed countries with high levels of financial support for recycling and waste minimization activities. | No action. Section 3.12.4 p. 72 - text just refers to this as an example of early work on environmental externalities that have since been addressed more recently (2012 example given) |
| 8145 | 3 | 11 | | | | You might want to illustrate the different views of distributive justice by extending the emissions permit example to show how they would be allocated depending on what system one uses. | No action; difficult to address given our length constraints |
| 6959 | 3 | 11 | 1 | 11 | 4 | A further response to a rights-based conception of intergenerational justice is to push a (Kantian) obligation based view: present people have duties to future people, but it need not follow that future people have rights against present people. In my view, Onora O'Neill offers the best defence of this approach in 'Towards Justice and Virtue: A Constructive Account of Pratical Reasoning' (Cambridge: Cambridge University Press, 1996). | Agreed. We added a sentence to the first paragrah of this sub-section. |
| 12132 | 3 | 11 | 1 | 11 | 13 | This does a good job of summarizing some key issues quickly. One that it leaves out, however, is the claim of 'will theorists' that future people cannot have rights because they cannot exercise them. See, for example, Hillel Steiner (1983) 'The Rights of Future Generations', in Energy and the Future, ed. Douglas MacLean and Peter G. Brown. Totowa, NJ: Rowman and Littlefield, pp. 151-65. | Agreed. We added the reference. |
| 16668 | 3 | 11 | 14 | | | The usual cites for equal allocation of emissions permissions plus trading are Dale Jamieson, "Climate Change and Global Environmental Justice, " P. Edwards and C. Miller (eds.), Changing the Atmosphere: Expert Knowledge and Global Environmental Governance (Cambridge: The MIT Press, 2001): 287-307; and Peter Singer, One World, Yale University Press, 2002; both following Agrawala & Narain, Global Warming in an Unequal World | Agreed. We added references |
| 4483 | 3 | 11 | 15 | 11 | 35 | As noted above (in comment #10), this approach to "distributive justice" seems to suggest that "justice" is like dividing up a fixed pie. The real-world economy is not like that. It would be unjust in the extreme to coercively redistribte the goods and services produced in all the world's countries according to some abstract scheme. Production and distribution are inextricably linked, and the effort and talent (and capital) involved in production give the producers a prima facie claim to the fruits of that production. Furthermore, promoting the notion that "justice" is like dividing a pie will make it much more difficult to make progress on climate, because there can be no criteria for agreement if the negotiations take the form of purely redistributive conflicts. In short, ignoring production in discussions of distributive justice is an unwarranted abstraction from the actual functioning of the global and national economies, and violates the basic right of people to own what they produce. | Thank you for the comment. The subject matter here is not all goods that are relevant for well-being but the remaining permissible emission permits. |
| 13003 | 3 | 11 | 15 | 11 | 19 | The distributive concerns are not limited to the particular mode of implementation (i.e., a cap and trade permit scheme), but arise from any intervention (e.g., via taxation, standards, etc.). | Agreed. We changed the text accordingly |
| 7911 | 3 | 11 | 15 | 11 | 35 | There are many egalitarians that do not presuppose equality for the sake of equality but ascribe instrumental value to equality . Rather, there is a presumption in favor of equality. The presumption is not prone to the levelling down objection. Also, is prioritarism really the most common perspective? The defense of prioritarinism should be substantiated. | No action; disagree with comment. We don't understand the 'presumption in favour of equality'. We do not mean to defend a particular view. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13015 | 3 | 11 | 15 | 11 | 35 | The quick survey of principles of intergenerational justice should at least mention classical utilitarianism, which seeks to maximize value irrespective of distribution but takes account of diminishing marginal utility, and therefore ends up being significantly more egalitarian than present distributions, or likely future distributions. | Agreed. We discuss utilitarianism later in the chapter and we put a reference in the text |
| 11552 | 3 | 11 | 15 | 11 | 35 | The discussion of equality should take into account the difference between absolute and relative equality. Richard Wilkinson & Kate Pickett “The Spirit Level: Why More Equal Societies Almost Always Do Better” (2009) shows that relative inequality within countries matter (in terms of health, etc.) more that absolute global inequality. | Disagree with comment. We don't see the relevance of the literature for the topics discussed. |
| 4936 | 3 | 11 | 18 | | | [Del] By distributing [tradable] emission permits .. ~ The possibility of trading is a different (additional) issue, at least irrelevant here. | Noted; we deleted "tradable" |
| 9001 | 3 | 11 | 18 | | | The use of the word "tradable" is specious and is not needed in the phrase "distributing tradable emission permits". It is the distribution of permits, whether these are tradable or not that are necessary to achieve a "globally just" distribution of emissions. Markets might not work; "we" might be smart enough to distribute the permits correctly without requiring the subsequent trading of permits. As a philosophical-ethical chapter, this an example of this chapter's heavy reliance on the a framework where markets - working via property rights (a category always created by social arrangement based justified on philosophical grounds) - to achieve social ends. | Agreed. We deleted "tradable". And see what we said on p. 11, line 43-44 |
| 3924 | 3 | 11 | 18 | 11 | 18 | Who is 'we' - a policy elite? And if we are a policy elite what weight should we put on dissenting views? | Agreed. We changed the text accordingly |
| 2113 | 3 | 11 | 20 | 11 | 20 | Comma missing (after parantheses). | Agreed. |
| 6961 | 3 | 11 | 21 | 11 | | Surely add a reference here to Rawls, as a prioritarian? | No action; disagree. This is controversial. However, we added a |
| 3925 | 3 | 11 | 22 | 11 | 22 | Does a strictly egalitarian position require 'a fair go' (meaning some sort of equal opportunity to move from log cabin to president), or does it mean equality of outcome, (in the Gini coefficient sense that effort, skill and merit should go unrewarded)? The phrase 'equality is of intrinsic value' could be read in the second way. | No action; disagree. 'Equality of intrinsic value' is neutral between equalities of different things |
| 3926 | 3 | 11 | 26 | 11 | 27 | The proposition that we should promote wellbeing of X over Y does not explain why 'we' should not ignore X and instead promote the wellbeing of Z over X and Y, where Z is the least well-off in the world. | No action; disagree if the comment is meant as a criticism. 'We' always |
| 17702 | 3 | 11 | 31 | 11 | 35 | The sufficitarian views should be mentioned on this chapter it is only briefly mentioned in this part. The suficitarian view combined with the Prioritarianism view can be of great importance. | No action; the combination of sufficientarianism and priroritarianism (below the threshold) is an interesting view, certainly worth exploring, but, |
| 12133 | 3 | 11 | 33 | 11 | 34 | Prioritarianism is 'the most common perspective on distributional justice' among contemporary analytic academic philosophers. That seems to me an adequate justification for focusing on it—but it is only fair to note that worldwide, egalitarianism is surely more widespread among the general public | No action; it might be true that "egalitarianism is surely more widespread among the general public", |
| 9287 | 3 | 11 | 34 | 11 | 35 | I am far from sure that the claim that prioritarianism is “the most common perspective on distributional justice” is correct. For example, the vast majority of economics literature using any social welfare function uses a straightforward utilitarian one. It is surprising that this section does not mention utilitarianism at all. | Agreed. We changed the text accordingly. Utilitarianism is being discussed in a another section of the |
| 13004 | 3 | 11 | 35 | | | I'm surprised to hear that prioritarianism is the most common perspective. | Agreed. We changed the text |
| 13016 | 3 | 11 | 35 | 11 | 35 | On what basis is it claimed that prioritarianism is the most common perspective for distributional justice? I know of no evidence for this claim, which strikes me as dubious. | Already addressed. |
| 15641 | 3 | 11 | 36 | 12 | 2 | It is not clear why prioritarianism is singled out as raising concerns about the background distribution of resources - in principle these could apply to any of the egalitarian positions outlined above. This paragraph could be enhanced by referring to some of Simon Caney's more recent work on the distinction between holistic and atomistic accounts of climate justice (eg Caney, S. 2009. Justice and the Distribution of Greenhouse Gas Emissions. Journal of Global Ethics 5 (2):125-46.) | No action; already addressed. For Caney see p. 12, lines 1-2, we replaced to the one suggested: 2009. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3927 | 3 | 11 | 36 | 12 | 2 | This section ignores the problem that 'we' are not a benevolent government. In reality, the contemplated distributions will take place through political processes, meaning most likely that they will favour those with the greatest political clout. If the chapter aims to help policy makers with ethical issues, it needs to put them in the context of what is likely to happen when politicians actually move to put in place the proposed redistributional mechanisms. This further illustrates why a positive theory of state action is necessary. | No action; disagree. The literature reviewed in this section does not predict likely outcomes of the ongoing negotiations |
| 4937 | 3 | 11 | 37 | | | emission rights ~ as above, better to call it: emission permits (throughout this section) | Agreed. We replaced emission rights by |
| 12134 | 3 | 11 | 41 | 11 | 42 | The logic of why the worse off would benefit more from being able to sell an equal share of emissions (declining marginal utility?) needs to be specified, and an explanation needs to follow of why the first option is problematic. | Comment unclear. |
| 9800 | 3 | 11 | 42 | 11 | 43 | The currently highly unequal distribution of rights is crucial in the justice discussion. Whenever emission targets are set, two drawbacks have to be considered: 1. concerning intragenerational justice the status quo of living has to be considered, moreover a huge part of the emissions of developing countries is caused by products sold in the industrialized countries. 2. concerning intergenerational justice the legacy value has to be considered, i.e. the possibilities we leave for future generations. REFERENCE for legacy value | No action; in the text we consider these issues in the other subsections (issue 1 in 3.3.4, issue 2 in 3.3.2) |
| 4922 | 3 | 11 | 43 | | 46 | To some extent, this is actually the case for an "inter-national" system, namely, the EU's ETS. | No action; this sub-section reviews the philosophical literature. |
| 14840 | 3 | 11 | 48 | | | Caney could just as well be interpretted to be arguing that it is questionable to insist that the prioritarian ideal is the preferred distribution when the distribution of only one good is being adjusted, it may well be the case that an even *greater* reallocation to the worse off is justified. Again, this section seems to provide undue emphasis to counter arguments that are not evidently of relevance to the climate context. | Agreed. We changed the text accordingly |
| 2115 | 3 | 11 | 48 | 12 | 2 | A brief explanation of why this claim is true might be helpful. | Will be addressed in SOD |
| 7909 | 3 | 11 | 6 | 11 | 13 | At this point, the future individual paradox (FIP) occurs for the first time and a way to circumvent it is suggested. However, later on the FIP is mentioned several times as a problem. More convincing would be to discuss the FIP in greater detail here and refer to this section later on. You should also note that Parfit himself has recently argued that the FIP does not nullify our duties towards future generations (2011). | Agreed. We improved the discussion and added the reference. |
| 2112 | 3 | 11 | 7 | 11 | 13 | I wonder if this discussion of the Non-Identity Problem is not too condensed to make sense to those unfamiliar with the Problem. I realize that space is very limited, but perhaps something can be done to explain the Problem more clearly. Alternatively, if there is no space for that, then perhaps the attempt to explain it should be given up. (However, given that the Problem crops up several times later in the chapter, perhaps the latter is actually not the way to go.) | Agreed. We improved the discussion |
| 13014 | 3 | 11 | 7 | 11 | 13 | This account of the non-identity problem would be incomprehensible or misleading for anyone not familiar with it. A better and clearer account is needed. | Agreed. We improved the discussion |
| 6960 | 3 | 11 | 9 | 11 | 13 | A different tack is to argue that we owe justice to future people not because of the particualr identities they will come to have (which generates the NI problem), but just in virtue of the fact that they will be people. Jeffery Reiman argues that this is a Rawlsian approach to the NI problem ('Being Fair to Future People', Philosophy and Public Affairs, Vol. 35, 2007, 69-92). I think he interprets Rawls correctly, and that this approach is also generated by the Kantian vision of intergenerational justice mentioned in the previous comment. In general, I think Kantian approaches are seriously under-represented in the chapters as a whole. | Agreed. We improved the discussion. The fourth response to the NIP (new text) reflects the idea the commentator refers to; we added the reference. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7910 | 3 | 11 | | | | You write: "If an intergenerationally just global quota has been determined, and if there are going to be emission permits allocated under that quota, then the question of how emission permits ought to be distributed among the states (and, ultimately, the individuals) on this planet arises." This is certainly correct. However, the very important question what a just global quota could be is neither addressed in section 3.3 nor at any other point in chapter three. Given that many ethical contributions on how far current generations should lower GHG emissions (and hence, what "our" quota should be) exist (e.g. Gardiner 2004, 2011a, Ott et al. 2004, Page 2006, Caney 2010a, Ott/Baatz 2012) and that this is one of the most important questions concerning climate change, it should be explicitly addressed at greater lenght in chapter 3. In addition, questions about how to allocate emissions permits eventually depend on how much permits are available in the first place. | No change needed. In my understanding the text does address the question "what a just global quota could be" by discussing in 3.3.2 how considerations of justice can help to specify the "just global quota". Of course, I am happy to add references. I do not think that this section should assess normative theorists' specific suggestions of what the "just global quota" is since these suggestions have to rely on empirical claims, the assessment of the normative |
| 17158 | 3 | 11 | 14 | | | You could add that there are also more complex ethical theories discussing distributive issues. There might be more than only one criterion for how to distribute wealth, etc. See for instance Kowarsch, M./Gösele, A.: Chapter 7: Triangle of Justice, in Edenhofer, O./Wallacher, J./Lotze-Campen, H./Reder, M./Knopf, B./Müller, J. (eds.): Climate Change, Justice and Sustainability: Linking Climate and Development Policy, Dordrecht: Springer 2012, pp. 73-90. They argue that three dimensions of justice are to be taken into account at the same time: basic needfulfilment, basic opportunities, fair procedures. Distributive questions can only be solved when applying all these criteria at the same time. | No action; disagree with comment |
| 15639 | 3 | 11 | 18 | | | Re "tradable" - in principle, a just distribution could be achieved without requiring that permits (or 'entitlements') be tradable. Being tradable seems to be more strictly a condition for efficiency rather than justice. | Agreed. We deleted tradable. And see what we said on p. 11, line 43-44 |
| 15640 | 3 | 11 | 20 | | | It could be worth explaining that what all egalitarian views (whether direct or indirect) share is the idea of the equal worth or dignity of all human beings (see eg Sen (1980). Equality of what?). Otherwise it isn't clear in what sense indirectly egalitarian views are indeed egalitarian. | Comment unclear. The view referred to is controversial. |
| 13265 | 3 | 11 | 36 | 12 | 2 | there is the factual case, not explicit, that current emissions rights (considered as the per CO2 per capita emissions) are not fairly distributed and that any, even hypotetical, allocation of emission's rights should have to deal with this assimetry. It is considered to analyse this case in the report? | No action; already addressed |
| 3320 | 3 | 112 | 29 | 112 | 31 | I find the usage of "distributive justice" here odd. Distributive justice standardly concerns the partition of benefits or burdens, not whether justice is determined with respect to outcomes. Take human rights, for instance, which figure prominantly in climate ethics debates. They are neither procedural nor distributive in the traditional sense. They are deontological: concerned with specific results, namely, that rights are upheld, but are not concerned with distributing rights in any ordinary or traditional sense of partition being up to the judgment. Rights involve judgment in terms of applicability and balancing, but neither is distribution per se. So, I would strongly recommend revisiting this paragraph by making a different between procedural and *substantive* justice, including both distributive justice and human rights justice as species of substantive justice. | Will be considered further. |
| 3322 | 3 | 112 | | 114 | | I find the absence of qualitative normative approaches such as capabilities theory or human rights troubling. The executive summary will provide the at-a-glance overview of normative frames for many policy makers and observers. That human capabilities or rights are not even mentioned is a serious oversight from the standpoint of considering climate ethics in a balanced way. | Will be addressed in SOD |
| 3321 | 3 | 113 | 27 | 113 | 32 | I find this paragraph vague to the point that I cannot evaluate what it is saying. Are the "instruments" *means* or *normative* guides? If the latter, then I find the assertion lacking credibility without much more said. | This will probably be de-emphasized in SOD, since it is the subject of later chapters in WGIII. |

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| 3323 | 3 | 115 | 1 | 115 | 10 | Again, there is much more to climate justice and ethics than well-being and fairness. Questions of right are not primarily procedural and are not primarily concerned with maximizing or distributing well-being. Rather, rights are commonly thought of as the conditions of dignity, or the consequences of freedom (autonomy). When related to well-being, rights are concerned with the basic needs or conditions of agency of individuals. The absence of a discussion of rights or capabilities (which are not directly framed in terms of well-being, which is a matter of functioning not capability) makes this paragraph seriously misleading and concerns me that the entire chapter will have majorly misleading discussions of justice and ethics. | We can't say everything in one paragraph, and we can't deal with a prediction about what will happen later in the chapter. |
| 3324 | 3 | 115 | 27 | 115 | 28 | First, well-being and cultural values hardly exhaust the relevant human values at stake in climate justice or ethics. Autonomy or freedom, agency or capability (dignity) ought to figure centrally. None of these is reducible to well-being or considers itsself anything short of universal, i.e., not culturally limited. Second, "non-human values" is equivocal and perhaps non-sense. Perhaps you mean, "values concerning non-human life" or something of the sort? You aren't implying, I assume, that you will consider the values of -made by or held by- non-humans, if there be such values? | Noted; will be addressed in SOD |
| 3326 | 3 | 116 | 14 | 116 | 14 | "Non-human values" is confusing again. Also I would include mentioning "biotic integrity" alongisde "biodiversity." A wave of criticism of the term "biodiversity" is beginning to form and the result may be to blindside appeals to the term for a time until sufficient conceptual clarification is done. Biotic integrity does not share the exact same domain as biodiversity but handles many of the objects or situations I believe you have in mind, siuch as species extinction, wilderness, and so on. | The mention of biodiversity has been removed. |
| 3325 | 3 | 116 | 4 | 116 | 12 | Again, the absence of considerations of right or of capability seems a major oversight here. Both are neither compensatory nor always or ever distributive (capability is distributive, but in a way that is embeds quantiy within qualitative structures that are highly determinative of the shape of any possible distribution) -but could at best be used to justify appeals to either and to shape the way in which such appeals could possibly be discharged to the satisfaction of justice. | Capabilities are dealt with under wellbeing. The entire section on justice is about rights. This has been made more explicit. |
| 3327 | 3 | 117 | 38 | 117 | 40 | This is speculation and plays into techno-optimism. Moreover, it is normatively problematic. Unless we have strong, definite grounds which allow us to predict a rise in technological capacity which will offset climate burdens sufficiently to allow humans to improve well-being, then claiming it "might" be so is distraction or worse. Consider, it might be the case that if my daughter goes and climbs a cliff-face well above her current climbing ability that she will emerge victorious with improved skills. But I would be rash to speculate so in the absence of determinate and strong grounds that she will emerge victorious. | The author of this comment forgets that growth results from investment as well as technical progress. However, we will delete 'human', and try to make this clearer. |
| 3328 | 3 | 117 | ftnote 1 | 117 | ftnote 1 | Gardiner (2011) has the most sophisticated analysis of a *morally non-arbitrary* concept of a generation. I would cite it. | Agreed, I added a reference to Gardiner 2011 |
| 6962 | 3 | 12 | 1 | 12 | | Perhaps add a reference to Jonathan Wolff and Avner de-Shalit, 'Disadvantage' (Oxford: Oxford University Press, 2007) re. their pluralist account of disadvantage. | Thank you, reference added |
| 9801 | 3 | 12 | 19 | 12 | 22 | I would be very cautious using the argument that "people living today would not exist at today's level of prosperity had previously living people not engaged in the emission-generating activities as they did, and thus nobody is better or worse off owing to the emissions of previously living people." Politicians and business practionners might use this argument also for future generation to excuse their decisions today. | No action; we cannot omit an argument for fear of it being misused. |
| 2202 | 3 | 12 | 19 | 12 | 22 | Confusingly stated; not only would these people living today not exist at their present level of prosperity; they would not exist at all. | Agreed. Text was changed accordingly |
| 7912 | 3 | 12 | 2 | 12 | 2 | At the end of section 3.3.3 in remains unclear which distribution of permits is to be regarded as just. If you are not willing to make such assertions, you could at least clarify which distributions would definitely be unjust. For instance, on page 32 different principles are mentioned though some (most?) of them should not be considered accroding to the analysis in section 3.3.3 (e.g. the "sovereignty principle"). Please be more explicit at this point. | Is discussed in ch. 4 and further below in sec. 3.6 |

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| 9290 | 3 | 12 | 20 | | | As far as I can see the clause “at today's level of prosperity” is unnecessary (and therefore confusing). Isn't the point that owing to the non-identity problem, the people who in fact live today would not have lived at all in the case in question? | See above response to comment 2202 |
| 9291 | 3 | 12 | 21 | 12 | 22 | “and thus” - this follows only if the auxiliary premise that nobody can be better or worse off existing than not existing is used. That premise is controversial (IIRC e.g. Arrhenius, Holtug, Rabinowicz, Bykvist all deny it). | No action; we are only describing an argument, not endorsing it. In addition, we disagree with the characterization of |
| 12528 | 3 | 12 | 22 | | | Add after "people" -- "Shue (2009) provides a bounded view of these issues to develop a balanced framing for policy development." Henry Shue, 2009. SBSTA Technical Briefing: Historical Responsibility. http://unfccc.int/files/meetings/ad_hoc_working_groups/lca/application/pdf/1_shue_rev.pdf | Will consider this reference; there is a peer-reviewed article that would be better to refer to |
| 4484 | 3 | 12 | 23 | 12 | 37 | The claim is made that the arguments in this paragraph refute the arguments in the previous paragraph. This is only an assertion, however; there are arguments to be made on both sides of the "historical responsibility" question, and this paragraph by no means settles them. | This is not the claim. The first sentence says 'speak against', not 'refute'. We changed the wording. The claim is that there are two ways of taking into account historical emissions from the perspective |
| 13659 | 3 | 12 | 23 | 12 | 37 | There is emphasis n the problems of assigning 'historical responsibility' in this section on account of 'lack of knowledge'. However, it can be seen that even if the year from which accounting is done is changed to 1970 (around which time, CO2 emissions were globally acknowledged to cause environmental damage), Annex-I countries bear responsibility for a majority of the emissions (in spite of knowledge of the problem). So historical responsibility can be argued to be current responsibility (Kanitkar et.al) | No action; we seem to agree or I do not understand the comment. |
| 13425 | 3 | 12 | 23 | | | Not clear what “do not speak against” means. May be clearer if it is changed to “From the perspective of distributive justice, however, these objections should not stand in the way of taking into account…..” or something to that effect. | Agreed. |
| 9340 | 3 | 12 | 27 | 12 | 29 | Historical responsibility can still remain ;it is important to remember this and highlight that the three conditions mentioned earlier do not take away historical responsibility. | No action; we believe the text adequately reflects this |
| 2116 | 3 | 12 | 27 | 12 | 28 | I wasn't sure why taking emissions into account in this way is not (at least partly) open to the objections of the previous paragraph. Regarding the first objection, it might still be argued that at least until they reach adulthood, present people still cannot reasonably be expected to influence past people's action. And regarding the second objection, if past people are to be excused for ignorance of the consequences of their actions, then this seems to apply also to the *by-products* of their actions. | No change needed. Presently living people cannot influence past people's actions. From the perspective of distributive justice what counts are the benefits that people have realized and will realize from their own and past |
| 13005 | 3 | 12 | 38 | | | Tim Hayward and Steve Vanderheiden's papers on ecological space might deserve citation. | Agreed. We added references. |
| 13414 | 3 | 12 | 38 | 12 | 42 | Missing from this paragraph and from the chapter as a whole are references to significant recent work on concepts of equity in the context of climate change and climate justice, including the carbon budget approach linked to equitable sharing of atmospheric space (which has been dealt with by several writers, including in the BASIC experts report) and the greenhouse development rights framework (Baer et al, 2008). | Agreed. We added references |
| 9524 | 3 | 12 | 4 | | | Please, add words, 'idea of', in front of historical responsibility as it is under discusson in UNFCCC. | No action; disagree with comment |
| 7359 | 3 | 12 | 4 | 12 | 4 | "This is usually interpreted to imply that current and historic differences among countries should play a role in determining emission reduction obligations" - this does not state clearly enough that the "historic differences" are the historic differentiated contributions. It also could be useful to quote the entire Article 3(1) or at least its concluding sentence that: "Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof." So it is not just emission reductions but also in the approach to "adverse effectts" so adaptation that developed countries have agreed to do more. A link to the Rio Declaration Pricinple of CBDR may also give readers a better understanding of the relevance and application of the principle. | Agreed, we made changes |

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| 9118 | 3 | 12 | 40 | 12 | 42 | Heinonen & Junnila have deontrated with a case study of two Finnish cities that the impact of increased driving may be rather small due to multiple factors, but primarily to GHG emissions per VMT in a city structure being substantially higher than of those in less dense areas. | Thank you. Reviewing the literature on this issue does not belong in this. |
| 4923 | 3 | 12 | 6 | | 8 | Actually the UNFCCC itself makes clear that interpretation in the preamb.: "Noting that the largest share of historical and current global emissions of greenhouse gases has originated in developed countries .. " and in para 3.1. "in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead .." Concerning the footnote, those commitments/obligations only for: developed countries (included in Annex II of the UNFCCC) .. | We made some changes in response to 7359 which address this comment, too. |
| 9525 | 3 | 12 | 7 | 12 | 8 | Please, replace here with the following, as this principle of 'common but differentiated commitments and responsibilities' remains the subject of interpretation and negotiation (Honkonen, 2009); some states insist developed countries should have mitigation obligation in proportion of their historical emissions but there is no common recognition how parties deal with their historical emissions under UNFCCC. | We made some changes in response to 7359 which address this comment, too. |
| 8248 | 3 | 12 | | 14 | | The main focus of the authors remains to provide insights on potential complexities associated with allocations of emissions rights across regions (or agents) based on their differential historical emissions-activities.<br>Comment: At this point, it might also be worthy to discuss about distributive and social and ethical aspects of emission allocation in a situation in which emissions in one country has gone down dramatically due to external circumstances (such as that in Russia) relative to the historical level (e.g. 1990).<br>While the three principles of responsibility sharing are well discussed, are there some studies that estimate how different country responsibilities (e.g., developing and developed country) might alter if alternative measures are used. In other words are there estimates that can practically be applied to different countries as emission rights for the future? | Thank you. Reviewing the literature on this issue does not belong in this. |
| 6963 | 3 | 12 | | | | I think this section could be cut without loss. | No action; sections are set by IPCC |
| 15642 | 3 | 12 | | | | The emphasis in this and the subsequent section on "historical" responsibility over other kinds of responsibility is somewhat problematic. Some parties to negotiations would see references to historical responsibility as being synonymous with "full" historical responsibility (i.e. strict responsibility of developed countries for all past emissions). While this may be an overly restrictive view of what historical responsibility entails, it is nevertheless the case that there is an important distinction between (a) historical responsibility and (b) _causal_ responsibility for emissions (which may relate to past, present or future). 3.3.4 implies as much by saying that CBDR applies to both current and historic differences (line 7). However, later sections - in particular section 3.3.5 - sometimes blur this distinction. For example, the Polluter Pays Principle is not purely an instrument for assigning historical responsibility (indeed some theorists argue it is purely prospective), but it is certainly associated with causal responsibility. | Thank you. Agreed. We put emphasis on the distinction in 3.3.5 |
| 10951 | 3 | 12 | 1 | 12 | 42 | Note the sensitivity of outcomes of a responsibility approach to choices made.Note also that a "forwardlooking" responsibility approach can get a very different outcome for fast-growing DCs. Confer: Rive, Torvanger, Fuglestvedt (2006), Climate agreements based on responsibility for global warming: Periodic updating, policy choices, and regional costs, Global Environmental Change, 16, 182-194. | Thank you. The article investigates the likely distributional implications of alternative ways of taking into account historical responsibility for DCs and over |
| 13266 | 3 | 12 | 19 | 12 | 22 | this third argument is complex. Not all people have been benefited from the emissions of previous generations. For the poorest in least developed countries, this argument do not apply. Maybe a threshold of living standard could be set to recognize who have been benefited and who have not. | No action; we are only describing an argument, not endorsing it. For the discussion of the argument, see below. |
| 15644 | 3 | 12 | 19 | 12 | 22 | Suggest removing further discussion of the non-identity problem here and below as it has been amply discussed above; some would argue that the prominence of this issue in academic debate is disproportionate to its relevance to policy. Removing this would contribute to shortening the chapter overall. | No action; no change needed. It is true that some have that view |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16960 | 3 | 12 | 19 | 12 | 22 | To further support my comment about not labouring the non-identity problem, here is a sample from a new book on climate change and intergenerational justice: 'Although it [the non-identity problem] presents a real philosophical puzzle about how some approaches to justice can conceptualise harm-avoidance principles with intergenerational scope, its dominant place in debates about intergenerational justice does no favours to philosophical contributions to such debates, and - in my opinion - has become a serious hindrance to progress in the face of real and pressing political problems.' (McKinnon, C. 2012. Climate Change and Future Justice: Precaution, Compensation, and Triage. Abingdon, UK: Routledge., pp.41-42) | No action; see response to the previous comment 15644 and see comment 7909 |
| 15643 | 3 | 12 | 8 | | | CBDR applies not only to "emission reduction obligations" but also to adaptation obligations as well. Alternatively, change line 4 to "Historical responsibility with respect to mitigation" | We made some changes in response to 7359 which address this comment, too. |
| 8822 | 3 | 13 | | | | this section on intra-generational justice reads too much like a tutorial; I'd make major cuts here in the text and rely on cited references if the reader wants additional details. | Disagree with comment. We believe the text provides a survey as is required. |
| 16669 | 3 | 13 | 1 | | | A book-length treatment of the compensation issue is Catriona Mackinnon, Climate Change and Future Justice: Precaution, Compensation and Triage (London: Routledge), 2011. | Will consider this reference; may be grey literature |
| 4485 | 3 | 13 | 13 | 13 | 18 | All three "principles" implicitly assume that the individuals involved are members of a community with well-defined rights and obligations to each other. This is not the reality; we live in nation-states, and it is unrealistic and counterproductive to pretend that all individuals can be viewed as members of a single global collective. We may have some responsibility for the actions of our own governments, and we may feel a sense of empathy or solidarity with citizens of other nations, but no national government is going to treat all people in the world as if they were their own citizens. This can be illustrated by considering what would constitute "justice" if some government or governments) behave in an aggressively genocidal manner (e.g., Nazi Germany). Would it be "just" to allocate emissions rights to such a government or governments? The point is that the justice argument cannot be separated from existing political realities. This comment applies to the philosophical underpinning of the entire chapter. | No action; disagree with comment; do not see why this is an objection to the principles. They are about what rights and responsibilities there should be. |
| 10423 | 3 | 13 | 13 | 13 | 20 | Expand this section | No action; we believe the text adequately |
| 3607 | 3 | 13 | 13 | 13 | 18 | Please add "Disregarding transaction costs, according to the Coase-Theorem (Coase, 1960), compensatory payments lead to the same optimal emission reduction, regardless the polluter or the injured party pays". Cite: R. H. Coase (1960). The Problem of Social Cost. Journal of Law and Economics 3, 1–44. | Disagree with comment. None of the three schemes asks the injured party to pay. |
| 3928 | 3 | 13 | 13 | 13 | 20 | Ronald Coase has made the point that, in the absence of well-defined property rights, the attribution of cause from proximity effects is arbitrary. From the victim's point of view the polluter is the cause. From the polluter's point of view it is instead the victim's proximity (or even their existence) that is the cause. (Coase's actual famous example, was the free range farmer's cattle feeding on the cropper's crops and the question of who should pay for the fence.) However, once the property right is established, the conflict can be sorted. (Perhaps the free range farmer buys the croppers land, or perhaps the free range farmer becomes a cropper?) Who knows what the outcome will be? Coase won the Nobel for this insight and it is surely important enough for the chapter to acknowledge. | Disagree with comment. See previous response. |
| 17703 | 3 | 13 | 19 | 13 | 28 | Why suddenly from a neutral level of analysis, the text jumps to an individual lever with he or she. I does not seem right; probably just referring to "agents" will fit better. | Thanks. We replaced "he or she" by agent. On the victim-side we kept he or |
| 2203 | 3 | 13 | 2 | 13 | 2 | They not only suffer disproportionately; many of them die. See first comment. | Thank you. In parantheses we added "or will die prematurely owing to these |
| 9119 | 3 | 13 | 21 | 13 | 21 | To my knowledge the intake fractions are much higher in cities (e.g. Apte, J.; Bombrun, E.; Marshall, J.; Nazaroff, W. (2012): Global Intraurban Intake Fractions for Primary Air Pollutants from Vehicles and Other Distributed Sources, Environmental Science and Technology, 46, 3415−3423.). | No action; comment unclear |
| 9341 | 3 | 13 | 24 | 13 | 24 | ; | No action; no comment |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4924 | 3 | 13 | 24 | | 28 | The PPP is universally accepted (as a principle "in principle") according to the 1992 Rio Principle 16, but indeed it is not universally applied. As a matter of fact, the PPP is part of the UNFCCC: in form of financial and technological assistance by the Annex-II developed countries to the developing countries. Indirectly the BPP is also there when the (better) "respected capabilities" of the developed countries are also considered as an argument for their duties for compensatory measures (i.e. assisting developing countries).. | Thanks you. See above, response to comment 15645. |
| 13415 | 3 | 13 | 29 | 13 | 46 | This treatment of arguments on why the polluter pays principle cannot be applied (or can be applied in only a very limited way) in relation to compensation is much too one sided. At least equal space should be given to the opposite argument. This counter-argument has been made by others such as Gardiner 2010 and Shue (1992 and other articles) -- for example their point that if people in poorer countries are deprived of their share of an important resource needed for their very survival, then ignorance is not an acceptable reason for not assisting or compensating especially since the rich nations' overuse of the resource denies the poor of extricating themselves from the problems the rich created. | Thank you. This is a misunderstanding. The review in this section agrees with the point made in the comment, see end of sec. 3.3.5 (and compare 3.3.4): "Principles of distributive justice can also be applied (at least to some degree) to the distribution of duties to pay for adaptation measures to those who suffer from climate damages. It has been suggested that these duties should be allocated mainly to the highly industrialized and rich countries according to their ability-to-pay that reflects their causal role in bringing about the problem in question (Shue, 1999; Caney, 2010; Gardiner, 2011). Secondly, currently living people stand under intergenerational duties of justice with respect to climate justice if they can be said to know not only about the seriously harmful consequences of their |
| 2117 | 3 | 13 | 31 | 13 | 31 | Aren't the rights to receive compensation also potentially relevant to *future* people? | Agreed. We changed to "for currently living and future people" |
| 2118 | 3 | 13 | 33 | 13 | 35 | A reference to sec. 3.3.6., where this question is discussed in the legal context, might be useful. | Agreed. We added cross-reference |
| 11553 | 3 | 13 | 33 | | | The discussion of duties bearers might have should take into account the difference between the duty to avoid (local) environmental pollution and (global) climate change. In the former case people cannot claim ignorance. | No action; we're only dealing with climate change, so this is irrelevant. |
| 9120 | 3 | 13 | 38 | 13 | 44 | Potentially with fine particulate matter also. And the direction of GHG's is not clear due to the wealth and proximity effects. | No action; comment unclear |
| 2204 | 3 | 13 | 38 | 13 | 38 | Even under the usual conditions for the nonidentity problem, there are ways in which a person might be said to be harmed without appeal to a threshold conception of harm. Consider this notion of harm: Person P is harmed by an action A if P is made worse off by some consequence of A than if P had been unaffected by that consequence. This idea explicitly allows that one may be harmed by some consequences of an action and not harmed (perhaps even benefited) by others. In climate change case, one consequence of our prolonged GHG emissions is the existence of certain future people; another is, let's say, their suffering and/or dying in a drought. The suggested concept of harm implies that our emissions harm these people by afflicting them with drought, thereby making them worse off than they would have been had they not been so afflicted—which could have been the case, for example, if they had migrated before the drought began. The fact that they would not have existed were it not for our emissions does not nullify the harm. (Example is from John Nolt, "Response to Critics of 'How Harmful Are the Average American's Greenhouse Gas Emissions?'" Ethics, Policy and Environment, accepted, revised and forthcoming.) | No action; in the text the point is made on p. 12, lines 30-33. |

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| 14841 | 3 | 13 | 1 | | | This section relies heavily on an distinction between wrongful actions that call for compensatory measures and other actions that may lead to undeserved benefits or cause harms. It is not clear how important (if at all) this distinction is in the climate context.<br><br>That PPP is "...far from universally accepted..." is a strong and unsubstantiated statement.<br><br>The our basic problems are obviously each subject to counter-arguments that should not be omitted. Is the identity problem relevant? Are the inheritors of the benefits of emissions of those who are now dead responsible (see Shue). Is the difficulty of defining a threshold harm sufficient to absolve the polluter? | Thank you. - The distinction is considered important by many authors and in many contexts. At the same time ist importance is contested as sections 3.3.5 together with 3.3.6 show. - Agreed. We deleted "far from universally accepted". |
| 15645 | 3 | 13 | 1 | | | The conceptual distinction between sections 3.3.4 and 3.3.5 is unclear, and suggests that using distributive and compensatory justice as a point of distinction between the two sections may not be ideal, particularly as considerations of historical responsibility are split across the two sections. Moreover, it is at best incomplete to say that the three principles identified in 3.3.5 (lines 17-18) are principles of compensatory justice when in fact they are at least as plausibly principles of distributive justice (see eg Caney, S. 2010. Climate Change and the Duties of the Advantaged. Critical Review of International Social and Political Philosophy 13 (1):203 - 28.). It may be more straightforward, for example, to combine 3.3.4 and 3.3.5 into a single section on principles for assigning responsibilities for emissions. | No change needed. We do not think that PPP is "at least as plausibly" understood as a principle of distributive justice. This claim is more plausible with respect to BPP and CPP but as I say in the text these principles are heavily disputed. -- Also, we do think that the issue of historical responsibility should be discussed (as in the draft) from both |
| 3929 | 3 | 13 | 1 | 14 | 47 | Surely a chapter on ethics in relation to the use of government action should acknowledge John Stuart Mill's famous harm principle and advice policy makers how to think about it from an ethical perspective taking their own values into account? It seems to be a natural fit with the non-identity principle. Mill's harm principle says its OK to remonstrate with people that they should behave morally and ethically, but it is impermissible to take away their freedom to make a moral choice, unless their action would impose a harm on others. The non-identity principle seems to be making a case that actions today can't be said to be imposing a harm on unborn generations. Surely the chapter should be providing policy makers with guidance on how to evaluate these two points from an ethical perspective? | Thank you. We added references on harming as wronging. |
| 12779 | 3 | 13 | 25 | 13 | 25 | Because of PPP being part of the CBDR the statement that PPP is "...far from universally accepted" should be reconsidered. | Agreed. We changed 'far from' to 'not' |
| 13267 | 3 | 13 | 45 | 13 | 46 | this a double edge argument. Some people is not worse but rather not exist at all, that is true. But there are potential people who should have existed, but factually does not, if the past emissions were not emitted. Technology improvements plays for both sides, on one, better medical equipment and infrastructure allow some people that in past conditions did not exist, to exists now; on the other, better technologies for natality control create the figure that some people could have exist, but do not. | No action; comment unclear |
| 6311 | 3 | 13 | 45 | 13 | 46 | I would encourage the authors to limit the discussion of Parfit's non-identity problem. While it has been reviewed amongst philosophers extensively in the literature, it is deemed by many to be relatively nonsensical. For the purposes of the credibility and integrity of this report, I would limit discussion on what comes across to the reasonable, non-philosophical public as rather silly. | Disagree with comment. The non-identity problem is genuine. Reviewing the philosophical and normative literature on climate change requires |
| 8146 | 3 | 14 | | | | It would be helpful to provide examples of how the BPP and CPP principles relate to climate change (CC). | Noted; space constraints prevent us from providing much in the way of |
| 13416 | 3 | 14 | 1 | 14 | 8 | This treatment of arguments on why the polluter pays principle cannot be applied (or can be applied in only a very limited way) in relation to compensation is much too one sided. At least equal space should be given to the opposite argument. This counter-argument has been made by others such as Gardiner 2010 and Shue (1992 and other articles) -- for example their point that if people in poorer countries are deprived of their share of an important resource needed for their very survival, then ignorance is not an acceptable reason for not assisting or compensating especially since the rich nations' overuse of the resource denies the poor of extricating themselves from the problems the rich created. | No action; this comment is the same as comment 13415, see our response to comment 13415 |

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| 6964 | 3 | 14 | 1 | 14 | 2 | I outline an approach to intergenerational corrective justice that overcomes the problem of dead duty bearers: Catriona McKinnon, 'Climate Change and Future Justice: Precaution, Compensation, and Triage' (London: Routledge, 2011), esp. chapter 4. | Agreed. We added a reference and refer to McKinnons partial solution of the problem. |
| 11554 | 3 | 14 | 1 | 14 | 2 | The discussion of the identity problem should consider that there may also be an identity problem at the victim side. Who should have compensation? | Agreed. We added this dimension of the discussion |
| 9292 | 3 | 14 | 16 | 14 | 18 | “Owing... section 3.2.4)”. I found this sentence confusing. Is the point that past emissions that e.g. raised the standard of living for predecessors but happened to have no knock-on effects (e.g. via technological progress) for present people are excluded? If so, I don't understand how the non-identity problem is relevant here. | Agreed. We clarified this. |
| 2120 | 3 | 14 | 16 | 14 | 20 | Passage is cumbersome. | Agreed. We clarified this. |
| 12135 | 3 | 14 | 18 | 14 | 19 | BPP's implication that existing people should be responsible only for emissions from which they have benefited seems to me exactly right. While some disagree, it may be worth noting that this is not necessarily an objection to the principle. | No action; we do not claim that it is an objection to the principle as such. |
| 12136 | 3 | 14 | 20 | 14 | 22 | Need benefiting from injustice be voluntary in order to create an obligation to disgorge the gains? (Note Butt's argument that it need not [2007, p. 134].) | Noted. |
| 6965 | 3 | 14 | 21 | 14 | 21 | The word 'feasibly' does a lot of work here. It would be good to indicate that somehow. | Noted. We deleted "feasibly" and added |
| 11555 | 3 | 14 | 23 | 14 | 33 | The presentation of the community pays principles is too short. In general, thorough discussions of collective responsibility and remedial responsibility are lacking. | Cannot be addressed given the space constraints |
| 6966 | 3 | 14 | 26 | 14 | 26 | Janna Thompson's communitarian approach to intergenerational justice should be referenced in connection with 'transgenerational community' (see Janna Thompson, 'Intergenerational Justice: Rights and Responsibilities in an Intergenerational Polity', London: Routledge, 2009). | Agreed. We added a reference to Thompsons 2001 article in Ethics. |
| 2119 | 3 | 14 | 3 | 14 | 4 | There is something confusing about this conclusion, with its focus on PPP. For example, the third problem identified in the previous paragraph does not seem to arise for PPP, as the question of whether or not the polluter *benefited* from the emissions is not obviously relevant to her compensatory duty under PPP. | Agreed. We clarified this. |
| 12137 | 3 | 14 | 31 | 14 | 33 | Shouldn't the criterion be whether the past emitters could reasonably have anticipated whether their emissions would be harmful? | No action; this is how the "ignorance" problem is explained on p. 13, lines 33- |
| 9293 | 3 | 14 | 32 | 14 | 33 | In light of the last sentence, I take it that “can [now?] be shown” should read “were known at the time of emission”. | Thank you. In the sentence we now refer back to the first and second problem as |
| 9342 | 3 | 14 | 34 | 14 | 47 | a great deal of space to illustrating the limited applicability of the principle of compensatory justice. any other approaches? | No action; we review distributive justice in 3.3.4 |
| 14844 | 3 | 14 | 34 | | | That the applicability is "limited" has not been compellingly established. | Thank you. 'Compellingly' is too much to expect in this survey. We changed the |
| 16670 | 3 | 14 | 39 | | | distinction between causal responsibility vs. ability to pay was discussed in following prior to other references: Dale Jamieson, “Global Responsibilities: Ethics, Public Health, and Global Environmental Change,” Indiana Journal of Global Legal Studies 5,1 (Fall 1997): 99-119 | Thank you. We added a reference. |
| 12138 | 3 | 14 | 39 | 14 | 42 | There does not seem to be a plausible rationale based on *distributive justice* for including the causal responsibility of past people as a factor in allocating the burdens of adaptation, as opposed to ability to pay. | Thank you. We changed the wording. We mean to refer to the correlation between level of (past) emissions and |
| 6967 | 3 | 14 | 45 | 14 | 46 | A third and distinct reason for thinking that present people have IG duties of justice is that they have an obligation to (at least) put future people at risk of life in conditions in which the pursuit of justice is not possible. | Thank you. We changed the wording and added a cross-reference. |
| 14842 | 3 | 14 | 8 | | | "…a small part of the problem…": is not substantiated. | Agreed. Was changed to "some part". How big the part is depends on the percentage of emissions (causally relevant for climate change today and in |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14843 | 3 | 14 | 9 | | | BPP: again, discussion of the counter-arguments to the objections, which do not seem strong. (What about partial responsibility for past emissions that led to benefits being enjoyed? How strong is the condition of voluntary acceptance?) | No action; cannot be addressed given the space constraints |
| 12780 | 3 | 14 | 1 | 14 | 2 | I am not sure if this assumption is replicabel to climate policy, since countries do not die. | No action; point is made: See below, p. |
| 6465 | 3 | 14 | 3 | 14 | 8 | The analysis of the polluter pays principle is based excusively on obligagtions of individuals. Yet nations have responsiblility under the UNFCCC under the "no harm" priciple in the Preamble, and various express provisiions dealing with obligations ofd developed and developing countries. If this is true the limitations of the 'plluter pays principle" identified in this section are not applicable. A sentence should be added distinguishing obligagions of individuals from nations. | Agreed. See sec. 3.3.6 |
| 8147 | 3 | 15 | | | | Can you provide an example of a causal link with respect to legal issues and its relationship to CC (e.g. liability of a firm for polluting)? | Will be addressed in SOD |
| 4619 | 3 | 15 | 18 | 15 | 18 | bon père de famille | Will be addressed in SOD |
| 9121 | 3 | 15 | 18 | 15 | 21 | Again the implications of accumulation of wealth (agglomeration economies) and the GHG's from the construction of infrastructure systems (including buildings) should not be forgotten. | No action; comment unclear |
| 9122 | 3 | 15 | 22 | 15 | 24 | Higher density may potentially lead to more consumption of goods, especially if rebound effect exists due to savings on transport costs (see the first comment concerning the whole AR5). | No action; comment unclear |
| 14846 | 3 | 15 | 30 | | | The causal link is trivially shown in the case of depleting a finite common resource, the depletion of which prevents subsequent legitimate use. | No action; consulted with legal expert - this is incorrect, at least in the context of tort law. It is necessary to show that the |
| 6968 | 3 | 15 | 30 | 15 | 39 | Reference should be made here to Sinnott-Armstrong's rejection of the Harm Principle as generating liability for individuals for CC in virtue of their emissions: his arguments draw on (he claims) the absence of a causal link between individual emissions and CC. See Walter Sinnott-Armstrong, 'It's Not My Fault: Global Warming and Individual Moral Obligations' in Gardiner, Stephen M., Caney, S., Jamieson, D., and Shue, H. (eds), Climate Ethics: Essential Readings (Oxford: Oxford University Press 2010). An excellent response is Hiller, Avram, 'Climate Change and Individual Responsibility', The Monist, Vol. 94, No. 3 (2011), pp. 349-68. And John Nolt's controversial paper should also be mentioned: Nolt, John, (2011), 'How Harmful are the Average American's GHG Emissions?', Ethics, Policy and Environment, 14:1, 3-10. | No action; comment is mistaken and this is not an appropriate place to mention this literature |
| 9526 | 3 | 15 | 35 | | | Please, delete also. | No action; disagree with comment |
| 6969 | 3 | 15 | 40 | 15 | 46 | This paragraph could be cut without loss. | No action; this paragraph was included because some of the arguments for climate responsibility rely on theories of |
| 9003 | 3 | 15 | 47 | | | Legal systems do not recognize legal liability from externalities. Existing legal systems appear to provide inadequate and incomplete help to making progress on normative questions. | No action; consulted with legal expert - the chapter makes it clear that the legal system is a source of possible insight on |
| 16631 | 3 | 15 | 47 | 16 | 2 | Change the sentence that starts with "[t]his approach…" to this approach could lead to serious errors because weighting monetary values helps capture wealth differences among different countries. | Noted. |
| 4925 | 3 | 15 | 6 | | | Just recently a court (ECJ) decided against aviation companies as emitters of GHGs .. | Will be addressed in SOD |
| 4926 | 3 | 15 | 9 | | 14 | Just recently a court (US AC) decided that the GHGs are pollutants .. (i.e. with harmful effects and certain duties for the emitters within the USA) .. | Will be addressed in SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14845 | 3 | 15 | | | | This section seems fails to distinguish between states and individuals (or firms), which may well have different responsibilities. This may especially be the case after having signed an international declaration (Rio, 1992) stating: " "In view of the different contributions to global environmental degradation, States have common but differentiated responsibilities. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command." As CO2 remains in the atmosphere, the mentioned degradation continues even as a result of historically emitted GHG pollution. | No action; we are avoiding discussion and interpretation of UNFCCC and related international agreements (beyond the scope of our chapter). |
| 12781 | 3 | 15 | | 16 | | All topics regarding historical responsibility or intergenerational justice should be summarized in one section. | No action; disagree with comment; it seems reasonable to separate legal |
| 7360 | 3 | 15 | | | | This section discusses legal concepts of historical responsibility from a compensatory perspective but misses discussion of legal concepts in the allocation of emission rights considering historical responsibility. This is not addresed in 3.3.4 and so should be inculded here. Some discussion of such issues is availble in: Carlsson, Jonathan. (2009) 'Reflections on Problems of Climate Justice: Climate Change and the Rights of States in a Minimalist International Legal Order.' Transnational Law & Contemporary Problems Vol,18, 45. and Parikh Jyoti, et. al. (1997) 'Climate Change, North-South Co-operation and Collective Decision-Making Post-Rio.' Journal of International Development, Vol. 9, No. 3. 403 | No action; international law beyond scope of chapter |
| 3930 | 3 | 15 | 1 | 16 | 2 | This section arguably needs to make the point that a common law determination does not generally dictate the outcome. Polluters who are determined to be outside the law can make themselves legal by achieving the plaintiff's consent. | No action; comment unclear |
| 4569 | 3 | 15 | 17 | 15 | 18 | Add: Grossman, David A., Tort-Based Climate Litigation. 2009. In: William C.G. Burns and Hari M. Osofsky (eds.), Adjudicating Climate Change: State, National, and International Approaches. Cambridge University Press Cambridge UK, 193-229. | Will consider these references |
| 3141 | 3 | 15 | 2 | | | section 3.3.6 might benefit from some discussion of legal cases (e.g., in Alaska) where countries have actually tried to address climate with nuisance and other frameworks. The attribution problems, within the legal system, are a severe barrier. And a little case study or two (just a few sentences) would help underscore that. | Will be addressed in SOD |
| 15646 | 3 | 15 | 27 | | | Re "1990" - explain that this determination was on the basis of the publication of the IPCC's first assessment report. | No action; consulted with legal expert - it does not seem to me that the |
| 4568 | 3 | 15 | 7 | 15 | 8 | Add: Burns, William C.G. and Hari M. Osofsky. 2009. Overview: The Exigencies That Drive Potential Causes of Action for Climate Change. In: Adjudicating Climate Change: State, National, and International Approaches. William C.G. Burns and Hari M. Osofsky (eds.). Cambridge University Press, Cambridge UK, 1-27. | Will consider these references |
| 6466 | 3 | 15 | 15 | 15 | 29 | In the United States, legal liability under statue as well as tort law makes someone reponsible for inherently dangerous activities once they should have been on notice that the activitiy was dangerous. Actual knowledge is not a requirement.In climate change the anlsysis would follow that when governments or indviduals are put on notice through scientific organizations that greenhouse gas emissions were potentially dangerous. Under litigation about the meaning of the "no harm principle" international courts have said that lack of certainty about harm is not an excuse for behavior that is dangerous. | No action; already addressed. |
| 8823 | 3 | 16 | | | | same comment with respect to procedural justice: too much general information is included; I suggest letting texts fulfill this function and omitting much of this tutorial. | No action; disagree with comment |
| 11197 | 3 | 16 | 15 | | | The UN has a system of accredited non government parties, and it may be worth mentioning this here, as to how the UN effectively recognises and addresses this issue. | Will be addressed in SOD |
| 16671 | 3 | 16 | 16 | | | Classic cite for procedural justice, especially the question of who among the affected count is Nozick, Anarchy, State, and Utopia | Will be addressed in SOD. |
| 6971 | 3 | 16 | 16 | 16 | 20 | The 'all affected' principle delivers a fully intergenerational vision of justice, such as that embodied in Rawls' Just Savings principle. | Will be addressed in SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7913 | 3 | 16 | 25 | 16 | 31 | What would the ideal of deliberative democracy mean for climate policy and decision making? In our opinion, it would be more important to elaborate on that. And: procedural justice clearly is more than just providing information. | Will be addressed in SOD |
| 11198 | 3 | 16 | 31 | | | The UN General Assembly has recognised the right of Indigenous Peoples to not only be consulted or to participate in activities that will affect them but accords them the right to give or withhold their free, prior and informed consent to developments that may impact them. This right to FPIC includes the right to reject development proposals from any third party, government or industry, that affects their customary territories. (United Nations Declaration on the Rights of Indigenous Peoples). | Will be addressed in SOD |
| 6970 | 3 | 16 | 6 | 16 | 8 | This makes it look like procedural and distributive justice are alternatives, whereas (for many) distributive justice is the outcome of procedural justice. | No action; disagree with comment |
| 14848 | 3 | 16 | | | | Sec. 3.3.7 on procedural justice could greatly benefit from some of the empirical research carried out on the conduct of the UNFCCC negotiations, and the disparate capacity to engage between developed countries and developing countries. | No action; this issue is too large to be addressed here |
| 3931 | 3 | 16 | 4 | 16 | 8 | This section seems to be saying that if a political majority determine to kill all non-believers that is fine from a procedural justice viewpoint as long as the public decision was taken in a fair way, independent of outcome and the oppressed minority had a fair say in the decision. But that notion of untrammelled majoritarian democracy is starkly inconsistent with the idea of individual human rights. This might be the ideal 'deliberative democracy' it is not the ideal of checks and balances and protections for human rights that are central to the US constitution. The idea of individual basic rights is supported elsewhere in the chapter in the intergenerational context, its application to the procedural justice section would seem to be relevant and appropriate. | Will be addressed in SOD. It may be enough to remove 'independent of outcome' from the first sentence. |
| 11556 | 3 | 16 | | | | In relation to the discussion of levels and scope of procedural justice two contributions should be taken into account. Steve Rayner “How to eat an elephant: a bottom-up approach to climate policy” (Climate Policy 10 (2010) 615–621) and Elinor Ostrom “Green from the Grassroots” (Project Syndicate, June 12, 2012). Both papers discuss the relevance of polycentric and overlapping local and national policies - combined with a thin global agreement. | Will be addressed in SOD; this issue is more appropriate in 3.11.2 |
| 8824 | 3 | 17 | | | | this section, on “non-human values,” would become more meaningful if it were to begin with examples of the types of impacts and areas of risk that are relevant because they are directly related to climate change. | Done that to some extent |
| 17164 | 3 | 17 | 11 | | | Chapters 3.4 and 3.5 do not make sufficiently clear that the aggregated view is highly problematic from many ethical perspectives. It seems like a bias toward utilitarianism here. | This was not the intention of the section and chapter. We have changed the |
| 12139 | 3 | 17 | 11 | 17 | 14 | It seems to me that more of a transition is needed in shifting to 3.4, indicating that the account is moving from largely deontological accounts of distributive justice to consequentialism. | We have put more stress on the transition. |
| 7915 | 3 | 17 | 12 | 17 | 24 | Please explain the concept of a value that your remarks are based on. What is a value: a whish, preference, good, benefit, etc.? | Not every common concept can be defined. Our use of a concept reveals |
| 7916 | 3 | 17 | 15 | 17 | 18 | This reads as if an unpolluted environment is a luxury good. That thi is not the case is demonstarted, for instance, by Martinez-Alier (2002). | This remark has been removed |
| 9386 | 3 | 17 | 19 | | 27 | In discussing values, much emphasis is laid on the "incommensurability thesis"; yet this is a very general observation which does not say much about the particular values involved. | Noted; another example added. |
| 17161 | 3 | 17 | 19 | 17 | 27 | In my opinion, the authors make it too easy for themselves when arguing that different kinds of values (environmental, cultural, social, economic, etc) cannot and should not be compared with each other. If a decision is to be taken, then such a comparative valuation is absolutely necessary and indispensable: Weighing different kinds of goods is at the heart of most decisions. But the point is that not everything can be reasonably valued with one single (quantitative or pseudo-quantitative) metric, such as in monetary terms (values require a common nummeraire to be commensurable). Rational choice does not necessarily require commensurability, but only comparability. See, e.g., Beckerman, W.: Economics as applied ethics. Value judgements in welfare economics. Houndmills, Basingstoke: Palgrave Macmillan, 2011, p. 97. | The authors do not argue that different kinds of value cannot and should not be compared. |

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| 2205 | 3 | 17 | 26 | 17 | 27 | Procedure is not the only other possible determinant of rightness in such cases. One may count all choices that are worse than no other as right. Or one may used localized and expanded conceptions of betterness. | Have changed 'will' to 'may' |
| 16675 | 3 | 17 | 29 | | | The section on non-human values should make reference to respect for nature. The Taylor book of that title (published in a new edition in 2011) is only cited for its arguments concerning the moral status of individual organism. For a broader conception of respect for nature see Dale Jamieson, "Climate Change, Responsibility, and Justice," Science and Engineering Ethics 16 (2010): 431-445 | Included |
| 9387 | 3 | 17 | 34 | | 36 | The comments on Kant are rather cursory - actually, a whole strand of thought in the human rights-traditions refers to the diginity of persons. | We don't have the space to treat Kant properly |
| 6973 | 3 | 17 | 40 | 17 | 40 | Why 'vehicles'? Why not 'who experience pleasure, pain, suffering …'? | Corrected |
| 9388 | 3 | 17 | 42 | | 44 | It is not very fair to cite Routley and his ideas about "chauvinism" in order to introduce non-human values. In recent years, authors in the field of environmental ethics have given detailed and very elaborated accounts of non-human values. | We've expanded a bit |
| 9389 | 3 | 17 | 42 | 18 | 12 | The overview over environmental ethics - or positions which defend a value in nature - is very cursory. It does not represent the current situation in research. | We've expanded a bit |
| 11557 | 3 | 17 | 8 | 17 | 10 | Another justification of just procedures is an epistemic argument. If people and societies are challenged by a knowledge deficit (as for example Hayek argues), then polycentric deliberation through democratic and just procedures may be necessary due to epistemic reasons. | Will be addressed in SOD |
| 17160 | 3 | 17 | 1 | | | You should add justifications for procedural justice beyond mere instrumental reasons (such as your first reason, which is however very unspecific), for instance that human rights etc imply a certain right to "self-determination" and to co-decide about the way certain goods are provided in society. See, for instance, again: Kowarsch, M./Gösele, A.: Chapter 7: Triangle of Justice, in Edenhofer, O./Wallacher, J./Lotze-Campen, H./Reder, M./Knopf, B./Müller, J. (eds.): Climate Change, Justice and Sustainability: Linking Climate and Development Policy, Dordrecht: Springer 2012, pp. 73-90. There are many other publications arguing this way. | Will be addressed in SOD |
| 6972 | 3 | 17 | 1 | 17 | 10 | This section could be cut without loss - it adds very little. | Will be addressed in SOD |
| 13932 | 3 | 17 | 8 | 17 | 10 | The reference to "imprefect procedural justice" is not that clear. You may consider deletion. | No action; disagree with comment |
| 8595 | 3 | 17 | | 17 | | A section on values is a good idea, but it would be very helpful to have a more balanced introduction. A clear paragraph identifying the limitations of what this section is and is NOT covering (including rights) would be helpful | Done that. |
| 8148 | 3 | 17 | | 22 | | How is value and well-being linked to CC? What do different strategies imply about well-being? Can you illustrate how different social welfare functions impact the rankings of different strategies regarding CC in a more concrete manner with an example (e.g. carbon tax policy)? | Have added examples. |
| 8249 | 3 | 17 | | 22 | | The authors talked about the concept of individual and aggregated social wellbeing in the form of a society's social welfare function over time.<br>Comment: The authors' explanation of estimating a temporal social welfare function (SWF) is clear. However, since the focus is on estimation of a temporal SWF, it might be more elaborating if they explain little more on the procedural issues relating to the measure of temporal SWF. For example, some key temporal issues such as uncertainty in population growth due to exhaustible resource constraints over time are not covered in their discussions in this subsection. | At this point we are dealing with values. There are empirical constraints on the promotion of values, such as resource constraints. We cannot deal with constraints at this point. They come up later in the chapter and the volume. |

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| 14309 | 3 | 17 | 11 | | | The current version of the chapter shows a strong bias in favor of using social welfare functions to support climate change decision making. Many pages are devoted to the derivation of social welfare functions, whereas their fundamental shortcomings are not discussed in detail. Only 3 lines refer to the problems of aggregation (page 20, lines 33 - 35). The discussion of the "Paretian approach" (Section 3.5.3.) is not a suitable substitute for such a discussion as it refers to a method that was suggested to work even under the condition that no such a thing like a social welfare function exists. It does not, however, discuss the reason why "Some economists have claimed ..." that there are severe problems in deriving social welfare functions (page 20, line 33). As these reasons (e.g. the Impossibility Theorem of Arrow) have led the 2nd Assessment Report to make a strong recommendation against the usage of social welfare functions (and especially against the usage of optimization approaches to climate change decision making in general) the AR5 must refer to this statement and explain the progress (if there had been some) that led to a reconsideration of this recommendation. The mere observation that many researchers have used CBA is not sufficient to abstain from a detailed discussion of the weakness of CBA applied to a global problem. | The remarks in the SAR do not seem to constitute a strong rejection of social welfare functions or optimization. We believe we have stated the required assumptions correctly. |
| 8581 | 3 | 17 | 11 | 17 | 28 | This section on values would benefit from a first few lines more clearly linking it to the previous discussion of ethics so that the reader can more easily make the jump from one section to the next (as they stand there is almost no connection made). It is also intriguing that the examples used to discuss value in the second paragraph are both largely monetary. Its also not clear that these examples have anything to do with VALUES (more freedom to devote to environmental resources? This may be a result of certain kind of wealth, but is hardly a value if framed in this way). Line 19 is particularly problemtic - it fundamentally assumes that the ONLY way to assess an outcome is through a utilitarian aggregation. This is a serious problem. How for instance, does this section propose to deal with extinctions? Is the loss of life truly captured through aggregation? Does value lie only in the aggregate? This entire chapter assumes that utilitarianism (and then narrowed even more stringently into neo-classical economics) is the only way to represent value even though the literature on ethics and climate change, and on the utility of utilitarianism for complex policy contexts, would point out the limitations of this. | More linking has been created between sections. The word 'aggregation' was evidently misleading and has been removed. |
| 7914 | 3 | 17 | 11 | | | From 3.4 onwards the whole debate is on value and welfare. Debates on justice and deontological reasoning are skipped, although most literature in climate ethics is on justice and, so far, there only very vew utilitarian/welfarist contributions exist (see comment 50). Section 3.3, which takes this (partially) into account, is unrelated to discussions in other sub-chapters. Demands for redistribution and compensation are mostly ignored in chapters 3.4 to 3.10. | We try to deal with one topic at a time. Section 3.3 is about justice and section 3.4 about value. |
| 6467 | 3 | 17 | 17 | 17 | 28 | This section must acknowledge that some ethical principles would not resolve conflicts of values throug weighing or balancing but would restrict certain behaviors absolutely if they interfere with basic rights or deontological duties, This sectio as written is very misleading in that it does not recognize that disputes about ethical duties according to many ethical theories should be settled based upon the strenth of ethical arguments. For this reason it is important to add a sentence ot this section something like: Some ethical theoires hold conflicts between values must be resolved by the strenght of ethical arguments. If for instance, an activitiy creates a human rights violattion, that activity is ethically unacceptable and cannot be justified on consequentialist analyses. | This is not about a conflict of different ethical principles, but a conflict of the values that are recognized in a single ethical theory. The idea that rights constitute a side-constraint on maximizing value is discussed in sections 3.2 and 3.3. It does not conflict with the weighing of values. |
| 12782 | 3 | 17 | 28 | 17 | 28 | The subdivision of human values, which is used in the following sections should be mentioned here. So that human values include cultural and social values, wellbeing and its aggregation, lifetime wellbeing functions, social welfare functions, valuing population. Maybe it could be helpful to make subsections:<br>3.4.2 Human values<br>3.4.2.1 Cultural values<br>3.4.2.2 Wellbeing etc. | We do not have the space to reiterate the structure of the section. |
| 6312 | 3 | 17 | 28 | 17 | 29 | Again, it is simply inaccurate to say that "values can be classified into human and non-human values." Use a different language, i.e. anthropocentric and non-anthropocentric, or similar. | Anthropocentric' is now mentioned as a synonym for 'human'. |

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| 7917 | 3 | 17 | 29 | 18 | 18 | The whole section is highly superficial, given standards of environmental ethics. Also, you should discuss the consequences for climate policies if some of the perspectives mentioned are adopted. Eventually, the section should be skipped given it's insufficient depth. | Section expanded a bit |
| 9393 | 3 | 18 | | 23 | | These pages are very much an excursus about social welfare-theory and utilitarianism. This does not represent the range of options to work on competing values in ethics. | More emphasis has now been given to the range of options. |
| 13566 | 3 | 18 | | | | also related to comment 4, and so relating to consistency, later on, these broader dimensions are touched on including the definition of wellbeing (on page 18) in a broad sense as that (which is) good for a person - in addition to the Gross National Happiness of Bhutan (see also Happiness Planet Index http://www.happyplanetindex.org/), there are also studies which trace a persons wellbeing / happiness and affinity to the environment to time spent in nature (see work of Nisbet et al. 2009 Environment and Behaviour) http://eab.sagepub.com/content/41/5/715.short and 2011 Journal of Happiness Studies http://www.springerlink.com/content/t657024255174pt7/) | Comprehensive references have been included |
| 4938 | 3 | 18 | 11 | | | {Add} The {}increased speed/rate of the loss | No action; disagree with comment |
| 9527 | 3 | 18 | 11 | | | please, delete .) (parenthesis and period). | Done |
| 11558 | 3 | 18 | 16 | 18 | 18 | If human value cannot be measured. What is the relevance of using the aggregate of people's willingness to pay for it as a measure of its value? More needs to be said about what value theory is assumed. | This comment seems to result from a misunderstanding at this point, since we |
| 17139 | 3 | 18 | 19 | | | See also: Petheram, L., Zander, K., Campbell, B., High, C., and Stacey, N. (2010) 'Strange Changes': Indigenous perspectives of climate change adaptation in NE Arnhem Land Australia. In Global Enviornmental Change 20 (4): 681-692; Nakashima et al. (2012) Weathering Uncertainity: Traditional Knowledge for Climate change Assessment and Adaptation. UNESCO and UNU Press. | We checked the first reference; it contains little evidence of damage to culture specifically. The second reference appears to be grey |
| 12140 | 3 | 18 | 20 | 18 | 23 | It may be worth noting that whether there are any goods that are not measured in terms of good for individuals (human or otherwise) is controversial (that there are not is assumed at the top of p. 20). | Some sentences have been added about this controversy. The top of page 20 |
| 3932 | 3 | 18 | 20 | 18 | 21 | Can a reference be provided for this assertion? It looks like a novel assertion, because as I understand it, the economist's concept of individual utility maximisation would not see any such division. Human wellbeing can't be divorced from the cultural and social context. Individual's act on the basis of the overall effect on their wellbeing, defined in the broadest possible context. | This has been dealt with by means of a reference and some sentences. |
| 11216 | 3 | 18 | 25 | | | add s to people, ie Arctic indigenous peoples | Done |
| 11217 | 3 | 18 | 26 | | | add s to people, ie Cultural values and indigenous peoples. Correct section is 3.11.2.3 (not 3.10.2) | Done |
| 17140 | 3 | 18 | 26 | | | Reference is made that a further discussion of cultural values and indigenous peoples is included in section 3.10.2 - however, section 3.10.2 deals with The Cost of Mitigating GHG's and does not include a discussion of these issues. A discussion of Social and Cultural Issues is included in section 3.11.2 | Numbering corrected |
| 3933 | 3 | 18 | 28 | 18 | 28 | Since this is an ethical chapter, should it not note that the benchmark for the Gini coefficient is equality of materialistic outcome - specifically, actual outcomes are compared with the benchmark that x percent of the population should receive x percent of the income, for all values of x and regardless of effort, luck, skill or merit. | This matter of detail is not needed here. |
| 9390 | 3 | 18 | 33 | | 35 | The overall value of human life is not well-being, but dignity (or call it autonomy, self-respect etc.). The focus on well-being is understandable in two frameworks: theories on distributive justice and - in a way - a utilitarian framework. Yet, it is not adequate in a discusison of "values". | Wellbeing is explicitly defined to include all of a person's good. So it includes dignity if dignityis a good. |
| 7918 | 3 | 18 | 33 | 19 | 4 | The capabilities approach is briefly mentioned. Then, the move from values to aggregation quickly shifts the perspective to utilitarian ethics. This perspective, however, obscures problems of justice and human rights, importants aspects of the capabilities approach and other ethical approaches (see comment 50). The whole section (including 3.5-3.7) is interesting for utilitarians only. | No action; we deal with the aggregation of people's good, whatever it consists in. This is explained |
| 17162 | 3 | 18 | 4 | 18 | 5 | One could add: Leopold, Aldo: A Sand County Almanac. New York: Oxford University Press, 1949. And: Schweitzer, Albert: Kultur und Ethik, Beck: Munich 1996. | One of these added |
| 2206 | 3 | 18 | 4 | 18 | 5 | A more up-to-date and better argued source than Taylor is Agar N. Life's Intrinsic Value: Science, Ethics and Nature. Columbia University Press, New York, 2001. | Added |
| 17704 | 3 | 18 | 8 | 18 | 10 | Poor quality graph, great idea but not properly explained. Some color would be good. | Figures will continue to be improved in |

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| 2335 | 3 | 18 | 33 | 21 | 44 | For this section, I would like to add some points from my research article to elaborate main argument in the sub sections.<br>“The profile of wellbeing varies among different social structures. Interns of material sense of wellbeing, lack of a telephone does not count as poverty in a developing country, because telephone is not considered a necessity. However, in a developed country, a telephone is considered as a consumer good, the lack of which is deemed as poverty. Furthermore, social stratification leads to ordering sense of wellbeing. Social network, civic conscience and mutual trust as the elements of the social capital of society to strengthen the people participation, caste system appears as obstacle for the social process.” Reference:-<br>Withanachchi, S. 2011, “Participatory Development Approach in Local Governance – Its Relevance for Economic Development: a case study of Sri Lanka”, Federal Governance, vol. 8 no. 3, pp. 50-68 | Noted |
| 13933 | 3 | 18 | 11 | 18 | 11 | There is a typo. A ) in excess. Two parethesis in excess occur on footnote 3 in that same page. | Corrected |
| 3142 | 3 | 18 | 19 | | | section 3.4.2: there are some reports (by UNESCO, I think) on impacts of climate change on world heritage sites.<br><br>throughout, the role of uncertainty and perception (especially in light of chapter 2) seems under-played. Section 3.8 addresses uncertainty, but do the perspectives discussed earlier in the chapter—for example, varied justice perspectives—lead to different assessments under different kinds of uncertainty?<br><br>The chapter should get a steer from the TSU on policy design and choice (addressed in section 3.8 and 3.9). These are good discussions, but the same issues are rehashed (usually with lower quality writing and analysis) throughout WG3 and this needs to get streamlined. □ | Peer-reviewed literature on cultural damage is scarce. It is not really feasible to say much about uncertainty in the space; this has to be left to chapter 2. Overlap with other chapters is being addressed as well as we can. |
| 9344 | 3 | 18 | | | | Could add the discussion on well-being in the conceptual framework of the Millennium Ecosysttem Assessment (2003) and (2005) | Not peer-reviewed |
| 6974 | 3 | 18 | | | | The relevance of the material in this section to ethical debates about CC should be better signposted. | Some examples have been added. But it seems obvious that valuation is needed |
| 16672 | 3 | 19 | | | | I'm not sure about this distinction between values that contribute to the good of a community and those that contribute to humans as individuals. It could and has been argued that the former are values precisely in virtue of functioning in the latter way. | Yes. This controversy is now mentioned with a reference. |
| 8582 | 3 | 19 | | | | The quality of graphics is hard to read and I don't actually understand what this is trying to convey. | Figures will continue to be improved in |
| 9391 | 3 | 19 | 1 | | 2 | In ehtics, the most important question is how well-being is defined, not how it is aggregated. Moreover, the claim which the authors formulate is not coherent with the former claim of the "incommensurability" of values. If well-being is a value, there is nothing more to say than that there are trade-offs which cannot be avoided. | No action; comment unclear |
| 2122 | 3 | 19 | 1 | 19 | 3 | The reader may benefit from some brief sign-posting explaining the focus on *aggregation* of wellbeing. | Text has been changed. |
| 16633 | 3 | 19 | 1 | 19 | 1 | Delete. | No action; other comments imply that this sentence needs stressing, not |
| 4488 | 3 | 19 | 19 | 3 | 23 | Why include this discussion when its premises (numerically measurable utility that is cardinally comparable across individuals) are so easily rejected? This discussion and the accompanying Figure are potential candidates for excision. | Not everyone thinks they are easily rejected. |
| 7919 | 3 | 19 | 19 | 19 | 23 | A cardinal scale at every point in time is a heroic and completely unrealistic assumption. | Some basis for it is referred to. |
| 9392 | 3 | 19 | 3 | | | Usually, ethics does not define the well-being of a society in terms of aggregates, but in terms of either community values or political values (equity, justice, common goods such as health-care, public education, good condition of the environment) plus individual well-being. | This is well covered by the existing text. |
| 13934 | 3 | 19 | 9 | 19 | 9 | This figure is not helpful and uses space. The text is clear enough. Suggest deletion of this figure. | Conflicts with previous comment. |

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| 8583 | 3 | 20 | 1 | 22 | 28 | It is strange that in a chapter on ethics and economics, the strategies for defining a social welfare function are covered in depth (line 1 on pg 20, to the end of page 22), while the ethical problems of these, and some of the ramifications they have on discussions about population are refered to only vaguely and in only 4 lines (lines 28-31 on page 22). It is this type of systemic lack of balance that is going to result in profound criticism of this chapter. | No action; subsection on population on p. 22 adequately addresses this issue |
| 11559 | 3 | 20 | 1 | 30 | 24 | Textbook style explanation of economic concepts. The economic concepts should be related to the ethical, social and political dilemmas (as it is done in chapter 4 where sections are problem driven discussions). The relevance of the concepts for environmental issues and climate change should be stressed. What implication does it have for climate ethics how we measure well-being? The sections may be shortened. | Noted; we already intend to shorten textbooky sections for SOD |
| 3934 | 3 | 20 | 33 | 20 | 35 | Why is the adjective 'sceptical' used here rather than "mainstream" or "valid"? What economists have accepted is that interpersonal utility comparisons are inherently subjective, making choices between contending weighting systems arbitary. The sentences in lines 33 and 34 are a bit misleading in that they omit the subjectivity-arbitrariness aspect. If there is any claim to the contrary - that these comparisons can be made on a non-arbritary objective basis, it should be documented. Failing that, the rest of this section starting in line 36 with the words 'we set it aside' looks like a cop out. | Sceptical' is a correct adjective. References to means of interpersonal comparison are included. |
| 7935 | 3 | 20 | | | | In general, models discussed overstate mitigation costs (see section 3.12: inovation is - unplausibly - modeled as exogenous) and underestimate damages (reasons are amongst others: high dicount rates, the models only account for certain types of harms, damages are assumed to be linear, etc.). Again, a critical discussion of the models would be valuable that takes up the many critical points raised throughout chapter 3. | Noted; will be addressed in SOD |
| 9002 | 3 | 20 | | | | The discussion on social welfare functions is of little practical value to make progress in arriving at normative decisions in the question of climate change which involves agreement and negotiations among human populations (states) and not central planning. Even in a national context, the use of social welfare functions might not be justified. One possible way to provide a perspective on the usefulness of the concepts related to aggregation is to refer to the possibility that if the a global social welfare function were to be used as a framework, the Convention recognizes two kinds of 'individuals' - Annex 1 and non-Annex 1 countries. The application of the principle of common but differentiated responsibility would entail a greater weight to non Annex 1 welfare functions. | Parties to negotiations make judgements of value, which should be soundly based. This chapter aims to help them. |
| 10263 | 3 | 21 | 22 | | | Routa, J., Kellomäki, S., Kilpeläinen, A., Peltola, H. and Strandman, H. 2011. Effects of forest management on the CO2 emissions of wood energy in integrated production of timber and energy biomass. GCB Bioenergy 3: 483–497. Citation from the article: "Over the life cycle, the net CO2 emissions per unit of energy are smaller for wood than those for fossil fuels; i.e. on average 99 kgCO2MWh 1 for Norway spruce (range 65–152 kgCO2MWh 1), 123 kgCO2 MWh 1 (range 78–192 kgCO2MWh 1) for Scots pine and for coal 341 kgCO2MWh 1, if the emissions for production and transportation of coal are excluded (Statistics Finland, 2005). Intensive management for timber and energy biomass clearly decreases net CO2 emissions in energy production."<br>"Intensive management for timber and energy biomass clearly decreases CO2 emissions in energy production. Thus, it seems possible to produce forest biomass for energy purposes with relatively low CO2 emissions by applying intensive management and in this way also substitute for fossil fuels (Sathre, 2007)." | No action; comment is aimed at a different chapter |
| 2123 | 3 | 21 | 33 | 21 | 34 | I can see that the alternative of *average* utilitarianism is not important here, as we are dealing with a fixed population; but still, this sentence might seem puzzling to those familiar with the alternative. So perhaps it could be noted as a view to be discussed in the next subsection. | Wording has been altered |

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| 6977 | 3 | 21 | 40 | 21 | 44 | This paragraph could be cut without loss. | It has been cut. |
| 9288 | 3 | 21 | 43 | 21 | 44 | “Is not consistent with Harsanyi's theorem” - it would be better to state which axiom(s) of Harsanyi's theorem is violated by the SWF under consideration (esp. since anyone who would otherwise advocate the maximin SWF is likely to bite the corresponding bullet(s)). | Has been cut |
| 4490 | 3 | 21 | 7 | 3 | 12 | There are hidden Malthusian assumptions in the assertion that this form of utilitarianism leads to anti-natalist policies. For example, a larger population may lead to a larger number of geniuses (Mozart, Einstein, Salk), with corresponding increase in the average utility of all. | No action; comment unclear |
| 16673 | 3 | 22 | | | | This begins a discussion on the failures or weaknesses of the applications of cost-benefit analysis to cliimate change. This point was made early on in the discussion in Dale Jamieson, “Ethics, Public Policy, and Global Warming,” Science, Technology, and Human Values 17, 2 (Spring 1992): 139 153. Moreover, Mark Sagoff's classic attacks on cost-benefit analysis would seem apropos here as well. | Done. |
| 17705 | 3 | 22 | 19 | 22 | 27 | There can be a average critical level utilitarianism function too | No action; yes, but not everything can be mentioned. We have to balance |
| 2124 | 3 | 22 | 2 | 22 | 3 | This is the sort of sign-posting I had in mind in comment 16 above. | Sign-posting has been improved. |
| 16635 | 3 | 22 | 2 | 22 | 6 | What/who determines value? This would lead nicely into the economic discussion of anthropocentric measures of value. | The epistemology of value is discussed in the sections on economic |
| 3935 | 3 | 22 | 28 | 22 | 29 | This sentence should surely be copied into the executive summary. | Noted; will be addressed in SOD. |
| 7921 | 3 | 22 | 39 | 23 | 7 | You should mention (and dicsuss) general objections against constructing a social welfare function, especially if the function is supposed to represent well-being globally over a century. Criticism to such an approach goes back to the 40s (Neumann/Morgenstern 1943). | No action; comment is unclear |
| 9345 | 3 | 22 | | | | p.22, line 31:Section 3.4 In examining the value of population, how do the authors view the contribution made by population to production of goods and services which add to well-being. | No action; we distinguish objectives from constraints. This is a matter of |
| 7920 | 3 | 22 | 31 | | | Here, you move straight from a utilitarian to an economic anaylsis. As is well-know, economics is not just applied utilitarianism. The many differences between both approaches go completely unmentioned, thereby concealing the many problematic assumptions the economic concepts (that are dealt with later on) are based upon. Rather than moving on to aggregating costs and benefits you should discuss what the analysis in 3.4 means for acting on climate change. | Noted; need for more climate examples already intended for SOD. |
| 13935 | 3 | 22 | 2 | 22 | 31 | Do not think this section adds much. Can be a short footnote of previous section. | No action; disagree with comment. Population is perhaps the most important, and perhaps the most |
| 7922 | 3 | 22 | | | | Is the old economic idea to claculate efficient (optimal) climate policy still alive in chapter 3.5? If so, you must try to show why positions that deny this very possibility are not plausible (see comment 36). Also, if you think that it is possible, you must address optimality in a triangular affair as stated in the first chapter, i.e. calculate the optimal mix between mitigation, adaptation and geoengineering. | No action; comment unclear |
| 7923 | 3 | 22 | | | | The problem of weighing and aggregating peoples utility is highly sophisticated and has not been resolved in utilitarian theory so far. In addition, it faces rather fundamental challenges (as famouslyexpressed by Parfit (1984) and Rawls (1971)). Therefore, the goal to maximize utility over time is problemtaic and discussions on how to do it best should occupy less room. | If it's difficult it needs more space, not less. |
| 10965 | 3 | 22 | 32 | 27 | 4 | The point that is being made in this section is in the last sentence of four words. The section could be shorter in areas like covering the Pareto criterion. | We do have to cover the Pareto criterion and the potential Pareto criterion. |
| 6468 | 3 | 22 | 33 | 22 | 37 | This section fails to acknowledge that aggregation of harms and benefits is ethically problematic according to some ethical theories including deontological and rights based theores. In fact the entire section of Chapter 3 is ethically problematic from a deontological ethical perspective. This can be remedied by acknowledging as the Stern report did, that if human behavior create human rights violations, the welfare aggregation techniques may be unacceptable. | The comment ignores the existence of 3.3. However, the chapter has been reorganized to place more stress on this point. |
| 9346 | 3 | 23 | 1 | 23 | 1 | page 23 line 1: what does ' times arre separable' mean? | No action; this expression is defined. |

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| 16636 | 3 | 23 | 12 | 23 | 19 | Why not assess the different views? Are they irrelevant to policy-making? Or are the authors being prescriptive by omission? Explain the reasoning behind this to clarify doubts. | No action; comment unclear. The paragraph says that the assumption is |
| 12141 | 3 | 23 | 2 | 23 | 3 | The concept of separability is first introduced in 3.4. Also, doesn't 'weak separability' need to be defined? | No action; the notion 'weakly separable' is not used in the analysis. |
| 4492 | 3 | 23 | 20 | 23 | 28 | This paragraph (and the preceding text) implicitly assumes that "practical decision-making" has to be case in cost-benefit form. It most definitely does not. There are other criteria, the most basic being "right vs. wrong." (This is not meant to imply that it is easy to determine which is which in some situations.) It is a economistic fallacy to assume that all collective action problems can be framed as cost-benefit problems. | No action; disagree with comment. Judging goodness is always a matter of balancing goods against bads. |
| 16637 | 3 | 23 | 20 | 23 | 28 | Clarify how social welfare functions can be used as practical tools or what can the theory helps us understand. Shorten this section. Many of the technical details can be excluded. Highlight the examples with practical applications. | Practical dimensions of CBA will be expanded |
| 14244 | 3 | 23 | 6 | 23 | 11 | It might be worthwhile noting that, in the context of how section 3.4.4. aggregated temporal well-being into life-time wellbeing, the pure discount factor in equation 3.5. assumes that individual temporal well-being is aggregated at the same rate as wellbeing is aggregated over generations. However, there is some argument to be made that individual temporal well-being should be aggregated according to the individual's time preference, while the generational discount rate is usually considered more suceptible to normative reasoning. Section 3.5.1. assumes that temporal individual well-being is aggregated over individuals first and then aggregated discounting at a rate delta. If 3.4.4. should still hold, then delta entangles individual and generational discount rate assuming implicitly that they are the same. Work like that of Calvo & Obstfeld (1988) [ Optimal time-consistent fiscal policy with finite lifetimes. Econometrica 56: 411–432.] distinguishes the discount rate at which individual's discount their own temporal well-being and the rate at which a social planner discounts the lifetime well-being of different generations. Also note that in the climate change context, Schneider et al. (2012, forthcoming) [Tradingoffgenerations: Equity, discounting, and climate change. European EconomicReview, http://dx.doi.org/10.1016/j.euroecorev.2012.08.006 ] show that there is a tension between intra- and intergenerational equity if a normatively chosen generational discount rate differs from an individual's time preference rate. | Noted; partially addressed in revision. |
| 4348 | 3 | 23 | 22 | 23 | 48 | Indication of negetive side of use of forest biomass is important. However, suggestions from the positive side to overcome the disadvantages are useful for the dicision makers. | No action; comment unclear; page and section reference numbers incorrect |
| 6313 | 3 | 23 | 29 | 24 | 37 | It should be noted here that many have argued that converting ethical values to monetary values cannot happen without loss in all situations. See the work of Mark Sagoff, for example. | Included reference to Sagoff |
| 8584 | 3 | 23 | 30 | 25 | 44 | It is a problem that an entire section discussing the - very difficult and ethically problematic - use of monetization to represent value, and WTP/WTA does, at no point, refer to any of the literature that addresses the limitations of WTP/WTA as a methodology. I honestly cannot imagine another section of the IPCC leaving out a debate of equal importance and pretending it does not exist. It would require little extra space to acknowledge the limitations of this methodology which are CORE to the purpose of the chapter, which is presumably to present the literature that specializes in the interface between ethics and neoclassical economics when attempting to address cliamte change. | Noted; there is now more about this |
| 11560 | 3 | 23 | | | | Compensation is only discussed in relation to money distribution. There is need for a thorough methodological and theoretical explanation and justification. | Mentioned problems of money as a numeraire |
| 6469 | 3 | 23 | 29 | 25 | 44 | This section is ethically problematic if it fails to sacknowledge that applying monetary values to determine ethial duties is according to some ethicall theories unacceptable and deontoligical theories in particular. The section is acceptable if it is clear that the utilitarain assumption of this section are contested by many ethical theories and that these conflicts are resolved by ethics on the strenght of ethical arguments about duties, not by efficiencey calculations. | There needs to be something at the beginning to forestall this sort of thing. |

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| 8149 | 3 | 24 | | 25 | | There is a nice discussion of contingent valuation methods and the challenges in using it in Chap. 14 of Boardman et al Cost Benefit Analysis: Concepts and Practice (Prentice Hall, 2006). The chapter also discusses some of the judgment biases (e.g. loss aversion, ordering effects, embedding) that impact on behavior. You might want to include some of these concepts here as a way of introducing descriptive models of choice. | Noted; will be addressed in SOD. These issues are now covered in seciton 3.10. |
| 11532 | 3 | 24 | | 25 | | There is a nice discussion of contingent valuation methods and the challenges in using it in Chap. 14 of Boardman et al Cost Benefit Analysis: Concepts and Practice (Prentice Hall, 2006). The chapter also discusses some of the judgment biases (e.g. loss aversion, ordering effects, embedding) that impact on behavior. You might want to include some of these concepts here as a way of introducing descriptive models of choice. | No action; duplicate |
| 9802 | 3 | 24 | 1 | 24 | 2 | The contingent valuation approach is subject to controversy for different reasons. Concerning climate change you should address one of these reasons: the monetary value of climate change is very difficult to assess on an individual level, due to time (the effects will happen in the future) and space issues (they will occur somewhere else). Nevertheless it is a good screening approach. | Noted; mentioned problems of money as a numeraire |
| 12244 | 3 | 24 | 29 | 24 | 30 | Please change "extremes of wealth between rich and poor countries" to "extreme differences in wealth between rich and poor countries". | Done. |
| 13937 | 3 | 24 | 39 | 24 | 47 | This box does not add. The text is sufficientñy clear regarding qalys. | Since value of life is a difficult topic, a |
| 16931 | 3 | 24 | 39 | 25 | 28 | Box 3.1 “Value of Life”.<br>This box (and the associated text) needs to show far more sensitivity to the issues and the history of the IPCC Second Assessment. In the first place, the SAR did clarify that the concept is entirely about the “Value of Statistical Life (VOSL)” – not the general Value of Life. I would strongly urge this chapter to use the precise term.<br>Second, the writing seems to miss entirely the fundamental point that led to the blow-up in the SAR. VOSL varies between countries – absolutely. As long as there are no transboundary effects, this doesn’t matter: it is a simple statement of fact. However, since climate change is a global problem with intimate transboundary effects, it is a fundamental moral issue as to whose VOSL is appropriate. VOSL obviously reflects the resources a country has. To be blunt, extending the example in the chapter, if US emissions kill Indians, it is US resources that would be deployed to reduce these emissions. The Indian VOSL is logically irrelevant except in an “opportunity cost” sense that the US could save more Indian lives in other ways, but this is only hypothetical and hence of no relevance unless it is matched by actual US foreign aid expenditure and substitution thereof.<br>Both the political history of the SAR confrontation and the basic logical points it revealed are summarised in Grubb M., C. Vrolijk and D.Brack, The Kyoto Protocol: A Guide and Assessment (1999, Earthscan, London), Annex 2: Key themes in economic debates: insights from the IPCC Second Assessment Report. I would hope that by now there are full accounts since but I have not seen them. | This report takes a different view about the value of life than the SAR's. This is because it takes a different approach to the foundations of cost-benefit analysis. However, we are careful not to say the SAR was mistaken. We do not have the space to engage in much debate about this. |
| 12142 | 3 | 24 | 42 | 24 | 43 | Note that consequentialist theories do not have to accord the same weight to benefits and harms. | We can't say everything. |
| 4620 | 3 | 24 | 44 | 25 | 28 | It should be pointed out that it is the value of qalys which enter benefit-cost analysis and not qalys themselves as these cannot be invested; S.Frederic, Understanding discounting, J. Econ.Psychol., 2006, 27: 667-80 | Noted; the box points out that qalys need an exchange rate with money to be included in a cba |
| 13936 | 3 | 24 | 1 | 24 | 2 | Declared preference valuation are not only contingent valuation ones. This has to be clarified. But, more than that, all methods are "subject to controversy, not only contingent valuation as the text seems to suggest. Think you should rephrase this sentence. | Noted; will be addressed in SOD. Techniques of valuation have been moved to 3.10. |
| 13938 | 3 | 25 | 29 | 25 | 38 | This paragraph is a digression. Optimal taxation appears as out of the subject this section is dealing with. | No action; disagree with comment |
| 7926 | 3 | 25 | 29 | 25 | 38 | It is an old and outdated perspective that taxes are always inefficient, as shown by the year of the citation. | Noted. |

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| 16638 | 3 | 25 | 39 | 25 | 44 | This paragraph needs more support. Add more references. Move the sentence that talks about the catastrophic collapse of population to a footnote or develop the full argument. This is an intriguing but potentially contentious idea. | The possibility clearly exists, and there seems to be no reason to ignore it. |
| 18385 | 3 | 25 | 8 | | 40 | The problem with these economic calculation is that they fail to take account, to use a simple example, of the fact that paying the high cost and intensity of care required for extended life make the reduce the availability of these doctors, increase their prices both of which make care more difficult & refocus research on long-life vs tropical diseases, for example. These points are only infrequently included in cost-benefit analses. | No action; this comment muddled values with constraints. |
| 12783 | 3 | 25 | 34 | 25 | 34 | Is the reduction of inequality a target of climate change policy in general?. Rich countries may also focus on the need principle for the distribution of emission rights (In this context also see Carlsson, Fredrik; Kataria, Mitesh; Lampi, Elina; Lofgren, Asa; Sterner, Thomas (2011): Is Fairness Blind?--The Effect of Framing on Preferences for Effort-Sharing Rules. In: Ecological Economics 70 (8), S. 1529–1535. Online verfügbar unter http://www.sciencedirect.com/science/journal/09218009) | No action. This seems to miss the point. It's not that inequality is a target but that it affects valuations. |
| 8150 | 3 | 26 | | | | Can you relate the Pareto criterion to a CC example? | There is more detail in the box. |
| 15360 | 3 | 26 | | | | That is not the application of potential Pareto; it is to separate efficiency and allocation according to the second theorem of welfare economics – no decision in isolation. Potential Pareto says unless we are unable to fix distributional effects the action offers an opportunity to get the best outcome. | No action; the potential Pareto criterion is stated and then refuted. There is no fault with the logic. |
| 3936 | 3 | 26 | 10 | 26 | 11 | The statement that a greenhouse gas exernality makes the world economy inefficient in a Pareto sense is false as stated. The world economy can only be made more efficient in a Pareto sense if some way can be found of improving the welfare of at least one person without reducing that of anyone else. To prove that proposition one must identify that way and use it to prove the point. And in doing so one must consider all the real world problems with political processes, taxes etc. The sentence gives no evidence that any such measure has been identified. Lines 11-12 suggest that instead what is being proposed is that the externality could be eliminated in a frictionless situation where all potential losers were costlessly identified and fully compensated without incurring any transaction costs or adversely affecting any incentives. No resources would be spent in lobbying for colmpensation for example. If that is what is being argued, it is little wonder that the point does not register strongly in international negotiations. A related point is that the economists' neolclassical models commonly assume that NGOs and others will not self-create to deal with the externality independently of government action. | This has been put into a box with more detail |
| 7361 | 3 | 26 | 11 | 26 | 14 | It is very unclear what is meant by it being "possible to eliminate the externality in a way that is good for everyone." The incorporation of the externality into prices may over time result in the same (or inreased) level of welfare but in a theoertical sense but in a "real" sense that internalisation imposes significant immediate costs that cannot be construed as anything other than "sacrifice." I am also unsure that the phrasing "eliminate the externality" is appropriately specific. | This has been put into a box with more detail |
| 6978 | 3 | 26 | 30 | 26 | 43 | This material could be cut without loss: the subsequent para is sufficient. | No action; disagree with comment |
| 12245 | 3 | 26 | 34 | 26 | 43 | These paragraphs are a bit unclear. Please elaborate the basis for the critique. | It's hard to see how it could be unclear. The argument follows the standard form |
| 12246 | 3 | 26 | 44 | 27 | 4 | We think this critique is a bit misplaced, as the potential Pareto criterion is a criterion for efficiancy and not suited for deciding matters of wealth distribution. | No action; the potential Pareto criterion is stated and then refuted. There is no |
| 10421 | 3 | 26 | 5 | 26 | 14 | This framing of the externality might be controversial without additional references. | Noted; this has been put into a box with |
| 7927 | 3 | 26 | 5 | 26 | 14 | We do not understand why nobody would be worse off, if externalities are internalized. What is with those that received benefits from externalizations? Please explain. | This has been put into a box with more detail |
| 16639 | 3 | 26 | 6 | 27 | 24 | What are the consequences of this assumption in practical evaluation? | No action; something wrong with the numbering of this comment. |

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| 9394 | 3 | 27 | | 30 | | The discussion on "discounting future goods" is very informative; yet, it does not include the discussion on whether or not discounting is desirable/is right in a moral sense. Authors in the camp of strong sustainability are very critical of discounting. Authors who defend an eco-centric approach often reject discounting. | We are aware of this. Discounting techniques and sustainability conditions may contradict each other. A discussion about this should be made on the |
| 11365 | 3 | 27 | 11 | 27 | 12 | The text says that the discount rate tells us how much one should do for the future. But: the discount rate *alone* does not tell us that. One needs *additional* assumptions for that. In order to know how much one should do for the future one needs in addition to assume, for example, that the objective of policy should be to "maximize the discounted total of utility (...) over time" (page 28, line 25-26). This additional assumption together with the discount rate then tells us how much one should do.<br>However, this additional assumption is highly controversial. Maximizing a SWF -- especially one that consists of a sum of (discounted or undiscounted) utilities -- goes not only against the commonsense of many but also against the views on intergenerational justice discussed in section 3.3.2. Many would consider it much more reasonable to define a level of welfare that is owed to future generations (or other things that are owed to future generation) *independently* of maximizing a certain sum. Maximizing a sum could demand too large sacrifices from the present generation (if a low discount rate is used) or too little from the present generation (if a high discount rate is used).<br>For references, see for example:<br>Simon Caney (2008), "Human Rights, Climate Change, and Discounting," Environmental Politics, 17 (4), p. 549.<br>John Rawls (1971): A Theory of Justice, Cambridge: Harvard University Press, pp. 297 - 98.<br>Dominic Roser (2009), "The Discount Rate – A Small Number with a Big Impact", in Center for Applied Ethics and Philosophy (ed.), Applied Ethics: Life, Environment and Society (Sapporo: The Center for Applied Ethics and Philosophy, Hokkaido University), pp. 12 - 15. | No action; see justice sections for different ways of viewing social welfare. As 99% of the literature on discounting, this section is based on the assumption that the collective objective is to maximize a discounted sum of future expected utilities. |
| 4622 | 3 | 27 | 21 | 27 | 21 | the value of consumption (see comment 36) | No action; comment unclear |
| 10703 | 3 | 27 | 23 | 27 | 23 | Could it be explained more why different discount rates should be used for different assets ? | Will be addressed in SOD |
| 7928 | 3 | 27 | 4 | 27 | 4 | Rather than "credible" you should write "morally acceptable" or "unfair" or "immoral". | No action. What is at issue is the truth of a proposition, not the fairness of a |
| 3937 | 3 | 27 | 4 | 27 | 4 | The argument that it is not credible to propose that the rich should benefit at the expense of the poor without compensation for the poor seems to be inconsistent with the proposition that the world today should make an uncompensated sacrifice in favour of wealthier future generations. Should the paper advise policy makers about how to think about this implication? | This is a good point. The example is now tightened up. No inconsistency need arise. |
| 4621 | 3 | 27 | 5 | 27 | 5 | The title should read: Discounting the value of future goods because not all goods can be invested (see comment 36) | Will be addressed in SOD |
| 9803 | 3 | 27 | 5 | | | Please sound this paragraph with the corresponding deliberations in chapter 2. | Noted. Cross chapter consistency will be |
| 9285 | 3 | 27 | 6 | 27 | 19 | The last line is confusing in light of the previous paragraph. The first paragraph in this extract says 'the discount rate tells us how much one * should * do for the future' (emphasis added). The second paragraph then asserts that there are normative and positive perspectives on the discount rate, and that 'both approaches can be relevant, depending on the application'. This is naturally read as implying that there is a purely positive approach to the question of what one should do. But that is absurd. The point might instead be that one can ask both normative and positive questions about discounting (how much should we discount/how much do various bodies discount in various contexts), rather than that there are both normative and positive approaches to answering a single question. Or it might be that some approaches to answering the normative question take answers to the positive question as part of their input, alongside normative additional premises (e.g. a 'democracy'-based premise to the effect that governments/intergovernmental organisations ought to discount to the same extent that individuals in fact do in such-and-such settings). I suspect the latter is what the author has in mind, but this isn't clear from the current text. | Will be addressed in SOD; will add 'under the normative approach' at the beginning of the sentence |

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| 8585 | 3 | 27 | 6 | 27 | 13 | The word should is used repeatedly in this paragraph. The inference is that the result of CBA tell us what we SHOULD do. This blatantly disregards any other ways of making decisions and leads the reader to imply that CBA results are the only form of evidence required for making what are necessarily incredibly complex decisions. I realize this seems like a ridiculously petty comment but I am drawing attention to it because of the much broader assumptions it makes that are rife throughout this chapter which gives profound preference to neoclassical eocnomics over any other way of thinking about climate change decision making. | No action; CBA is justified as the benchmark operational toolbox to evaluate policies from the previous section of this chapter. Limitations to CBA are expressed in other chapters. |
| 10422 | 3 | 27 | 6 | 30 | 24 | Less theory about the General Ramsey rule and how it can be framed to incorporate climate change vulnerabilities, or intergenerational inequities in the face of climate change | No action; the Ramsey rule is precisely about taking into account of intergenerational inequalities and |
| 9347 | 3 | 27 | | | | A concluding para needs to be added to Section 3.5 to provide guidance with respect to climate change: what about cost-benefit and climate chage? | No action; we believe the issue is already dealt with adequately. In addition, note that the entire ipcc work is |
| 8596 | 3 | 27 | | 27 | | I have mentioned several detailed comments for this section - and as I have suggested elsewhere - an entire reorganization of the text would be best solution. However, at the very least a better introductory paragraph that says something along the lines of; "Aggregation is required for a variety of economic analysis techniques and is covered in this section. It should be noted however, that assumotions about aggregation can be problematic from an ethics perspective. For instance, as discussed in Section 3.4, many values are difficult to monetize. In addition, many issues of concern may not be feasible or meaningfully aggregated. Despite these limitations this section is focussing primarily on eocnomic strategies of aggregation due to their widespread use. As discussed in Section 3.9 adn 3.11, there are other ways of valueing wellbeing and of conducting analysis" | Noted; the chapter has been reorganized in response to this comment and others like it, to make the limitations more explicit. |
| 14257 | 3 | 27 | | | | When discussing delta (the pure time preference discount rate of future utility), I miss discussion of the vast empirical and experimental literature showing evidence of a delta that decreases with the time horizon of the future cost/benefit. Quasi-hyperbolic discounting is one possible example; hyperbolic discounting another. These intuitive preferences are very important when the time horizon is as long as for climate change impacts. CBAs should reflect/respect such preferences. | Will be addressed in SOD |
| 8151 | 3 | 27 | | 30 | | Discounting future goods You might want to introduce descriptive models of discounting that illustrate hyperbolic discounting and other behavioral principles in behavioral economics. (See the discussion on quasi-hyperbolic time discounting in FOD Chap. 2 Sect. 2.2.3) and the examples we use to highlight these points. You could then relate these descriptive models to normative discounting models (i.e. exponential discounting). | Will be addressed in SOD |
| 11533 | 3 | 27 | | 30 | | Discounting future goods You might want to introduce descriptive models of discounting that illustrate hyperbolic discounting and other behavioral principles in behavioral economics. (See the discussion on quasi-hyperbolic time discounting in FOD Chap. 2 Sect. 2.2.3) and the examples we use to highlight these points. You could then relate these descriptive models to normative discounting models (i.e. exponential discounting). | No action; duplicate |
| 7924 | 3 | 27 | | | | Please account for the philosophical literature on discounting (e.g. Parfit 1984, Broome 1992, the conbtributions in Ott/Hampicke 2003, Ott 2003, Baum 2009, Roser 2009, Caney 2009, Hampicke 2011). Section 3.6 is not an appropriate review of the relevant literature but is highly biased and no progress with repsect to SAR has been made. Given that the preceding sub-sections draw on utilitarian thinking it should be mentioned that utilitarians reject discounting future utilities/well-being. | Noted. |

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| 12784 | 3 | 27 | 20 | 27 | 26 | When dealing with discounting issues you may also like to have a look at Pigou, A. C. (1920), The Economics of Welfare. London: Macmillan and Company or Ramsey, F. P. (1928), A Mathematical Theory of Saving, in: Economic Journal 38, 543 – 559), Arrow, K. J. (1999), Discounting, Morality and Gaming, in: P. R. Portney und J. R. Weyant (Hrsg.), Discounting and Intergenerational Equity, Resources for the Future, Washington D.C., 13 – 22). Buchholz W., Schumacher, J. (2008), Discounting and Welfare Analysis Over Time: Choosing the η CESifo Working Paper Series. | Will consider these references |
| 12785 | 3 | 27 | 32 | 27 | 32 | This utility function is not consistent with the notation in the previous section. | No action; this utility function is not introduced in the previous section. See |
| 10702 | 3 | 27 | 5 | | | Interesting and useful section. But could it be showed more clearly how discounting of costs (and impacts of emissions) are being done? (Or alternatively, point to parts of the chapter where this is used). This could make it easier for non-economists to understand the application and the role of discounting in the context of climate change. | No action; this is not the right chapter to do that. |
| 10966 | 3 | 27 | 5 | 30 | 24 | Comparison of different approaches such as those of Stern and Nordhaus has already led to an appreciation that discount rates tend to be overused. Much of this is recognition that both collective values in an increasingly urbanised society, and growing dependence on long term infrastructure, are quite different to the more individualistic consideration of values that applies in the commercial context. In order to be more specific for the context of climate change, this section should consider the growing recognition that some forms of government decision making for the allocation of major assets can be classified as either delays in mitigation or as maladaptation. For example, construction of a major state highway on land less than 2 meters above sea level is an obvious example where use of a discount rate determines a planning horizon of about 30 years, but it then tends to cluster a wide range of public and private investment into assets that will not be sustainable. The future impacts will be experienced by an increasing population which has also been accumulating per capita wealth at a rate higher than inflation. So depreciation is outweighed by the other factors. | No action; all these effects may be relevant to Benefit-Cost Analysis, but this does not affect the way we should determine the rate at which these costs and benefits should be discounted. |
| 14245 | 3 | 27 | 5 | | | This is a very nicely written summary of dicounting. However, I would like to raise awareness on the literature discussing non-constant and, in particular, hyperbolic discount rates. In particular, in the context of the current chapter on Ethical Concepts and Methods, I would consider the case of interest where hyperbolic discounting arises as a consequence of intergenerational altruism. While the papers on this topic emphasizing the point in the climate change context are still under submission [e.g. Karp, Provision of a public good with altruistic overlapping generations and many tribes], Ekeland & Lazrak (2010) [The golden rule when preferences are time inconsistent, Mathematical and Financial Economics, 4(1)] make the point in a slightly different context. Ekeland & Lazrak's reasoning implies hyperbolic discounting formulas very similar to those applied in the climate change economics by Karp (2005) [Global warming and hyperbolic discounting, Journal of Public Economics 89: 261–282]. A different rational for hyperbolic discount rates relates to which some of the authors of the chapter contributed themselves, derives hyperbolic discount rates from the limited substitutability between environmental goods and anthropegenically produced consumption, which connects directly to the ethical concept of weak and strong sustainability, which itself is likely discussed in more detail in a different chapter. | All these new insights from the recent literature and DP are useful and important. However, given the limitation of space, it is extremely difficult to introduce them in the text. |
| 12247 | 3 | 27 | 5 | | | This section 3.6 is very informative, well written and to the point on a very difficult subject. | Thank you for your comment. |
| 4347 | 3 | 28 | | | | Like 11.2, consump-side options in the table should be enriched. The contents in the table can be devided into several potions. | No action; comment unclear; page and section reference numbers incorrect |
| 4493 | 3 | 28 | 16 | 28 | 16 | As noted above (in comment # 12) the "Ramsey rule" as applied to the climate problem is an analytical mistake. Different kinds of assets have different rates of return. | No action. Yes, the Ramsey rule is about the rate at which safe assets should be discounted. A risk premium must be added for risky projects, as in |

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| 7925 | 3 | 28 | 16 | 28 | 24 | The interpretation of equation 3.6 is far too simple. The discount rate depends on expectations regarding growth AND the scarcitiy of many DIFFERENT goods. | No action; this is not related to discounting. CBA should also take into account of the evolution of scarcity, thus |
| 12143 | 3 | 28 | 17 | 28 | 17 | The reader needs to be introduced to the concept of pure time discounting before δ is introduced and defined. | No action; because of lack of space, we prefer to leave the text as it is now. |
| 2125 | 3 | 28 | 23 | 28 | 23 | Is there an implicit assumption here that individual well-being is determined by preference-satisfaction? If so, is the assumption necesssary? | No action; we assume that. |
| 11366 | 3 | 28 | 26 | 28 | 26 | This is a minor remark but genuine utilitarianism would not accept a rate of pure time preference (delta) larger than zero. If one uses a delta > 0, one has foregone utilitarianism. | No action; we allow for delta=0 in the text. |
| 14372 | 3 | 28 | 30 | | | Should refer to previous IPCC related analysis of this issue in: K.J. Arrow, W. R. Cline, K-G. Maler, M. Munasinghe, R. Squitieri, and J.E. Stiglitz, "Intertemporal Equity, Discounting, and Economic Efficiency," in Bruce, Lee, and Haites, Climate Change 1995: Economic and Social Dimensions of Climate Change (Cambridge Univ. Press), chapter 4. | Will consider this reference |
| 6979 | 3 | 28 | 34 | 28 | 34 | The description of the arguments referred to as 'largely intuitive' is seriously misleading. These argument are moral/ethical. Also, Rawls' rejection of a positive discount rate should be referenced here, as should Gardiner's discussion in Stephen Gardiner, 'A perfect moral storm' (Oxford: OUP, 2011), chapter 8. | Will be addressed in SOD |
| 13939 | 3 | 28 | 37 | 28 | 38 | Suggest to rephrase last sentence before the box. "One additional? argument is that it? Places an extremely moral burden on the current generation". | Will be addressed in SOD |
| 9804 | 3 | 28 | 40 | 29 | 5 | Are deliberations like Box 3.2 really intended to be integrated in the IPCC report? They are nice thought exercises, but I do not see the impact on the reader. Either you should further elaborate on climate change or you leave it out. | No action; we consider it to be useful for helping the reader to understand the meaning of the calibration. |
| 4623 | 3 | 28 | 7 | 28 | 7 | to inequalities. Add "one will have an incentive to spread consumption over time" | Will be addressed in SOD |
| 7929 | 3 | 29 | 11 | 29 | 12 | The median of 4-5% should not be seen as a reasonable choice for it ignores important arguments against such a rate. See the next comment (80). | Will be addressed in SOD |
| 14373 | 3 | 29 | 9 | | | Cline (1992) was the first to use the Ramsey framework for discounting climate change on a century-scale horizon. It would be appropriate to include this reference in the table. Its entries are: delta = 0 (zero pure time preference); eta = 1.5 (elasticity of marginal utility; reaffirmed in Cline 2007 based on observed income tax structures); g = 1% long-term per capita growth. (Cline 2007: Yale Symposium on Stern Review; www.ycsg.yale.edu/climate/stern.html) | Will be addressed in SOD |
| 9286 | 3 | 29 | 9 | | | The 'delta'-value of 0.1% for Stern 2007 is not strictly speaking correct, given the way the author has defined delta on p.28. (Delta is defined here as the rate of pure time preference. Of course Stern's 0.1% is discounting for risk, not pure time preference.) | No action; we agree. Because of lack of space, we prefer not to enter into this level of details. |
| 4624 | 3 | 30 | 10 | 30 | 10 | …to the distant future, add "giving rise to a declining discount rate" | No action; comment unclear; line |
| 16640 | 3 | 30 | 16 | 30 | 24 | This paragraph should be closer to the start of the section. It provides a good introduction to the ideas in the section. | Will be addressed in SOD |
| 7456 | 3 | 30 | 18 | 30 | 25 | "The strategic energy fund has three lines of financing ---3) the scaling up renewable energy plan (SREP) launched in 2009 to enable government support for renewable energy market creation". Already in most if not all developing countries there is a vibrant market in fuelwood and charcoal trading etc. However, in some countries there are bans on charcoal production (but not trading), nighttime transport of fuelwood and charcoal, but not petroleum products, etc. These private-sector initiatives should be encouraged and SREP should be involved in removing such restrictions. Mainly they are in place so that 'officials' can collect bribes. | No action; comment unclear; section reference appears incorrect |
| 4494 | 3 | 30 | 2 | 30 | 15 | This paragraph does not do justice to Weitzman's insight. His result does not depend "heavily" on the marginal utility tending to infinity as consumption approaches zero; rather, the argument is that in the face of irreducible uncertainty the possibility of catastrophic outcomes comes to dominate the analysis. It is misleading to downplay Weitzman's argument just because marginal utility may not actually go to infinity. | Will be addressed in SOD; will remove the word "heavily" and a new sentence that recognizes the importance of catastrophes. |

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| 4495 | 3 | 30 | 23 | 30 | 24 | It is not necessarily the case that the discount rate should be the "risk-free" rate. Insurance policies have negative rates of return. As a side note, there is no observable risk-free rate; U.S. t-bills, for example, are not necessarily risk-free. | We agree. We remind the reader that this section is mostly about the risk free rate, and that a risk premium should be added/substracted if the projet |
| 7930 | 3 | 30 | 23 | 30 | 24 | "The discount rate described here should be used to discount risk-free costs and benefits." Is there any specific discount rate described in this section? If so, which? | No action; same comment as 4495 |
| 4496 | 3 | 30 | 31 | 30 | 32 | It is not the case that equity can be separated from efficiency when there are externalities. It seems odd to make this assertion in a text devoted to the largest global externality of all. | No action; no change implied, adequately addressed (line 32 of page |
| 8587 | 3 | 30 | 31 | 30 | 35 | "Conceptually, climate change mitigation among countries translates to determining emissions entitlements according to chosen equity principles, and then trading in entitlements in markets". Really? Statements like this that do not recognize valid debate about what climate change mitigation SHOULD include (many would argue that trading should not be included for ethical reasons; many other would argue that trading has serious limitations for mitigation) are profoundly problematic. It is possible that this section was poorly written, and that the authors meant to write that "in a stricly neo-classical theoretical model climate change could be simplified into allocations of entitlements which could then be traded, however the realities of climate change pose difficulties for this theoretical construct, and there are many other ways of understanding the challenge of mitigation". However, as it stands this is another example of the failure of this chapter to reflect much of the ethics literature, and to miss key opportunities for constructive discussions between ethics and neo-classical economics thinking. | No action; no change implied as the views of some against suitability and goodness of trading is noted elsewhere in the chapter and in lines 13 to 18 on page 31 of this section |
| 3938 | 3 | 30 | 32 | 30 | 33 | The paper needs to be aware that markets and the common law do commonly have mechanisms that respond to potential inefficiencies due to externalities. For example, many negative externalities (eg proximity to noise) get reflected in lower land values. Those who buy those properties are thereby compensated for the adverse location effect. Economists distinguish beween pecuniary and non-pecuniary externalities. So the text needs to have a more nuanced discussion of externalities. Another point is that markets achieve an efficient allocation of resources even if an uncompensated externality exists - they do so as long as no other feasible real world arrangements would provide better (but still imperfect) arrangements. Another way of making the point is that efficiency has to be judged against the next best achievable alternative, it is meaningless in a policy context to assess market efficiency against an unachievable perfect world alternative. | Noted; will be addressed in SOD |
| 6980 | 3 | 30 | 6 | 30 | 7 | How is this statement of what prudence requires 'in line with' sustainable development? | No action; because it reduces the discount rates, thereby inducing agenst to emphasize the distant future in their |
| 9348 | 3 | 30 | 24 | | | p30, line 24 section 3.6 Add Simon Levin's paper on ' the difficulty with discounting' | No action; not clear which paper the |
| 8586 | 3 | 30 | 25 | 33 | 26 | The title of this section is "Economics, rights and duties". At no point does the section discuss rights. None of the ethical frameworks covered discuss rights. Teh discussion of economic theory does not disucss rights. The challenges of rights and compensation (and non-compensatory rights) are ignored. Nor does this section actually tackle the relationship of economics to different frameworks of justice despite the first sentence which states that this is the goal of the chapter. For instance, it is not clearly laid out that the first section, Economic efficiency, equity and transfers, implicitly takes a view in which rights do not exist, that compensation is possible, that aggregation of value is possible. These assumptions are central ethical assumptions behind this economic framework and are not identified. | Noted; will be addressed in SOD. |

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| 6470 | 3 | 30 | 26 | 33 | 19 | This section entitled Economics, rights and duties, is deeply ethically problematic in its current form because it resolves conflicts between efficiency and rights conflicts through effienciency arguments. It is seriously flawed ethically because it fails to acdknowledge that equity and rights concerns are usually not resolved by welfare maximization alnalyses. It must contain an express acknowldegment that conflcits between economics,rights, and duties is resolved according to ethics on the strenght of ethical reasoning, not on consequentialist grounds. This is a particularly important addition because the vary title of the section is"economic, rights, and duties>" | Noted; will be addressed in SOD. |
| 3940 | 3 | 31 | 1 | 31 | 2 | An authority should be cited for the proposition that the issue of who should bear the costs can be separated from the issue of where mitigation takes place. The general contending proposition is that the battle over distribution affects incentives, and thereby outcomes. | No action; no change implied, addressed elsewhere in the chapter |
| 3939 | 3 | 31 | 11 | 31 | 15 | Again, a perfect world standard seems to be introduced in the use of the words 'undistorted' and 'all participating' countries. | No action; no change implied |
| 7363 | 3 | 31 | 13 | 31 | 13 | It would be more accurate to say : a system that reconises the difference between the "allocation" of emission rights and the "use" of emission rights "has been regarded as a core element to achieve equitable and cost effective mitigation." It is not necessary to characterise it as a "trading scheme"; instead trading or direct transfers (as referred to at the end of the paragraph) could be included as two models of reflecting the same general premise/objectives. | Noted; will be addressed in SOD |
| 4928 | 3 | 31 | 19 | | | .. e.g. in context of project-based mechanisms or green investment schemes of mitigation actions | Noted; will be addressed in SOD |
| 4939 | 3 | 31 | 27 | | | {Add} abatement potential is in {}many developing countries (because it is not valid for many other developing countries, esp. for majority of the LDCs) | Noted; will be addressed in SOD |
| 4927 | 3 | 31 | 3 | | 6 | Oversimplification? i.e unclear how developing countries' mitigation actions fit in this "translation". | No action; no change implied, invalid |
| 15362 | 3 | 31 | 3 | | | This part comes very close to confusing the question of whether there can (in a game theoretic sense of an outcome that is acceptable to all participants) be agreement on an allocation so that coordinated mitigation can proceed with the ethical question of the right thing to do. Of course, if all participants are motivated by the same moral imperative, then they would choose the outcome that is consistent with, or ranks highest under, that ethical point of view. It should be apparent from history in general and the progress of negotiations, from observing the level of and reasons for foreign aid, and from the stated positions of the parties that there is no such agreement. The discussion of ethical systems leads to characterization of what an ideal climate policy would be from the point of view of different systems. Political economy and the study of international relations reveal what nation-states are actually likely to do in negotiating international agreements and acting unilaterally. Moral reasoning provides a critique of observed and predicted outcomes, which may over time, if articulated well in the families, churches and communities where values are formed, lead to discomfort with the status quo – or to realization that there are other, higher priorities for action to change political systems in order to align public policy better with ethical norms and moral imperatives. Confusing what ought to be with what is likely to be, or worse yet failing to examine proposed solutions critically because their technical deficiencies are covered with moral rhetoric, almost always leads to change for the worse. | No action; no change implied already addressed in various sections |
| 6981 | 3 | 31 | 34 | 31 | 35 | These transfers could be intergenerational in scope. | No action; no change implied |
| 13006 | 3 | 31 | 42 | 31 | 43 | In the interest of balance, such worries also arise for economic arguments. | No action; no change implied |
| 8152 | 3 | 31 | 8 | | | I like the example of using Pigou to determine optimal adaptation and mitigation as it relates to emissions reduction. | Thank you for your comment. |
| 17293 | 3 | 31 | | | | There is an emerging literature on this and also part of the UNFCCC Cancun Text. | No action; no change implied |
| 14847 | 3 | 31 | | | | Sec. 3.7.3 may be redundant with material discussed in more detail in Ch 4. | Noted. |
| 8153 | 3 | 31 | | 32 | | An example illustrating how these different principles apply to CC would be helpful here. | Noted to be considered in revising |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15647 | 3 | 31 | | | | There is considerable overlap between this section and section 4.7.3.2 (equity principles). It would seem preferable to discuss the operationalisation of equity principles in greater detail in Chapter 4 rather than Chapter 3. The graph provides a simple illustration of the implications of different principles, and could be maintained wherever it is relocated to. | Noted to be considered in revising |
| 17163 | 3 | 31 | 36 | | | You could possibly take into account: Knopf, B./Kowarsch, M./Lüken, M./Edenhofer, O./Luderer, G.: Chapter 26: A Global Carbon Market and the Allocation of Emission Rights, in Edenhofer, O./Wallacher, J./Lotze-Campen, H./Reder, M./Knopf, B./Müller, J. (eds.): Climate Change, Justice and Sustainability: Linking Climate and Development Policy, Dordrecht: Springer 2012, pp. 269-286. There you can find both a systematic overview of ethical proposals for allocation of emission permits, and an economic estimate (graph!) of what this would mean for different regions in terms of costs. | Noted, will be addressed in SOD; reference cited appears to be grey |
| 15648 | 3 | 31 | 41 | 31 | 42 | Some of the same authors have nevertheless found that some degree of consensus exists between policymakers from developed and developing countries about longer-term convergence towards equal per capita emissions, the polluter pays principle, and the exemption of poor countries from onerous obligations: see Lange, A., C. Vogt, and A. Ziegler. 2007. On the Importance of Equity in International Climate Policy: An Empirical Analysis. Energy Economics 29:545-62. | Noted; will be addressed in SOD |
| 9395 | 3 | 32 | | | | The authors give a list of principles following Ringius et al. (2002). Even when this list serves as an example, it is necessary to include some of the principles which are now under discussion: "Grandfathering" (which might be part of "souvereignty"), "Across the Board", "Basic Needs", "Rawlsian Principle", "Proportionality Principle". Each of these principles represents what the authors say is in fact critical: "common, but differentiated contributions and rights", p. 33, line 11. | Noted to be considered in revising |
| 6982 | 3 | 32 | 1 | 32 | 2 | Reference Keith Hyams, 'A Just Response to Climate Change: Personal Carbon Allowances and the Normal Functioning Approach', Journal of Social Philosophy, 40/2, 2009, 237-56. | Noted to be considered in revising |
| 12144 | 3 | 32 | 22 | 32 | 23 | Why is grandfathering termed 'the sovereignty principle'? | Noted to be considered in revising |
| 13017 | 3 | 32 | 22 | 32 | 25 | What is here called “the sovereignty principle” seems to be several different possible principles, some of which have nothing in particular to do with sovereignty, as far as I can see. | Noted to be considered in revising |
| 4929 | 3 | 32 | 29 | | 33 | At least there are some "hints" how to operationalize the equity for the developed countries: (Art. 4.2.a " taking into account the differences in these Parties' starting points and approaches, economic structures and resource bases .." | No action; no change implied |
| 9004 | 3 | 32 | 29 | | 31 | This sentence is an instance of specious reasoning and uncalled for: "These agreements do not however resolve the fundamental issues in operationalizing equity principles." The sentence refers to the UNFCC Common but Differentiated Responsibility. Principles in agreements have to be operationalized; one cannot expect agreements to "resolve" them "fundamentally" since they are fundamental principles by nature. In fact, Box 3.3 to which the paragraph refers says that the Kyoto Protocol is its "first concrete expression" (page 33, line 13). The reason used to criticize the principle is therefore uncalled for. | No change needed, but should be considered in rewrite |
| 12529 | 3 | 32 | 33 | | | After "principles" add -- "Baer et al. (2009) provide a criteria-based effort sharing framework combining the perspectives of responsibility and ability-to-pay based on the UNFCCC principle of 'common but differentiated responsibilities and respective capabilities and their social and economic conditions.'" | Noted to be considered in revising |
| 9349 | 3 | 32 | 5 | 32 | 5 | p. 32 line5: the previous two lines, give three alternatives. which of these three does the word " this approach refer to" explain to make clear. | Noted to be considered in revising |
| 3611 | 3 | 32 | 5 | 32 | 5 | Please add "E.g., Oberheitmann (2010) proposes the inclusion of historical emissions since 1750 for the allocation of per-capita emission rights based on cummulated CO2-emissions" . Cite: Oberheitmann, A. (2010). A new post-Kyoto climate regime based on per-capita cumulative CO2-emission rights—rationale, architecture and quantitative assessment of the implication for the CO2-emissions from China, India and the Annex-I countries by 2050. Mitigation and Adaptation Strategies for Global Change 15, 137-168. DOI: 10.1007/s11027-009-9207-4 | Noted to be considered in revising |

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| 7931 | 3 | 32 | | | | This section should be moved (or related) to section 3.3. Here, the distribution of emission permits is discussed already. A similar list was presented in SAR and the progress in the literature since then is ignored. In addition, there is abundant literature on different distributive principles that should be accounted for (in addition to those cited below: Meyer/Roser 2010, Müller et al. 2009, Schüssler 2011, Shue 1993, 1999, WBGU 2009, Jagers/Duus-Otterström 2007, Gosseries 2004, Caney 2009, Bell 2008, Vanderheiden 2008, and probably many more). Also, the souvereignity principle is dismissed in the ehtical literature. A choice between the rivaling concepts is not as arbitrary as portrayed (see for example Gardiner 2004). Also, many authors argue that a combination of two or more principles can make up for the shortcomings of each principle considered on its own (Page 2008, Caney 2010b, Bear et al. 2009, Baatz 2013). The remark that "Normative interpretations of justice, equity and responsibility (see section 3.2) can be operationalized in different ways, implying different patterns of mitigation effort sharing and international transfers (Tol, 2001; Ringius et al., 2002; Heyward, 2007; Müller et al., 2009; Baer et al., 2009; Ekholm et al., 2010). There are no universally accepted principles to determine this choice. The use of equity arguments between nations and within societies may be self-serving (Lange et al., 41 2010)." seems to be a bad joke given two decades of profound investigations and discussions. Obviously, much more can and must be said at this point. | No plans to move section, but comment will be considered in SOD |
| 10376 | 3 | 32 | 1 | 32 | 7 | Egalitarian Principle is not very clear that the equal share is the equal of past emissions, present emissions, future emissions or the accumulated emissions. | Noted to be considered in revising |
| 12786 | 3 | 32 | 18 | 32 | 25 | It would be helpful to mention the difference between PPP and SOV (consideration of historical emissions under PPP). | Noted to be considered in revising |
| 15649 | 3 | 32 | 30 | | | Note that the same Article of the UNFCCC (3.1) refers even more specifically to equity, in the phrase that all parties should protect the climate system "on the basis of equity" - this should be included. | Noted to be considered in revising |
| 9397 | 3 | 33 | | 37 | | The discussion of "policy instruments" in ethics needs to comprise the debate on "good governance" and needs to discuss the role of democracy in terms of: How can people be involved in decision-making-procedures? What is the role of local communities in terms of subsidiarity? and: What are the democratic principles underlying decisions about environmental policies? Otherwhise, this section of the chapter is not coherent with the claim at the beginning of the report (introduction) that civil society and non-governmental associations play a crucial role in achieving the aims of mitigation. (The authors mention this on p. 45, 24-29, but don't give a normative background.,) | No action - this is treated in chapter 15. |
| 3941 | 3 | 33 | 1 | 33 | 19 | The ethical basis for the UNFCCC's normative prescriptions in this box are unclear in the light of this discussion in this chaper. Its proposals seem to be aimed a redistribution from rich countries to the poor, but if this is its principle, why is it proposing a transfer from today's rich to those who will be even richer in the future? Could the chapter provide policy makers with more guidance concerning how they should assess ethical values in relation to these propositions? Another point is that these rights and duties make no reference to himan rights - including the human right to be free to make moral choices. | Noted to be considered in revising, one suggestion is to remove Box 3.3 |
| 4940 | 3 | 33 | 11 | | | This principle of ‘common but differentiated commitments and responsibilities’ remains | No action; no change implied, confirming |
| 4930 | 3 | 33 | 13 | | | The differences in production/consumption/emission volumes and the related responsibilities (but w/o explicitly referring to the CBDR) were used for distinguishing the commitments of the developed and (majority of) developing countries in context of the 1987 Montreal Protocol (its Article 5 on "Special situation of the developing countries"). Similarly the 1991 legal instrument on reduction of VOC emissions (LRTAP/VOC protocol) introduced) specific emission control commitments for less responsible countries (Art.2.2.c: instead of 30% reduction on the duty to stabilize .. .) | Noted to be considered in revising, one suggestion is to remove Box 3.3 |
| 13424 | 3 | 33 | 16 | 33 | 17 | It is misleading to state that the on-going climate negotiations are aiming for an outcome with mitigation obligations on all major emitters. Nowhere in the agreed climate convention decisions has there been any statement to that effect, nor has the term “major emitters” been accepted or used in the decisions. There are many interpretations of the recent Durban Platform decision (Dec 2011) and if it is to be alluded to, it is important to have a balanced treatment of the literature and of the position of various Parties. | Noted to be considered in revising, one suggestion is to remove Box 3.3 |

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| 4941 | 3 | 33 | 17 | | | all major? emitters ??? ~ actually on all countries (with flexibilities to SIDS and LDCs) | Noted to be considered in revising, one suggestion is to remove Box 3.3 |
| 13940 | 3 | 33 | 2 | 33 | 19 | Suggest deletion of Box 3.3 since it does not contain any new info and you need to shorten the chapter! | Noted to be considered in revising, one suggestion is to remove Box 3.3 |
| 9805 | 3 | 33 | 20 | | | What is specific concerning climate change. If climate change is "just" one specific subdimension of environmental protection, the decision maker could read a textbook on policy instruments and regulations. | Noted; will be addressed in SOD. We will make this section more specific to |
| 13941 | 3 | 33 | 31 | 33 | 32 | It seems there is a typo where you state "… ate policy instruments in particular, see reduction,…" | Will fix in SOD |
| 13567 | 3 | 33 | 31 | | 21 | I found some of this language a little confusing - suggest some rewording | Noted to be considered in revising |
| 13423 | 3 | 33 | 8 | 33 | 9 | Developed countries are not “called on” to provide new and additional resources but have committed themselves to do so. | No action; no change implied, adequately addressed |
| 15650 | 3 | 33 | 3 | 33 | 19 | The box (or accompanying text above) should be more specific in stating that _all_ parties have "common but differentiated responsibilities and respective capabilities" for protecting the climate (as per UNFCCC Art 3.1). The reference to "common but differentiated commitments and responsibilities" is incorrect if it is intended as a quotation from the UNFCCC. At line 13, it is debatable whether Kyoto-style differentiation was its "first concrete expression" of CBDR. Arguably some commitments under the UNFCCC itself, eg on financing (Arts 4.3 and 4.4) qualify as the first concrete expression of CBDR. In any case, it would be preferable to see Kyoto-style differentiation as the "high point" of differentiation, and one that is unprecedented in any other international environmental agreements (see Rajamani, L. 2012. The Changing Fortunes of Differential Treatment in the Evolution of International Environmental Law. International Affairs 88 (3):605-23.). | Noted to be considered in revising, one suggestion is to remove Box 3.3 |
| 8411 | 3 | 33 | | | | I suggest to give more attention in this chapter (or in section 1.4.4) to the effects of energy subsidies. As stated by UNEP (2008, Reforming Energy Subsidies. Opportunities to Contribute to the Climate Change Agenda) it is becoming increasingly apparent that many types of energy subsidies today run counter to the goal of sustainable development: they can undermine private and public investment in the energy sector, which can impede the expansion of distribution networks and the development of more environmentally benign energy technologies such as decentralised renewable energy technologies. Fossil fuel incentives play a heavy burden on government finances, weakening the potential for economies to grow and reducing the potential to invest in social equity. | No action; this is out of the scope of "framing" chapters. As such, assessment aspects of policy instruments are addressed in, e.g., Ch 13 & 15 |
| 6084 | 3 | 33 | 20 | | | Subsection of 3.8 need to be restructured. For example, 3.8.2 should be titled as various types of policies followed by 3.8.2.1 economic instruments, 3.8.2.2 prescriptive approaches, 3.8.2.3 information instruments, 3.8.2.4 voluntary actions and agreements. | Good point. This will be restructured. |
| 17294 | 3 | 33 | 21 | 33 | 26 | “Policy” needs to be defined and the broader issues those are included needs to be identified or indicated. | Good point. We can do that. |
| 11189 | 3 | 33 | 27 | 35 | 31 | P34 (line 14-20): The discussion on 'hybrid instruments' is very short and supperficial and merely lists some 'old' seminal papers and a theoretical recent one. However, it fails to mention that the most comprehensive 'real world' climate policy to date, i.e. the EU ETS system, actually (and increasingly) is a 'hybrid instrument'. Here the quantity approach (limited number of allowances) is combined with a price approach (indeed, auctioning will be the rule in the power sector from 2013 onwards in the EU). Saveyn et al. (2011) compare the socio-economic effects for the EU for 4 different grandfathering/auctioning/carbon taxation schemes in the context of the Copenhagen Accord. This analys shows that auctioning generates a substantial amount of public revenues. Auctioning (and taxation) complies better with the ‘polluter pays principle’ and avoids handing out ‘windfall profits’ to sectors that can easily pass on the opportunity cost of allowances to their customers. BOX 3.4. is not making any reference to these 'real world hybric instruments' either. Literature: Delbeke, J., Klaassen, G.,Van Ierland, T., Zapfel, P., 2010 The role of environmental economics in recent policy making at the European Commission. Review of Environmental Economics and Policy 4 (1), 24–43 / | Good Point. We can add the point about the EU-ETS … some of the other points ARE addressed in other section of our chapter, like the bit about revenue from selling permits. |

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| 11382 | 3 | 33 | 27 | 35 | 31 | P34 (line 14-20): The discussion on 'hybrid instruments' is very short and supperficial and merely lists some 'old' seminal papers and a theoretical recent one. However, it fails to mention that the most comprehensive 'real world' climate policy to date, i.e. the EU ETS system, actually (and increasingly) is a 'hybrid instrument'. Here the quantity approach (limited number of allowances) is combined with a price approach (indeed, auctioning will be the rule in the power sector from 2013 onwards in the EU). Saveyn et al. (2011) compare the socio-economic effects for the EU for 4 different grandfathering/auctioning/carbon taxation schemes in the context of the Copenhagen Accord. This analys shows that auctioning generates a substantial amount of public revenues. Auctioning (and taxation) complies better with the 'polluter pays principle' and avoids handing out 'windfall profits' to sectors that can easily pass on the opportunity cost of allowances to their customers. BOX 3.4. is not making any reference to these 'real world hybric instruments' either. Literature: Delbeke, J., Klaassen, G.,Van Ierland, T., Zapfel, P., 2010 The role of environmental economics in recent policy making at the European Commission. Review of Environmental Economics and Policy 4 (1), 24–43 / | No action; duplicate |
| 13568 | 3 | 33 | | | | only a suggestion but just to point you out to work we've done on a systematic review examining ex post assessments of the effectiveness of climate policiesh as it assesses policies with a finer grain (includes source of authority, regulatory target, etc. and focuses on the policy cycle versus just instrument choice) See page 23+ and Figure 6 http://www.sciencedirect.com/science/article/pii/S0301421500000707 | Noted to be considered in revising |
| 9396 | 3 | 34 | | | | Since this chapter is about ethics, it would be helpful to include approaches which develop a normative background for policies regarding climate change. These are, i.e., authors who work on "ecological citizenship" (Andrew Dobson), and work on "Greening the state" (Wissenburg et al.). | No action - is treated in 3.11 |
| 11561 | 3 | 34 | 13 | | | It is relevant to mention here that "the political acecptability of carbon taxes is low"? | No action - we do not want to evaluate what policies are more or less politically |
| 11725 | 3 | 34 | 14 | 34 | 20 | Disagree. At least ['Hybrid' policies combining price and quantity control are likely to be superior.] should be deleted.Refer to No.13. | Will be addressed in SOD |
| 10639 | 3 | 34 | 14 | 34 | 20 | Doubtful. There is few arguments to support this statements. Please refer No. 7 | No action; unclear what no. 7 is |
| 9975 | 3 | 34 | 14 | 34 | 14 | This part should be deleted completely. Levying "carbon tax" and "cap & trade" simultaneously is not meaningful and would fail to reduce CO2 emission because carbon tax and cap & trade are theoretically same mechanism to reduce CO2 emission, as described in (Clive, 2007, page4-5).<br><br><Reference><br>[1] Clive Hamilton, Frank Muller (2007). Critique of the McKibbin-Wilcoxen Hybrid Emission Trading Scheme, Australia Institute. Available at: http://www.ies.unsw.edu.au/docs/WP98.pdf | Need better explanation of hybrid instrument |
| 11562 | 3 | 34 | 14 | | | "Hybrid policies combining price and quantity control are likely to be superior". Why? More needs to be said. | Need better explanation of hybrid |
| 7932 | 3 | 34 | 21 | 34 | 22 | Legal instruments should not be termed "command and control" policies. This just expresses an economic bias against the law. We propose using the term "legal regulation". | Consider using prescriptive regulations instead of command and control |
| 13942 | 3 | 34 | 26 | 34 | 26 | There are two .. in that line! | Will be fixed in SOD |
| 9976 | 3 | 34 | 31 | 34 | 33 | This part should explain that CO2 leakage caused by the implementation of the ETS happened actually through transfer of industry from one country to others. Market mechanisms at least under Kyoto-like international scheme, where the condition of all countries' meaningful participation is not met, does not work well, as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No50 line of this table. | No action; this is out of the scope of "framing" chapters. As such, assessment aspects of international policy instruments are addressed in Ch 13 |
| 12248 | 3 | 34 | 35 | 34 | 38 | Please elaborate further on under which assumpltions prescriptive instruments can perform better then market based instruments. | Good point; we will take this into account in revising section |
| 10976 | 3 | 34 | 31 | 34 | 33 | Market mechanism is highly recommended here in order to minimize total abatement cost. However, not only merits but also demerits should be stated here. | Good point; we will take this into account in revising section |

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| 8250 | 3 | 34 | 31-33 | 35 | 2-5 | While the authors cover many policy instruments that have been discussed in literatures, however, the existing international flexibility mechanisms such as “clean development mechanism” and “Joint implementation” are not explicitly discussed in this subsection. There is a suggestion that some words about the above mechanism can be incorporated around somewhere between lines 31-33. If these instruments are discussed in a later chapter, then it might be the place to provide a reference about those chapters as well. | Scope of section needs clarifying |
| 9977 | 3 | 35 | 33 | | | Carbon pricing is only one of mitigation measures. In this regard, this section should include "voluntary target scheme" as one of mitigation actions, depending on circumstances. There are successful examples of "voluntary target scheme" in the world. Each industry in Japan has voluntary target and the voluntary target scheme has played a big role, as described in (Yamaguchi, 2012, page35 and 154), (Manuel, 2010, page 6 and 13), and (Yamaguchi, 2010, abstract). In addition, there is also a successful example of "voluntary target scheme" in Netherlands, as shown in (Martijin, 2002, page162). These literatures are listed in the No63 line of this table. | No action; voluntary agreements are already discussed in this section (and in the box). |
| 4497 | 3 | 36 | 1 | 36 | 1 | Footnote 15 is much more important than the other points made in this paragraph, and should be elevated to being part of the text instead of just a footnote. | No action; it is important, but not covered in our chapter; that's why the |
| 11726 | 3 | 36 | 28 | 37 | 3 | Expression should be met with section 15.3.6. | Will ensure consistency with chapter 15 |
| 9978 | 3 | 36 | 28 | 37 | 3 | This part should explain the advantages of "voluntary target scheme" and successful examples in the world. Each industry in Japan has voluntary target and the voluntary target scheme has played a big role, as described in (Yamaguchi, 2012, page35 and 154), (Manuel, 2010, page 6 and 13), and (Yamaguchi, 2010, abstract). In addition, there is also a successful example of "voluntary target scheme" in Netherlands, as shown in (Martijin, 2002, page162). These literatures are listed in the No63 line of this table. | No action; the performance of policy instruments is left to other chapters (sectoral, national, international) |
| 6085 | 3 | 36 | 28 | 36 | 29 | After objective, add "There are voluntary initiative that does not include regulatory authority, ex.Japan". | Noted - action will be taken - discussion of voluntary agreements will be changed |
| 13569 | 3 | 36 | 4 | | | if there is interest in examining the policy cycle more thoroughly (see page 13 inour above report for the Network for Business Sustainability), an interesting examination of Germany's experience in the ETS using the Kingdon garbage can model (different streams, policy windows), please see Brunner Understanding policy change: Multiple streams and emissions<br>trading in Germany Global Environmental Change 18 (2008) 501– 507 http://www.pik-potsdam.de/members/brunner/publications/understanding-policy-change-1 | No action; no change implied |
| 13943 | 3 | 36 | 8 | 36 | 9 | "These legal mandates are called direct regulations or command-and-control approaches". Is already explained before and again in footnote 16. This is redundant. | Will be addressed in SOD |
| 7933 | 3 | 36 | | | | There are many success stories of environmental regulation in the EU, Germany and Japan (for instance, the so called "top runner approach" in the latter). See, e.g., Martin Jänicke (2012b) as well as his further writings on this topic. | Noted - we will add examples from section chapters |
| 8154 | 3 | 36 | | | | You might want to consider how individuals process information and the types of decision rules they utilize in determining ways to communicate information for achieving social change (See FOD Chap. 2 Sect. 2.2.2 ) | No action - this is treated in 3.11 |
| 11534 | 3 | 36 | | | | You might want to consider how individuals process information and the types of decision rules they utilize in determining ways to communicate information for achieving social change (See FOD Chap. 2 Sect. 2.2.2 ) | No action; duplicate |
| 18600 | 3 | 37 | | | | The double dividend hypothesis (p 37): no clear conclusion. | No action; the double dividend hypothesis does not have a clear |
| 11727 | 3 | 37 | 13 | 37 | 17 | It is reasonable. Hamilton et al. also says that hybrid mecanism would fail the various tests of good policy.<br>1.Hamilton et al.:[Critique of the McKibbin-Wilcoxen Hybrid Emission Trading Scheme], http://www.ies.unsw.edu.au/docs/WP98.pdf | Noted - need better explanation of hybrid instruments |
| 9496 | 3 | 37 | 13 | 37 | 16 | good sentence - I can agree | Thank you for your comments. |
| 10640 | 3 | 37 | 13 | 37 | 17 | Good argument. Hamilton et al. also says that hybrid mecanism would fail the various tests of good policy.<br>1.Hamilton et al.:[Critique of the McKibbin-Wilcoxen Hybrid Emission Trading Scheme], http://www.ies.unsw.edu.au/docs/WP98.pdf | No action; duplicate |

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| 9979 | 3 | 37 | 14 | 37 | 16 | This part should be kept in SOD because this is a good example of the problem. Levying "carbon tax" and "cap & trade" simultaneously is not meaningful and would fail to reduce CO2 emission because carbon tax and cap & trade are theoretically same mechanism to reduce CO2 emission, as described in (Clive, 2007, page4-5). This literature is listed in the No5 line of this table. | Noted - need to clarify hybrid instruments |
| 8751 | 3 | 37 | 40 | 41 | | The achievement of more sustainable consumption patterns depends on how consumers value environmental resources (instead of quality)? | No action; relevant, but not in this section / discussed elsewhere |
| 13570 | 3 | 37 | | | | the dearth of studies to do with policy interactions is duly noted. That being said, you may wish to have a look (page 69) of the NBS report which also echoes the importance of bundles. In addition, we are currently developing a paper through the climatepolicyinnovation.org network which reflects further on our findings to do with the importance of policy combinations / interactions http://www.climate-policy-innovation.com/ | No action; these aspects are further discussed in "assessment" chapters (e.g. 13, 15) or even sectoral chapters. |
| 18386 | 3 | 37 | | 38 | | Why focus only on the interaction between carbon taxes, policies to reduce emission and emission trading ---all of which have serious flaws as policies that might lead to changes in habits and practices with respect to energy use, transport systems, continued search for new oil & gas finds and none moving us towards a transition to a sustainable , clean and green world. It seems an excesively narrow approach. | No action; comment is too vague for action. |
| 17295 | 3 | 37 | | | | Policy interactions may include “disaster” and “renewable energy” policies as identified in the two respective recent special reports of IPCC. | No action; we believe the issue is already dealt with adequately, e.g. when elaborating on green certificates or insurance (footnote 15). Evlauation |
| 11190 | 3 | 37 | | | | Carraro et al. (1996) develops the politically important concept of ‘employment double dividend’. Carraro, C., Galeotti, M., Gallo, M., 1996. Environmental taxation and unemployment:<br>some evidence on the ‘double dividend hypothesis’ in Europe. Journal of Public<br>Economics 62, 141–181. | Good point; we will take this into account in revising section |
| 11383 | 3 | 37 | | | | Carraro et al. (1996) develops the politically important concept of ‘employment double dividend’. Carraro, C., Galeotti, M., Gallo, M., 1996. Environmental taxation and unemployment:<br>some evidence on the ‘double dividend hypothesis’ in Europe. Journal of Public<br>Economics 62, 141–181. | No action; duplicate |
| 11563 | 3 | 37 | | | | The different policy instruments are primarily discussed in terms of economic efficiency. Other considerations should be taken into account as well. What ethical and political consequences may different policy instruments have? Different instruments give priority to different key policy agents. What ethical implication may that have? | No action - ethical aspects are laid in previous sections of Ch3. For actual implicatons of policy instruments, see assessment chapters (e.g. 13, 15) |
| 12846 | 3 | 38 | 12 | 38 | 17 | My reading based on the preceding lines 7-8 is that the lesson is not simply that raising revenue could reduce inefficiencies. Instead, the lesson seems that revenue would have to be used to reduce other distortions, as stated in lines 7-8: “the superiority of carbon taxes or emissions trading depends on whether generated revenues can be directed to reduce other distortionary taxes.”<br>If the lesson is that revenue should be directed to reducing distortionary taxes, the example of EU permit auctioning is misplaced here (as the revenue from auctioning is not dedicated for reducing distortionary taxes). Rather, the province of British Columbia could be given as an example besides Australia. British Columbia uses carbon tax revenue to reduce business and income taxes (B.C. Ministry of Finance, http://www.fin.gov.bc.ca). | Good point, will be taken into account - DDH discussion will however be moved |
| 13571 | 3 | 38 | 28 | | 28 | It may be worthwhile to make a distinction between developing countries (more to do with ensuring basic educational attainment, % educated within their population, etc.) and OECD nations (more to do with marginalized populations having access / affordability to higher education, etc.) (again, bearing in mind these are generalizations). In other words, just to flag that issues like health (take the U.S. for instance) and education and (affordable) housing are also key concerns for industrialized nations also | Will be addressed in SOD |

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| 15370 | 3 | 38 | 31 | | 33 | Easterly (see William Easterly, The White Man's Burden: Why the West's Efforts to Aid the Rest of the World Have Done So Much Ill and So Little Good, 2006.) has argued that plans have not been successful in accomplishing development objectives, whether they have been developed indigenously or encouraged or imposed by multilateral financial institutions. Easterly includes poorer countries in his analysis, which in the terminology of North, Wallis Weingast are fragile Limited Access Orders (North, Douglass C., John Joseph Wallis, and Barry R. Weingast, Violence and Social Orders: A ConceptualFramework for Interpreting Recorded Human History. New York: Cambridge University Press, 2009). Stable limited access orders, including such countries as China and India, have achieved economic growth within a planning framework, but as Acemoglu and Shirk (Daron Acemoglu "Why Not a Political Coase Theorem? Social Conflict, Commitment and Politics", Journal of Comparative Economics, 31, pp. 620-652, December 2003; Shirk, Susan L. China: Fragile Superpower. New York: Oxford University Press, 2007. ) suggest, the plans are successful because they are in the interest of a relatively narrow ruling coalition, and if that coalition does not find adaptation or mitigation to be in its interest they will either fail to be included in the plan or will not be pursued or succeed if they are included. | Will take this into account in SOD |
| 11728 | 3 | 38 | 34 | | | One part of the developing countries don't fit such situation. [Most developing countries] is better expression. | Will be addressed in SOD |
| 9528 | 3 | 38 | 34 | | | Please, add many in front of developing countries due to consideration for China, Korea and transition countries. | Will be addressed in SOD |
| 6086 | 3 | 38 | 34 | 38 | 38 | The sentences here does not make sense. Therefore either delete or rewriting of this paragraph is necessary. Lack of human and financial resources, advanced technology, and have poorer institutional and administrative capacity may lead to the situation where not only certain market mechanisms such as carbon trading schemes but also direct regulation such as performance standards may not function well. Also the contrast between developing and developed countries with respect to policy choices is misleading. For example, actual climate policy introduced in the united states is direct regulation (CAA) and that in Japan is industry voluntary initiative. | Good point. We can clarify. |
| 13572 | 3 | 38 | 38 | | | suggest an example of entrenched distortions, which may be politically challenging (e.g. fuel and electricity subsidies) -- see fuel protests in Nigeria for instance http://www.cnn.com/2012/01/06/world/africa/nigeria-fuel-protest-explained/index.html | Will be addressed in SOD |
| 9350 | 3 | 38 | 21 | | | p.38 line 21: Section 3.8.3idoes not show the application of these general principles of taxes etc. to climatte change. This should be added. How, in other words, do these applynin the global context to an all pervading externality, without an international government? Are you defining GHG emissions as a surrogate for climate change? | Good point. Think about how to apply these principles to climate change. |
| 11191 | 3 | 38 | 15 | 38 | 16 | Saveyn et al. (2011) analyse the potential for a 'double dividend' (incl. employment) in the EU comparing a number of options with an increasing share of auctioning and carbon taxation. Saveyn, B., Van Regemorter, D., and Ciscar, JC. (2011). Economic analysis of the climate pledges of the Copenhagen Accord for the EU and other major countries. Energy Economics 33, S33-S40 | Reference will be considered in SOD |
| 11384 | 3 | 38 | 15 | 38 | 16 | Saveyn et al. (2011) analyse the potential for a 'double dividend' (incl. employment) in the EU comparing a number of options with an increasing share of auctioning and carbon taxation. Saveyn, B., Van Regemorter, D., and Ciscar, JC. (2011). Economic analysis of the climate pledges of the Copenhagen Accord for the EU and other major countries. Energy Economics 33, S33-S40 | No action; duplicate |
| 17332 | 3 | 38 | 18 | 38 | 21 | Consider cross-refering to Chapter 15 when appropriate | Good point. We will look for how to do |

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| 4931 | 3 | 38 | | | | 3.8.4 In this chapter generally, the equity and responsibility issues in context of the climate change policies (besides their global aspects) appear not only in relation to the developed countries and the developing countries, but also with their specificity for the EiTs (e.g. with their historical responsibility somewhere between the two former groups). In particular and more concretely, in subsection 3.8.4 whilst there are strong differences in these conditions between developed countries and developing countries, it was also clearly recognized that the EiTs were in a "between" situation and it also lead to differences in choice of policy instruments (as compared to those instruments which were generally considered relevant/suitable for the highly industrialized countries). During the early stages of the international negotiations (early 1990s) it was not so evident that these EiTs will undertake any emission control commitments; ultimately it happened with "flexibilities" (as e.g. referred to together with relevant policy choices for various sectors for Hungary in "Climate change and Hungary: mitigating the hazard and preparing for the impacts, 2010, ISBN 978-963-508-605-4 http://www.vahavahalozat.hu/files/vahava-2010-12-korrigalt-2.pdf). | No action; we believe the issue is already dealt with adequately |
| 13422 | 3 | 39 | 1 | 39 | 8 | The use of investment for climate actions is a crucial economic instrument, for both developing countries (thus it is appropriate to mention it here) and also for developed countries. Thus for example a deliberate choice to opt for renewable energy sources has to be operationalized through promoting investments in those sources, even if they are not at the moment as economical as climate-damaging sources. The investment-led approach, with its accompanying policy instruments such as subsidies and legislation, deserves more emphasis, citing the relevant and growing literature. The use of five-year plans in developing countries to allocate investments in climate-related sectors and activities should also be mentioned in this context. A paragraph or more on the investment-led approach (relevant to all countries) could also be usefully added in section 3.8.2 on economic instruments. | Good point. Investmetns can be mentioned in 3.8.2 |
| 13574 | 3 | 39 | 17 | | 20 | the examples of economic objectives are rather broad - encompassing aspects as diverse as innovation, lowering economic costs, etc. and so difficult to say that these may (all) be met | No action; no change implied, adressed p39 line 21 |
| 2271 | 3 | 39 | 18 | 39 | 16 | It is strange that the Assessnent of Performance does not include attempts to find out whether greenhouse gases in the atmosphere have changed as a result of these policies Meaureents over land surfaces are almost completely neglected | No action; no change implied. Covered as environmental objectives i.e. reduced emissions |
| 8155 | 3 | 39 | 19 | | | How much weight should be given to each of these four objectives and how will this tie into CBA? | No action; we have considered the point but feel it is already addressed (e.g. |
| 13573 | 3 | 39 | 2 | | | just to also note that for many developing countries the focus / thrust of power tends to be on the nation state rather than provincial / local levels of public authorities (again bearing in mind some major exceptions) - e.g. mega cities | Will be addressed in SOD |
| 9351 | 3 | 39 | 8 | 39 | 8 | p39 line 8 onwards: what about governance deficit in developing countries and its efect on efficacy of instruments? Authors do not mention improving governance as an institutional requirement | Good point. This should be added. |
| 17165 | 3 | 39 | 9 | | | There is a lack of coherence and linkage between this sub-chapter 3.9 and the chapters 3.3 and 3.4. The evaluation of policy options is again basically an ethical (i.e. comprising all relevant aspects, not merely effectiveness, etc) task, conducted along the same principles as those outlined in chapters 3.3 and 3.4, so please link these passages. It remains somewhat unclear where the several objectives are derived from. | We did work on improving links between sections in SOD. See revisions to first parag of 3.9, and other changes throughout 3.9. |
| 8588 | 3 | 39 | | | | There is a potential here to address some of the challenges of this chapter. I realize that the actual order of sections may not be changeable at this point, however, this type of broader discussion - in which multiple criteria area recognised - would have been valuable before the single-minded dicsussions of CBA etc. By placing this section after the previous it seems as thought the strictly economic criteria should take precedence over all others. If moving entire sections is behind the scope of revisions allowed for this chapter, then one way of addressing this would be to include some of the recognition in this section (ie. that there are many different criteria to deal with in any decision) in the earlier sections on CBA and the use of eocnomics as one tool for helping decision-makers make difficult decisions across non-comensurable dimensions. | Good point; we did consider reorganization, but instead add cross-references to other sub-sections. We added references to sections 3.3 and 3.4, and we add discussion of non-economic objectives. See new parag in 3.9.1. |

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| 13268 | 3 | 39 | 17 | 39 | 26 | How adaptation policies are considered in this four categories description? | No action. Adaptation is out of the scope. This is WGIII, focused on |
| 16929 | 3 | 4 | | | | I defer to the comments of my professional colleague Sonia Klinksy, on most dimensions of this topic, but offer one fundamental point. Almost all streams of considered analysis recognise that modern economic systems reside within some higher-level framework of rules based upon moral codes. Dr Klinsky has touched on some dimensions of this. Within institutional economics, it is generally referred to as the "institutional environment" that defines for example property rights along with the basic rights of individuals. These set the boundaries within which markets operate, and within which welfare can acceptably be aggregated for the purposes of policy (see my extreme example in relation to section 3.5).<br>With climate change, there is no global agreement on these fundamentals beyond the relatively loose principles set out in the UNFCCC. That is a core part of the problem.<br>To put it in layered terms, the economic system (and aggregation of welfare) resides within an social environment (which may or may not be formalised institutionally) that defines and enforces the acceptable principles and applications of aggregation and its boundaries. As we discused in the Washington IPCC meeting, trading relates closely to this, since trading implies exchangeability and hence potential to aggregate. The institutional environment for example enforces property rights, and also the bounds (eg. I cannot own and cannot sell my mother, or - in modern societies - slaves). I am allowed to own and trade other species, unless in general they are classified as endangered. These are collective social rules that define the boundaries. A diagram on this nesting might be useful. At the international level, the truce was essentially struck in the Westphalian system that codified the notion of Sovereignty of nation-states. Thus for example, War cannot be justified on arguments that it could improve aggregate global welfare.<br>Climate change strains the system because it involves the actions of each country impacting on others. Climate change by its nature thus transgresses the principle of sovereignty, without any other agreed moral framework with which to replace it. The likely victims have not agreed to any system of how their welfare could acceptably be aggregated, akin to the democratic system that underpins the moral legitimacy of economies within a sovereign state. Hence the recourse to negotiations and emphasis on procedure.<br>For this reason I believe the Exec Sum should follow much more closely the logical structure of the main chapter, which works from the ethical principles, and philosophies of justice, equity, and responsibility, values and wellbeing, before it gets to the economic 'toolkits' of aggregation. In other words the first sections lay out various moral frameworks; these should be developed to define more clearly the boundaries around various evaluation approaches (including aggregation & CBA). The Exec Sum should then I think lay out these boundaries, note that they may lead to incommensurate ways of looking at the problem "objectively", and that these can only peaceable or morally be resolved through negotiation, including some attempts to find proxies that represent the interests of future generations.<br>CBA forms a utilitarian approach that has to be nestled within this, with all the complexities and caveats around the way in which damages (and costs) are aggregated (section 3.5) and measured (3.10). | No action. ES already follows the structure of the chapter very closely. |
| 7902 | 3 | 4 | 1 | 7 | 24 | In our opinion, this is a rough summary only and should be refined. | Will be addressed in SOD |
| 8825 | 3 | 40 | | | | this section should include a discussion of the practical impacts of uncertainty. For example, Figure 3.4 as shown suggests a far higher level of precision in comparing costs and benefits than usually is possible; thin lines might be replaced by wider lines or bands to illustrate this important point. | Good point. We now clarify uncertainty. We add: "In particular, the diagram presents costs and benefits as if they were certain. A thorough discussion of |
| 14374 | 3 | 40 | 1 | | | Discussion reads like textbook; could be a section that could be edited down | No action; no change necessary, though we continue to edit for readability. |

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| 8589 | 3 | 40 | 1 | 41 | 4 | This section starts out promisingly, with a very nice clear recognition that there are multiple criteria to consider when evaluating mitigation options. Line 8 states this section is going to address 4 critiera. All of this is good so far. And then, on line 12, all of this framing is stopped and suddenly the reader is presented with the economic frame for policy analysis (and figure 3.4). This movement is illogical and leaves the reader with the impression that the other THREE criteria are subservient to economics. If the authors wish to include this discussion of an economics approach to decision making, it should be moved to a more appropriate location such as under section 3.9.1.1 | Good point, this has been clarified. The paragraphs and diagram do relate to all four criteria, not just economics. See new parag in middle of 3.9.1. The diagram can encompass all objectives, not just the first economic objective. |
| 7934 | 3 | 40 | 12 | 40 | 15 | An economic framework for policy analysis is adopted. This aproach supposes rational self-interested agents that maximizes personal utility. Given that these are heroic and counterfactual assumptions and given that there are many other ways to analyze policy-making, a reason is needed why this framewok is considered to be appropriate. | This point is addressed in SOD; similar to comment 8589. See new footnote in section 3.9.1.1 |
| 6087 | 3 | 40 | 2 | 40 | 4 | Criterion of promotion effect of technological innovation and diffusion is missing. In line 21-24 of page 6 of Chapter 3, there are sentences such as "Meeting aggressive emission reduction targets will be difficult without major changes in the technology of producing and consuming energy" and "Markets, left to their own devices, will underprovide technological change, even in the presence of a carbon price. Studies suggest that environmental and technology policies work best in tandem". Also in Chapter 1 (page 3, from line 47), there are sentences that "it is likely that deep cuts in emissions will require a diverse portfolio of policies and technologies. It is very likely that here are many different development trajectories, but it is virtually certain that the ability to meet those trajectories will be constrained if particular technologies are removed from consideration or are given excessive emphasis". Also in Chapter 2 (page 38, lines 23-24), there is a description that "Several researchers suggest that future pathways for RDD&D will be the determining factor for emissions reductions (Prins and Rayner, 2007; Lilliestam et al., 2012)". This is pointed out in Chapter 6 (6.4.1) that "autonomous technology might not be sufficient to limit climate change and dedicated resources and policies might be needed to induce it" (p.60, lines 22-23). In any case without rapid technological innovation and diffusion, deep emission cut will be impossible. It is highly appreciated that this Chapter has an independent section (3.12) on technological change. As pointed out in that section, policy can play a key role in shaping both the derection and magnitude of climate-friendly technological change. With this in mind, whether a certain policy has such effect as to promote technology innovation/diffusion is absolutely important criteria for policy evaluation. Please add "promotion effect for technologicalinnovation/diffusion as fifth criteria. | Good point but note that innovation is usually considered in dynamic efficiency. Still, we take this into account in the revised version of the section - by making the above-mentioned issue clearer (comment 8589). We added mention of technology here, but must point mostly to other sections for more substantial discussion; see section 3.12 |
| 9006 | 3 | 40 | 23 | 42 | 36 | As in other policy evaluation techniques covered in the chapter (see for example section. 3.9.2.1 for an evaluation of quantitative approaches to evaluating policy), there should be a caveat emptor in the potential uses of a partial equilibrium graph Figure 3.4 for policy evaluation purposes of climate change policies. First of all, partial equilibrium graphs implicitly assume full employment, which is not the case in the developing countries. Again, section 3.8.4 recognizes and example of this in: "strong synergies between development, economic and climate policies are found in the literature" (page 38, lines 29-30). When resources are not fully employed as it is the case in developing countries, Figure 3.4 and microeconomic approaches in general do not provide an exhaustive accounting of the impact. Second, there should be a mention that the important distributional impacts are between types of countries - between developing and developed countries - as listed in Box 3.5 on climate policy applied to coal-fired electricity. Climate policy applied to coal-fired electricity at the global level has the potential of preventing developing countries from installing needed energy supply and constricting the development of domestic capabilities, including those of the domestic private sector, and reducing poverty. | Good point; we clarify assumptions, and how unemployment also matters. We add "full employment" to the list of assumptions, and we discuss the generalization to the case with unemployment. |
| 13575 | 3 | 40 | 1+ | | | a couple of comments here 1) suggest highlighting the challenge with attribution / causality - of course some tools attempt to determine this line of reasoning (e.g. logic models) and more nuanced views acknowledge the difficulty in determining that policy x leads to outcome y | No action; good point but we can't discuss causality. |

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| 13576 | 3 | 40 | 1+ | | | just to flag again that economics are only one way to conduct policy evaluation -- these economics models can be helpful but speaking both as a former policy practitioner for the Cdn government and in assessing policies in a an academic sense, there is many a time when what these 'models' indicate rarely reflect what happens on the ground -- policy choices are to do focusing events / crises, political / constituency concerns, ideology, etc. - see Pal (2010) in Beyond Policy Analysis Nelson: Toronto | Will took this into account in SOD - we added caveats and discuss alternative approaches |
| 13577 | 3 | 40 | 1+ | | | an alternative view of policy choice and evaluation comes from systems dynamics and related views - an undergraduate student (Harris Berton) directed me to complexity theory (Morcol 2002) (see Pal 2010 page 357) and that rather than assuming linearity (the world, policy decisions as a clock) one can think of them as a cloud - where boundaries change and shift and is more difficult to assess the individual components of, but nevertheless, it remains a cloud) | No action - good point, but not clear how this is helpful. |
| 13944 | 3 | 41 | | 41 | | Footnote 25 is redundant too. Already well explained in the text. | We deleted that footnote |
| 9398 | 3 | 41 | | | | "Efficiency" needs a more critical discussion - i.e. in debates about collective goods and public goods in particular authors claim that efficiency cannot be achieved, even not in policy practices. Rather, sustainance of the good itself needs to be achieved through information practices, regulatory frameworks which engage civil society etc. | See new discussion in paragraph on efficiency. |
| 18387 | 3 | 41 | | 45 | | section 3.9.1.1 to 3.9.3.2 provide a list of policies as if our countries and policy makers could simply pick and chose among policies without a need to consider might work best in their country or region and in total abstraction from changes in the world economy or in the competitive strategies of the firms who must carry out such policies, if ever they were applied. You need to spend a bit more time to discuss the pros-and cons of enacting such policies and making them work. | No action. Sectoral and assessment chapters deal with these aspects. Consistency among framing chapters (e.g. 2 & 3) and sectoral/geographical assessment chapters is a continuous |
| 8156 | 3 | 42 | | | | I like the example of coal-fired electricity. Can you indicate how general are these six distributional effects to issues of CC? | Now addressed in 3.9.1.2 |
| 13945 | 3 | 42 | 4 | 42 | 27 | Suggest deletion. Keep (5) and (6) as a note, not to confuse readers who calculate aggergate surplus. The rest fits into the text. | No action. Comment unclear |
| 9807 | 3 | 43 | 10 | 43 | 13 | Your statement that the other pollutants might be already optimally regulated, is only valid if the emission level is zero. Otherwise there is always a benefit to society when emissions are lower. | No action. We feel that the text adequately addresses this issue. Lower emissions is NOT always a net benefit; |
| 4498 | 3 | 43 | 14 | 43 | 16 | This paragraph discusses "energy security" as if dependence on imported fossil fuels were the primary problem. However, this is not the case for two reasons. (1) Oil (the main internationally traded fossil fuel) is bought and sold in a world market, so the domestic price of oil in any particular country is largely independent of whether the oil is imported or not. Disruptions of a national economy caused by oil price spikes cannot be avoided by changing the mix of domestically produced and imported oil. (2) The main problem with imported fossil fuels is if the these fossil fuels are purchased from states that are actively or potentially hostile. Buying oil or gas from a hostile power enriches that state, to the detriment of the purchasing nation's security. It is economic strengthening of the hostile power that threatens national security, not the mere fact that the fossil fuels are imported. | No action - we make only one small mention of energy security; this is not the place for extended discussion. |
| 11729 | 3 | 43 | 14 | 43 | 16 | Yamaguchi et al. says that climate response needs the balance between the cost and benefit. This sentence should be deleted since such view point is lacking.<br>1.Yamaguchi et al.:[Climate change mitigation,P2-3], send attachment by another e-mail. | No action. Comment unclear |
| 9497 | 3 | 43 | 14 | 43 | 16 | delete this sentence - Climate policy should be chosen in consideration for both energy security and economy growth | No action. Disagree with comment/comment unclear. |
| 10641 | 3 | 43 | 14 | 43 | 16 | There is more cases where climate policy contradicts energy security. Yamaguchi et al discusses "balanced between energy security and mitigation reponses in his Climate Change Mitigation A Balanced Approach to Climate Change | No action. Disagree with comment |

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| 11011 | 3 | 43 | 24 | | 29 | Political feasibility cannot be meaningfully discussed in the abstract. It largely depends on how a proposed policy's expected distributional impact aligns with the distribution of power in the society? The latter, in turn, will hinge on the specifics of that society's institutional matrix such as the size of the selectorate relative to that of the total population and the ruling coalition (Bueno de Mesquita et al. The Logic of Political Survival, Cambridge, Massachusetts, MIT Press). Also, does the policy create economic rents, and can these rents, be used to purchase the support of a winning coalition of interest groups? | Good point. This has been added. We make this point explicit in 3.9.1.4 |
| 9806 | 3 | 43 | 3 | 43 | 16 | Paragraph 3.9.1.3. should be elaborated more in detail. Understanding and controlling environmental objectives are crucial when deciding about the appropriate climate change policy. | No action. Sectoral and assessment chapters deal with these aspects. Consistency among framing chapters (e.g. 2 & 3) and sectoral/geographical |
| 17296 | 3 | 43 | | | | It is important to include sustainability objective. | No action. This issue is dealt with more |
| 8590 | 3 | 43 | | | | Similar to an earlier comment (about 3.9.1), the order of these sections does not make sense to me. Placing a discussion about the breadth of approaches of policy evaluation before all the discussions of economics would help address the enormous problems the chapter has in automatically giving econmics preference as a worldview through which to see the challenge of climate change policy. If this type of reordering is at all possible I would strongly recommend it. | Noted; organization and structure of chapter will be addressed in SOD |
| 8826 | 3 | 44 | | | | the references in this section (quantitative approaches) are too focused on the work of economists. I suggest including insights from the decision sciences, including Keeney & Raiffa's Decisions with Multiple Objectives (1993) and Kleindorfer, Kunreuther, and Schoemaker's Decision Sciences: An Integrative Perspective (1993). In addition, this section should include a short discussion of the importance of facing difficult values-based trade-offs across objectives and the relevance of various techniques for helping stakeholders to address tough trade-offs; both references noted in the previous sentence include good discussions of this topic. | We added a paragraph and one of these references. We added this reference, at the end of section 3.9.2.1 |
| 13946 | 3 | 44 | 18 | 45 | 13 | I would recommend to cite for models: "Inside the Integrated Assessment Models: Four Issues in Climate Economics" (2009). Elizabeth A. Stanton, Frank Ackerman and Sivan Kartha. Climate and Development 1:2, pp. 166-184. It is a nice article to clasify climate change models. It could help to shorten this section. Page 59, for example, DICE, RICE, FUND and PAGE can be categoried under Stanton (welfare maximization, general equilibrium, partial equilibrium, cost minimization and simulation models). | Added reference - see footnote near end of section 3.9.2.1 |
| 4499 | 3 | 44 | 27 | 44 | 27 | The proper spelling is DeCanio (no space between "De" and "Canio". It is certainly appropriate to cite DeCanio (2003) in this chapter, but this is an odd placement for the citation, given that the arguments in DeCanio (2003) have mainly to do with flaws and weaknesses in conventional optimizing models, not with the failures of conventional bottom-up models. The DeCanio (2003) citation would be more appropriate in the following bullet point. | This has been fixed in SOD |
| 9352 | 3 | 44 | 34 | 44 | 35 | inp.44, line 34-35. Can it be added here that these models may not suit use for climate change where the future may be different, sometimes drastically different? The limitations of the models are not brought out clearly enough. | No action; there is no single best method (or model) for policy evaluation. Given the allocated words we have, we |
| 8398 | 3 | 44 | 22 | | | I defer to the author's judgement in terms of the exact definitions, but we tend to think of GCAM as a hybrid approach that could also be cited here. See: Kim, S.H., J. Edmonds, J. Lurz, S. J. Smith, and M. Wise (2006) The ObjECTS Framework for Integrated Assessment: Hybrid Modeling of Transportation Energy Journal (Special Issue #2) pp 51-80. | We considered this reference and find that it would add only small amount. |
| 9353 | 3 | 45 | 29 | 45 | 29 | p.45 line 29 a method not included is deliberative approaches. Also a little more on the approaches which are qualitative oriented is warranted. | Good point; we we tried to take this into account in revising section but given the allocated space, we cannot elaborate on |

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| 8591 | 3 | 45 | | 51 | | This discussion about metrics could be usefully integrated with the limited section on values earlier. This would have helped place some of the other dsicussions (such as of CBA) in a more appropriate context. I realize that reorganization at this late stage of development is usually not possible in the IPCC framework. However, based on the profound, possibly unsolvable, problems in this chapter I am strongly recommending that some reorganization is considered it at all possible. From my perspective it may be the easiest way to salvage this very difficult and problematic chapter. | Noted; will be addressed in SOD |
| 8157 | 3 | 45 | | 61 | | Metrics of Costs and Benefits Do you need all the material in this section. I found it a bit difficult to follow and see the connections with CBA and distributive/outcome justice. You might want to consider introducing an example to highlight key points regarding metrics and tie the discussion more closely to material in the earlier parts of the chapter. | Noted; will be addressed in SOD |
| 18388 | 3 | 45 | | 54 | | Section 3.10 is more realistic and points to the way metrics can affect the choice of trade-offs and can impact differentially on segments of the population and on other actors thus giving rise to the kind of dilemas that we currently fact between pumping more oil, searching for more gas, engaging in new such as fracking and greater use of methane. | Thank you for your comment. |
| 12787 | 3 | 45 | | 49 | | A classification or overview of the pros and cons of the metrics would be helpful as a summary. | No action - this is a good point, but we cannot add to this section by adding a summary. The section already is a |
| 17297 | 3 | 45 | | | | The costs of non-action may strengthen the arguments. | No action; we believe this is covered |
| 17166 | 3 | 45 | 30 | | | Again there needs to be more linkage and cross-references between this section 3.10 and 3.3/3.4. Ideally, 3.10 would discuss proposals for more precise metrics for the many possible ethical targets discussed in ch. 3.3 and 3.4. | Noted; will be addressed in SOD |
| 6314 | 3 | 45 | 36 | 46 | 3 | Here, the authors are finally using the language of anthropocentric vs. non-anthropocentric. Use this language consistently throughout the chapter, rather than human and non-human values, as noted previously. | Noted; will be addressed in SOD |
| 8827 | 3 | 45 | | | | the discussion of participatory approaches (section 3.9.2.2) is too brief. Important references are excluded (see work by Orwin Renn, such as his 1999 paper “A Model for an Analytic-Deliberative Process in Risk Management,” or the 2005 publication of the US National Research Council, Decision Making for the Environment. | No action - insufficient information. We searched multiple databases at online libraries, and could not find this reference. |
| 17333 | 3 | 45 | 15 | 45 | 29 | The literature about how participatory approaches can be used in "decision-support" and political negotiation processes is vast. This three paragraphs do not make justice of it. A good reference is the article by Nancy Roberts (2004) summarizing a lot of the literature. It can be found here http://arp.sagepub.com/cgi/content/abstract/34/4/315. Many references in the communicative planning literature as well. | We add this citation, and a sentence, but cannot possibly do justice to the vast literature in this short chapter. |
| 10270 | 3 | 46 | | 49 | | M. Amann et al.; GHG mitigation potentials in Annex I countries-Comparison of model estimates for 2020, (2009), IIASA Interim Report IR-09-034 is a gray literature, but the manner of MAC curves between CGE type models and technology rich models can be understood. The paper will be useful for readers. | No action; cannot cite grey literature |
| 10271 | 3 | 46 | | 49 | | For understanding differences in MAC (mitigation costs and potentials) among countries, the following paper will be useful in this section. T. Hanaoka and M. Kainuma, Low-carbon transitions in world regions: comparion of technological mitigation potential and costs in 2020 and 2030 through bottom-up analyses, Sustainability Science 7, 2012 | No action; we feel this issue is adequately addressed by existing citations |
| 10272 | 3 | 46 | | 49 | | For understanding differences in MAC (mitigation costs and potentials) among countries, the following paper will be also useful in this section. K. Akimoto et al., "Estimates of GHG emission reduction potential by country, sector, and cost", Energy Policy 38, 3384-3393, 2010. | No action - hundreds of possible cites; we need to pick and choose. This is not the place to discuss in detail. |
| 8158 | 3 | 46 | | | | There is a body of research in behavioral economics on why WTA may differ from WTP (See Chap. 14 of Boardman et al Cost Benefit Analysis: Concepts and Practice. ) | No action; cannot cite grey literature |
| 11535 | 3 | 46 | | | | There is a body of research in behavioral economics on why WTA may differ from WTP (See Chap. 14 of Boardman et al Cost Benefit Analysis: Concepts and Practice. ) | No action; duplicate |

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| 11564 | 3 | 46 | 20 | 46 | 20 | If it is true that multiple metrics of costs and benefits should be employed, the chapter should take the consequence thereof and focus on multiple metrics instead of primarily monetary cost and benefit. | No action; already addressed by comment 3372 |
| 4625 | 3 | 46 | 25 | 46 | 25 | It's important to note that onlt a money metric may be used in benefit-cost analysis (see comment 36) | Noted; will be addressed in SOD |
| 13269 | 3 | 46 | 27 | 46 | 28 | In same cases, as in some Energy Efficiency appliances, GHG abatement could produce economic gains. These gains also have impact on people, distributtive effects and changes in prices and costs. | No action; we believe this is already covered. |
| 10838 | 3 | 46 | 27 | 46 | 27 | "If GHG emissions are to be reduced, econmomic costs will be imposed on many actors". Surely this is an assumption? This, in my opinion, partially reflects a problem with CGE modelling in that it is assumed that the current state is in perfect equilibrium and thus (most) changes will therefore causes "costs". Perhaps there are win-win situations (as exemplified by the MAC curves in the following pages). Perhaps our models are a poor reflection of reality? Perhaps we, as a society, have missed an alternative development parthway or policy structure that makes GHG mitigation not cost (this is easy to imagine, since energy costs money and we generally like avoiding costs). Or perhaps, as you say, we have everything perfectly correct, and mitigation always costs! My suggestion is to weaken this statement so that you modestly acknowledge that GHG may not in fact cost (under the correct set of assumptions and society). E.g., some affect with "If GHG emissions are to be reduced, economic costs may be imposed on some actors while other actors may receive benefits, ..." | Noted; will be addressed in SOD |
| 12558 | 3 | 46 | 33ff | | | There is a large psychology and behavioral economics literature on subjective well being that is in part acknowledged later on in the chapter, e.g., 3.11.2.1 and 3.11.2.2, which could be foreshadowed here, allowing for the possibility that metrics other than changes in income exist. | Noted; will be addressed in SOD |
| 8251 | 3 | 46 | | 52 | | In this section the authors describe different modeling approaches and their limitations to estimate the cost of GHG mitigation. It seems that the section mainly focuses on the limitation-side of different types of modelling structures. Describing these limitations is plausible in the sense that it can help a reader to understand the scope of models results based on their prescribed structures. However, the readers may also be interested know the merit of each model over others. This part can be extended in this subsection. | No action; good point, but we won't have space for expanded discussion. |
| 8394 | 3 | 46 | 30 | 46 | 31 | A further point is that, technological changes can also involve changes in institutions and various welfare changes. | No action; this is a good point, but this is not the location to make this point. |
| 12557 | 3 | 46 | 34 | | | There is a large psychology and behavioral economics literature on the problems and limitations of contingent valuation measures, i.e., on both the discrepancy between WTP and WTA, and how to interpret responses on these measures in general. This literature deserves to be discussed or at least acknowledged. | No action; CV is covered later, on pages 56 onward. |
| 10705 | 3 | 47 | 1 | 47 | 1 | Footnote 30: A reference is given to section 3.6.3. which must - as far as I can see - be an error. | Noted; will be addressed in SOD |
| 13270 | 3 | 47 | 1 | 47 | 2 | the same comment as above. Some abatement measures could produce a reduction of the energy costs. | No action; already covered. |
| 10706 | 3 | 47 | 14 | 47 | 16 | It would be good if you indicate the impact on the results of including climate feedbacks and also give references to some IAM studies here. | Noted; will refer to later chapter on IAMs. |
| 9355 | 3 | 47 | 15 | 47 | 16 | line 15 16, very important; more focus on this | Noted; will refer to later chapter on IAMs. |
| 9354 | 3 | 47 | 1onwards | | | p47 lines 1 onward: there is some repitition between this section and previous sections could be avoided. | Noted; will be addressed in SOD |
| 4501 | 3 | 47 | 21 | 47 | 21 | It should be noted that the "representative consumer" abstraction is highly questionable. See the article by Kirman, "Whom or What Does the Representative Consumer Represent" in the Journal of Economic Perspectives (1992). | No action. But of course it is questionable; its not meant to be "realistic". |
| 12559 | 3 | 47 | 4 | | | For this statement ('leading to a drop in demand") and elsewhere (talk about a "single representative consumer" in next paragraph) , the authors should (a) specify what the behavioral assumptions are on which their predictions about behavior in response to policy interventions are based, namely rational expectations and responses, and (b) consider how these predictions might change (at least directionally) when these assumptions of rational responses are relaxed or replaced by some the descriptive models of human choice described in Chapter 2, Section 2.2. | No action; here we use the eocnomic model. The next section coveres behavioral models. |

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| 10704 | 3 | 47 | 1 | 47 | 1 | Footnote 30: When you introduce the concept "CO2-equivalent" you could give a reference to AR5 WGI chapter 8. | No action - we don't feel that this would add significant information; too many cross-chapter concepts to mention every |
| 8253 | 3 | 47 | 10 | 47 | 28 | There are limitations to the growth models too. A variety of growth models is based on steady-state calibration of the economy with a small number of sectors and regions. While these models can somehow describe the dynamics of abatement over time, they are not really calibrated to the business as usual state of the economy based on projections. The authors should highlight the pros and cons of the static and the dynamic model. Also, there should be some explicit discussions of recursive dynamic models. | No action; we say this already. |
| 8252 | 3 | 47 | 17 | 47 | 23 | The authors describe the general limitations of models regarding their assumptions on production and consumption activities. But, a notable point is that these models can always be extended to incorporate a spatial issue. For example, Sebastian Rausch et al. (2010) extended their EPPA model by different household groups to assess the distributional consequences of mitigation policy (see MIT Joint Program on the Science and Policy of Global Change report no 185). Also footnote 41 of chapter 3 refers to a study by Paltsev et al. (2007), in which they use EPPA model's results to estimate total cost of emissions abatement. | No action; cannot cite grey literature |
| 15376 | 3 | 48 | | | | The statement about SO2 as a weakness of economic models leaves out the key studies by Ellerman, etc. Convery, Frank, Christian de Perthuis, and Denny Ellerman. “The European Carbon Market in Action: Lessons from the First Trading Period – Interim Report.” Center for Energy and Environmental Policy Research: 08-002, March 2008. | No action; cannot cite grey literature |
| 11012 | 3 | 48 | 24 | | 28 | The opportunity exists to intervene to lower these costs. Most actual public policy is designed and implemented in less that optimal ways, often in far less than optimal ways. The models used in climate policy analysis cannot predict in advance what non-optimal policies will be implemented. There is, therefore, a tendency to model optimal policies. The result is a large and systematic downward bias in the estimates of abatement costs. This is a point on which policy makers should be cautioned. | No action; we believe we deal with this adequately. |
| 9007 | 3 | 48 | 24 | 48 | 28 | This is a good point: "The economic models generally involve an assumption of fully optimizing behaviour by economic agents. Therefore, aside from technological change, any reduction in emissions must be driven by changes in price." These are exactly the kind of explanations this chapter must contribute in to be true to its objective of being a "resource for policymakers and researchers who are trying to solve normative questions. In that sense, the chapter is policy-relevant but not policy-prescriptive" (page 8, lines 19-21). It is important to point out that fully optimizing individual behavior is a strong assumption often not true in practice because of imperfect information, monopolies on either the demand or supply side, and, especially in developing countries, unemployed resources. | Thank you for your comment. |
| 11565 | 3 | 48 | 24 | 48 | 28 | References should be made to chapter 4 and 13. | Noted; will be addressed in SOD |
| 12560 | 3 | 48 | 24 | 49 | 2 | Here is the first acknowledgement of the behavioral assumptions behind the economic models discussed previously. Probably better to move this discussion up to the beginning of the chapter. For the behavioural factors mentioned in this paragraph as having no scope in these models, at least one reference each should be provided. | No action; good point, but we do say things like this earlier in the chapter. And its not clear what location is recommended. |
| 12092 | 3 | 48 | 1 | 48 | 2 | "The conclusions resulting from the models depend on the assumptions made" - suggest also refencing this point as it is a crucial one - Weyant, J. (2000) An Introduction to the Economics of Climate Change Policy, Stanford University, Repetto, R. and Austin, D. (1997) The Costs of Climate Protection: A Guide for the Perplexed, World Resources Institute, Washington, DC. | No action; cannot cite grey literature |
| 6315 | 3 | 48 | 24 | 48 | 25 | The report states: "The economic models generally involve an assumption of fully optimizing behaviour by economic agents. Therefore, aside from technological change, any reduction in emissions must be driven by changes in price." Community-based social marketing models suggest that behaviour can be changed by non-economic means. Perhaps it is worth mentioning here. | No action; we believe the issue is already dealt with |

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| 12095 | 3 | 48 | 3 | 48 | 25 | One important assumption has been missed here, - whether or not co-benefits, such as air pollution reductions, are considered in the economic modelling. According to the OECD (2008) Environmental Outlook 2030 - "van Harmelen et al found that to compliance costs for regional air pollution policy in Europe, are reduced by 50–70% when combined with greenhouse gas related policies. Similarly, in the shorter-term, van Vuuren et al. (2006) found that<br>for the Kyoto Protocol, about half the costs of climate policy might be recovered from reduced<br>air pollution control costs. The exact benefits, however, critically depend on how climate<br>change policies are implemented and on the baseline policies that are used for comparison<br>(Morgenstern, 2000). Most available studies do not treat co-benefits comprehensively in terms<br>of reduction costs and the related health and climate impacts in the long-term, thus indicating<br>the need for more research in this area (OECD, 2000; IPCC, 2007a)." References Harmelen, T. van et al. (2002), "Long-term reductions in costs of controlling regional air pollution in<br>Europe due to climate policy", Environmental Science and Policy, 5(4), pp. 349-365.Vuuren, D. van et al. (2006), "Exploring the Ancillary Benefits of the Kyoto Protocol for Air Pollution in<br>Europe", Energy Policy, 34, pp. 444-60. Morgenstern, R. (2000), "Baseline Issues in the Estimation of Ancillary Benefits of Greenhouse Gas<br>Mitigation Policies", in Ancillary Benefits and Costs of Greenhouse Gas Mitigation, OECD Proceedings of an IPCC Co-Sponsored Workshop, 27-29 March 2000, in Washington DC, OECD, Paris. IPCC (Intergovernmental Panel on Climate Change) (2007a), "Summary for Policymakers", in, S. Solomon<br>et al. (eds.), Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York. | Noted; will refer to later chapter on IAMs. |
| 12096 | 3 | 48 | 3 | 48 | 25 | Recommend also including the key point from - Schneider, S. and Azar, C. (2002) 'Are the costs of stabilising the atmosphere prohibitive?', Ecological Economics, vol 42, issues 1–2, pp73–80 namely " Top–down (economic) models typically suggest that the cost of a 50% reduction of global CO2 emissions from baseline by 2050 would cost some 1–4% of global GDP, and a 75–90% reduction by 2100 would cost some 3–6%. But since these studies also assume that global income grows by 2–3% per year, this abatement cost would be overtaken after a few years of income growth. Thus, the cost of 'climate insurance' amounts to 'only' a couple of years delay in achieving very impressive growth in per capita income levels. To be ten times richer (than in 2000) in 2100 AD versus 2102 AD would hardly be noticed and would likely be politically acceptable as an insurance." | No action. Good point, but the table only is to show a set of results, not to review all literature. That is elsewhere. |
| 12093 | 3 | 48 | 3 | 48 | 4 | After "A key determinant of the<br>3 economic cost of limiting GHG emissions is the feasibility and future cost of using non-fossil fuel<br>4 energy in electricity generation and in transportation." Please consider adding "Studies suggest that it is technically possible for many nations to transition to 80-100% of their electricity demand to be met by renewables by a certain date, usually by 2050". For an overview of this literature please see - Elliston B, Diesendorf M, MacGill I, 2012, 'Simulations of Scenarios with 100% Renewable Electricity in the Australian National Electricity Market'. Energy Policy 45:606-613. http://www.ies.unsw.edu.au/docs/diesendorf-simulations.pdf This paper provides an overview of the literature here. | No action. Good point. But this is not the place to review all IAM model results. |

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| 12094 | 3 | 48 | 4 | 48 | 4 | The text here - "Another is the feasibility and cost of increasing energy efficiency in end uses." .....and please also note that the following Cambridge University team have assessed the practical limits of energy efficiency. Cullen, J., Allwood, J., Borgstein, E. (2011) Reducing Energy Demand: What Are the Practical Limits? Environ. Sci. Technol., 2011, 45 (4), pp 1711–1718 DOI: 10.1021/es102641n http://pubs.acs.org/doi/abs/10.1021/es102641n they found the following "They applied "best practice" energy efficiency changes to numerous energy end use systems. They concluded that 73 per cent of global energy use could be saved by introducing such changes." Also, many of the other IPCC chapters are assessing the feasibility and cost of increasing energy efficiency. So perhaps a table here would be good summarising what the other chapters have concluded for energy efficincy potential? NB - the IPCC AR4 and AR5 has found for that, for instance, the residential and commercial buildings had significant energy efficiency potential. | No action. Good point. But we can't review all results or add more cites here. |
| 12561 | 3 | 49 | 14 | | | Here and elsewhere in the chapter, should "abatement" be replaced with "mitigation", to use the term used in the WG3 title and other chapters? | No action - good point, but this is not necessary. |
| 10707 | 3 | 49 | 16 | 49 | 16 | Carbon or CO2-equivalents? | Noted; will be addressed in SOD |
| 14375 | 3 | 49 | 20 | | | Should look at results in Cline (2011) on alternative abatement cost functions and estimates of costs to meet the 450 ppm ceiling | No action; unclear what reference this is |
| 12562 | 3 | 49 | footnote 37 | | | I would move this footnote into the main text and refer to Ch. 4 | No action; disagree with comment |
| 12563 | 3 | 49 | footnote 39 | | | There is no Section 3.6.4, not sure what section the authors have in mind here? Here or elsewhere, one could also add that such an assessment of the impact of behavioural factors on the cost of mitigation, while it may not exist, is an extremely important omission. | Noted; will fix mention of section 3.6.4. We talk about behavioral factors later. |
| 4744 | 3 | 5 | | 7 | | I notice that chapter 4 is dedicated to sustainable development, but I would have prefered that sustainable development is also mentioned in this 3rd chapter | No action. More appropriate in chapter 4 |
| 15358 | 3 | 5 | | 76 | | see separate file: "wdavidmontgomery - general comments on Chapter 3.doc" | No action; do not have file referred to |
| 6305 | 3 | 5 | | 77 | | Generally speaking, this chapter employs a neo-classical economic perspective in framing many of the ethical questions. While this is not in principle inappropriate, much of the discussion is too detailed and could be shortened or more briefly summarized. For instance, shorten page 6, lines 38 to page 7, line 34, as one example, and/or reduce discussion of the various equations on pp. 21 ff ; or delete/shorten sections 3.3.3, 3.4.4, 3.4.4 and/or 3.4.5, considering that enough is said about these issues elsewhere. Generally, the authors should be encouraged to review the long and detailed explanations of specifics such as wellbeing functions. | The framing of the chapter has been made more explicit. But most of the detail remains because it seems necessary. |
| 6953 | 3 | 5 | 10 | 5 | 10 | Insert 'part of' before 'subject matter of ethics'. | Will be addressed in SOD |
| 8574 | 3 | 5 | 12 | 5 | 31 | The order of topics in the executive summary seems unusual. For instance placing the discussion of distributive vs procedural justice after the slightly random list of justice related questions? I think a careful reworking of the entire executive summary to ensure that the ideas are as integrated as possible, and that they flow in some sort of reasonable order would be an immensely valuable use of presumably short writing time. | Noted. It follows the order of the chapter, which is in flux. |
| 2200 | 3 | 5 | 15 | 5 | 17 | Present emissions do not only affect quality of life; they kill future people in substantial numbers. Please see the file 'Nolt comments on IPCC WG III AR5 FOD' submitted separately to comments@ipcc-wg3.de | Noted. |
| 16624 | 3 | 5 | 15 | 5 | 28 | It may be possible to condense these questions into a smaller number. For example, these questions can be summarized by: | Noted. |
| 3906 | 3 | 5 | 18 | 5 | 21 | Who might be competent to determine an internationally just emissions tractory, and what ethical basis would they have for disregarding the views of those who disagree? And what level of force would be ethically acceptable to deploy against dissidents? A further question that should be asked in this paragraph is "how would this allocation be enforced if it did not coincide with the interests of the most powerful nations, politically and militarily"? | Noted. |

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| 5122 | 3 | 5 | 18 | | 21 | Need to allow for uncertainty and flexibility -- unrealistic to claim "once . . . agreed . . . then" as if the plan simple rolls out | No action. Addressed in chapter 2 |
| 2247 | 3 | 5 | 2 | 5 | 4 | Well put. The ethics and economics that have been lavished on a proposition for which there is no scientific evidence is indeed deplorable. This entire Chapter is monumental nonsense. It should be omitted altogether. | No action. Chapter set by IPCC WGIII |
| 17157 | 3 | 5 | 2 | 5 | 4 | First sentence of Executive Summary strange and unclear (only gets clear through more extensive version in "3.1 Introduction"). | Will be addressed in SOD |
| 10784 | 3 | 5 | 2 | 5 | 4 | Exec Sumary. What does this paragraph mean? Rewrite pls | Will be addressed in SOD |
| 3907 | 3 | 5 | 22 | 5 | 22 | Who is the 'we' in this sentence and should the coercive powers of the state be used to enforce 'our' views on those who dissent? | good point -- we should be careful about that (ie, the authors should be careful) |
| 4745 | 3 | 5 | 23 | 5 | 23 | Proposition to replace "compensatory" by "mitigation", it is a more positive way to address this issue | No action. The meaning is monetary or equivalent compensation, not mitigation |
| 6954 | 3 | 5 | 29 | 5 | 31 | This paragraph sits oddly in the text: why introduce the distinction here? | Will be addressed in SOD |
| 3908 | 3 | 5 | 29 | 5 | 31 | Should it be pointed out that procedural and distributive justice would normally be incompatible goals? A lottery might be fairly drawn, but the holder of the winning ticket might already be the richest entrant. | Will be addressed in SOD |
| 8573 | 3 | 5 | 32 | 5 | 39 | As mentioned in my general comments, the crux of the problem I see with this chapter is the lack of integration throughout. At no point is the connection between the legal systems and the previous discussion of justice addressed, leading readers to get the impression that all of these components have been thrown together, and making it more difficult for them to see why legal arguments may be important in this debate. | Noted; will be improved in SOD |
| 8999 | 3 | 5 | 32 | | 39 | The executive summary devotes much space to legal approaches, which would require "wrongful conduct" to assign responsibility. This is at least an error in emphasis. This emphasis is misplaced since climate change is by nature an international, inter-state issue. Except for some specific mechanisms such as the WTO's dispute settlement mechanism, there does not exist stable international law processes or an supra-international authority to enforce laws/agreements. Enforcement at the international level still relies heavily on force not on legal principles; for example the inequitable, arbitrary and unpredictable debt resolution system for developing countries relies on the power of the creditor community centered in developing countries to cut off all forms of financing to debtor countries. The law is an application of ethical principles on which the international system is still being established. It would be advisable for chapter to stay with treating law as an application of ethics and stay decisively in the realm of ethics, particularly in the executive summary. | No action. This comment seems to reflect a misunderstanding of the discussion of law in the chapter. The chapter does not directly address the question of legal liability for climate change. Instead, it looks to law in order to illuminate the issue of when our society treats people as responsible for certain kinds of actions, particularly when the actions are only shown by later information to be harmful. An earlier draft of the section did actually address |
| 10785 | 3 | 5 | 32 | 5 | 35 | responsibility under either common or civil law has other implications beyond "nuisance or negligence". Please rewrite paragraph to include other responsibilities | No action; comment unclear |

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| 3909 | 3 | 5 | 36 | 5 | 39 | After of the order of a thousand years of common law decisions, it would be surprising to find that emitting CO2 by burning coal etc was a common law harm, but no one had noticed up to this point. So should it be clarified that the question the chapter is considering is whether a common law action NOW to declare it to be harm might be successful? A particular problem is the non-point-source-pollution problem - how does the plaintiff prove that the asserted harm was caused by the particular defendant in front of the court? Should not the authors consult and cite a legal authority on this point? Another very important point not made here is that a common law determination does not determine the outcome. What it does instead is determine who is in the right, and therefore what concessions either the plaintiff or the defendant subsequently need to make in order to achieve the other party's consent. The outcome (more or less pollution) is not therefore commonly determined by the common law itself. Since the focus of this chaper is on achieving an outcome (mitigation) this point seems to be potentially relevant. | No action. As with the prior comment, this reflects a misunderstanding of the chapter's discussion of the law. In terms of whether the law would find carbon emissions to be a tort, as I noted above there is on-going litigation about this issue, in the U.S. courts and elsewhere.<br><br>I agree with the commenter that a substantial problem is posed by the multiple sources of carbon emissions. There is actually some very interesting legal precedent and scholarship on the issue of multiple polluters, which I would be glad to discuss. But it really falls outside the scope of the "historical responsibility" topic.<br><br>I take it that the other part of this comment is a restatement of the Coase |
| 5121 | 3 | 5 | 4 | | 4 | add social behaviours | No action; less significant |
| 8575 | 3 | 5 | 40 | 6 | 6 | The jump from the first sentence that accurately recognizes the limited ability of any form of economic representation of values, in particularly non-monetary values related to non-human nature, somewhat befuddlingly turns almost immediately into a detailed discussion of social welfare functions which then morphs directly into a detailed discussion of cost-benefit analysis. Any genuine consideration of the difficulties of assigning value to non-human nature, or any consideration of rights, is completely overlooked. This is deeply problematic and is indicative of the overwhelming tone of the chapter which gives great attention to economic debates, without any real appreciation of rights and non-human values or alternative metrics. If nothing else, the executive summary must bound the limits of economics more clearly. For instance, after the first sentence in this section a clearer recognition of the limitations of most social welfare functions (including the idea that they almost never are able to represent rights, or if they do, in curtailed ways) would be useful so that readers could see the boundaries of eocnomics before they get into the detailed discussions of CBA techniques. | The ethics sections of the chapter evidently did not show the correct emphasis. They have been improved in this respect. Chapter has been reorganized in response to this comment and others. |
| 13562 | 3 | 5 | 40 | | | I don't know that 'anthropogenic' is the right word as cultural and social values also relate to humans (suggest maybe 'monetary' / 'rational'? | No action. Disagree with comment; it is an anthropocentric measure. |
| 4475 | 3 | 5 | 42 | 5 | 45 | It is not enough to say that different social welfare functions express different views about the value of equality. The concept of a social welfare function is itself questionable, because it necessarily involves making interpersonal comparisons of "utility". Second, whatever one's position on the "value of equality," a social welfare function may not capture it because SWFs typically are constructed from consumption, without paying any attention to the processes of production that are required to bring the goods into being. The most basic point here is that redistributive measures aimed at maximizing some kind of SWF may, by distorting the incentives to produce, result in a different set of goods to be "distributed." | This comment is mistaken in view of the content of the chapter. We will be more careful to clear up this issue in the executive summary. |
| 9000 | 3 | 5 | 42 | | | The executive summary highlights the social welfare function. This is an error in emphasis. As the chapter mentions later on, the philosophical-logical objections in the literature to the existence of a social welfare function are compelling. A more even-handed treatment of competing methodologies is advisable. | Will be addressed in SOD |
| 16625 | 3 | 5 | 42 | | | 1. What are the effects of present actions to future generations? | No action; comment unclear |
| 12778 | 3 | 5 | 45 | | | In which sense and is "Equality" the norm? | No action; comment unclear |

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| 8572 | 3 | 5 | 5 | 5 | 11 | I think that one of the areas in which changes could have the most impact would be in the executive summary. This is arguably the most important part of the document as it is most likely to be read by the largest number of people. I have marked these particular lines because I think they illustrate one of the ongong tendencies through the chapter - to take economics as "self-evident" and then cover the importance of ethics in vague terms. If language like "self-evident" is going to be used for economics, and the chapters is also supposed to give full credence to the importance of ethics, then the language used for the two components needs to be more closely equivalent in tone and emphasis. There is no reason why stronger language for the ethics part of this could be used. For instance, "the significance of ethics to climate policy decision-making is equally significant and central: decisions about climate policy will have profound implications on human and non-human well being and involve judgements about human values and interests. This chapter covers the literature focused explictly on the inevitable importance of ethics in climate change decision-making" would be one way of balancing attention. | Very good point. Will try to balance. |
| 18384 | 3 | 5 | 5 | | | One can question whether the importance of economics is always so self-evident eg. In cost-benefit analysis much depends upon assumptions. I would rephrase. | Will rephrase self-evident |
| 10690 | 3 | 5 | 9 | 5 | 9 | The wording "…reasonable people have differing views on this issues…" sounds strange. Please consider rewording or removing this. | No action; this is standard terminology |
| 17072 | 3 | 5 | 14 | 5 | 15 | After “environment protection” add “and social equity”(Artaraz, M,2002) Artaraz, M (2002) Teoria de ñas tres dimensiones de Desarrollo Sostenible. Escuela Universitaria del Pais Vasco-Euskal. htpp//www-acet.org/ecosistema | No action. Comment unclear; page and section reference numbers incorrect |
| 17073 | 3 | 5 | 14 | 5 | 15 | After”environment protection” add “and social equity”(Kirby,Oeefe and Timberlake, 1995;Sachs,1999) Kirby, J. P. O’Keefe, and L. Timberlake, 1995, Sustainable Development: An Introduction”, in J. Kirby, P. O’Keefe, and L. Timberlake, eds., The Earthscan Reader in Sustainable Development, Earthscan: London. Sachs, W., 1999, Planet Dialectics. Explorations in Environment and Development, Zed Books, London, Chapters 9, 10, 11, and 12. | No action. Comment unclear; page and section reference numbers incorrect |
| 17071 | 3 | 5 | 14 | 5 | 15 | After “environment protection” add “and social equity”(Artaraz, M,2002) | No action. Comment unclear; page and section reference numbers incorrect |
| 3905 | 3 | 5 | 12 | 5 | 39 | The executive summary identifies three normative questions, the answers to which need to be tested ethically. However, it does not indicate what the chapter's answers are to these three questions. As a result it cannot and does not examine these answers from an ethical perspective. Should not an executive summary aim to save the busy executive from having to read the full chapter in order to find the answers to the posed questions? | No action. We don’t answer normative questions. We provide the framework for others to use with their own values. |
| 17156 | 3 | 5 | 1 | | | Although there seem to be three topics addressed in this summary (ethical questions of climate policy, explanation of the welfare economic approach to climate policy evaluation, and pointing out the limitations of economic approaches in terms of general political objectives), this does not immediately get clear. Particularly the end of the Summary is confusing, unstructured, without clear message. PROPOSAL: Shift the third part of the Summary to p. 5 l. 40, that is: below introduction of ethical questions. Argue that from most ethical approaches we can derive a variety of societal/ political general targets relevant to climate policy - not only the target of economic efficiency. Then make clear that the role of economics primarily is to analyze efficiency (not so much the other objectives, which are for instance simply taken as "guardrails" in IAMs). But economics can also, in addition, inform questions of equity, etc. | Will be addressed in SOD; we need to underscore the positive nature of economics and the limits of using it for normative purposes. |
| 9529 | 3 | 50 | | | | Please, make graphs smaller. | Noted; will be addressed in SOD |

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| 18601 | 3 | 50 | | | | McKinsey curves are discussed on p 50 … . More or less dismissed since it not built refereed literature – said to be highly controversial. Misses the point more or less. The basic idea was to sort out cost and volumes by using existing knowledge and make assessments bottom-up in a transparent way. Thereby making it easier to identify the areas where policy action was really needed (and also avoid spending most of the resources on areas without any real potential). The approach is simplistic and static but still it gives an overview. One interesting result was that "negative costs" showed to be quite large. In reality since transaction costs, information costs etc was excluded to show what sort of difference policy can make (tose costs are to a big extent policy dependent). | Noted; will be addressed in SOD |
| 14376 | 3 | 50 | 5 | | | Need to identify sources | Noted; figure can refer to chapter 6. |
| 15377 | 3 | 51 | | | | McKinsey's statements about the cost of mitigation should not be included in AR5, their marketing materials are not even gray literature. McKinsey has refused to submit their methodology to peer review, has not shared data or even stated the nature of the analysis done to construct the curve. There are a large number of studies, for example EPRI's excellent review of studies of the cost of the Waxman-Markey bill, that should be discussed in AR-5 if the door is opened this far for studies not published in peer-reviewed books and journals. I applaud the author's intention to use the mention of the McKinsey work to point out its many flaws, but I think that the risk of legitimizing it by mention in AR5 as well as the precedent of including work whose authors have refused to submit to normal peer review outweigh the satisfaction of critiquing it. To make the points about errors in studies claiming negative costs for mitigation measures, I recommend use of some of Mark Jaccard's excellent published work. See: Rose Murphy and Mark Jaccard, "Modeling Efficiency Standards and a Carbon Tax: Simulation for the US using a hybrid approach". The Energy Journal. Vol. 32 (Special Issue 1). October 2011. | Noted; will be addressed in SOD |
| 3275 | 3 | 51 | | 52 | | As explicitly mentioned in the body text, "The McKinsey curves have been highly controversial representations of mitigation potential". Posting Figure 3.6 here can give a false impression to the public.<br><br>Energy Modeling Forum examined this issue and published report (EMF 2011). You can cite Figure 4 of this report because it compare the McKinsey's results with other study results.<br><br>Energy Modeling Forum, Stanford University, 2011. Energy Efficiency and Climate Change Mitigation, EMF Report 25 Volume I. | No action; cannot cite grey literature |
| 10228 | 3 | 51 | 11 | 51 | 11 | Text refers to Figure 3.6 using "US$ per ton of CO2e", but the Figure uses € per [metric] tonne CO2e | Noted; will be addressed in SOD |
| 2210 | 3 | 51 | 11 | 51 | 11 | Currency should be EUR | Noted; will be addressed in SOD |
| 10708 | 3 | 51 | 11 | 51 | 11 | The unit "CO2e" is used here without any explanation of what this means and how it is calculated. Usually this is based on GWP100 and this should be mentioned. | No action; it is defined earlier in the text |
| 10229 | 3 | 51 | 12 | 51 | 12 | Text refers to the 2030 curve though the 2015 version is shown | Noted; will be addressed in SOD |
| 2209 | 3 | 51 | 12 | 51 | 20 | Recommendation to use the 2030 as that one has been used more regularly. In any case, make the year of the exhibit consistent with the year mentioned in text | Noted; will be addressed in SOD |
| 10231 | 3 | 51 | 20 | 51 | 20 | Text referring to 2015 should be changed to 2030 | Noted; will be addressed in SOD |
| 9808 | 3 | 51 | 20 | 51 | 21 | This metrics can also be used on a company level. Projects can be ranked along their reduction resp. the monetary value involved. Thus an economic-ecological optimization can be reached. | Noted; will be addressed in SOD |
| 16357 | 3 | 51 | 3 | 52 | 14 | Box 3.6. The general tone of this box seems rather negative. Are there studies that go into the details of at least some of the numbers presented by McKinsey and finds that these are wrong ? In this case, please provide additional references.<br>Regarding barriers: did McKinsey ignore barriers in its reports ? Could the existence of barriers turn the curve into an useless picture, or could we conclude that it is very important to address barriers, as net costs in themselves are low for a number of technologies? | Noted; will be addressed in SOD |

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| 3057 | 3 | 51 | 3 | 52 | 14 | There is a fundamental flaw in the McKinsey curve and MAC curves generally. The flaw is in treating demand-side measures as if they were part of what is effectively a supply curve. Energy efficiency gains are treated as equivalent to the provision of clean energy supply. More efficient lighting, insulation, and "efficiency improvements other industry" are examples of this. But supply and demand are fundamentally different microeconomic concepts, are separate parts of the market-clearing equilibrium mechanism, carry differing dynamics, and should not be mixed together like this.<br>The quantities showing on the x-axis for demand-side measures are usually derived from perceived engineering efficiency gains. But aside from the implementation shortfall problem already noted in the text, there is the thorny problem of rebound mechanisms. For example, the segment of this "supply" curve showing as "efficiency improvements other industry" is subject to substantial rebound according to various analyses, so the horizontal length of this segment needs to account for this. Unfortunately, this length will depend on numerous determining elements including all factor prices, factor technology gains, and factor substitution elasticities. Without projecting, say, wage rates, the length of this segment will be mis-specified. Similarly, the segment showing as "lighting - switch incandescent to LED (residential)" is mis-specified owing to rebound effects. The Journal of Physics article on solid-state lighting referenced above shows the perils of assuming such a switch would have any effect at all on lighting-associated energy use over the long run [Tsao, J.Y., Saunders, H.D., Creighton, J.R., Coltrin, M.E., Simmons, J.A., 2010. "Solid state lighting: an energy-economics perspective." Journal of Physics D: Applied Physics 43 (35), 354001]. Similar rebound arguments apply to insulation.<br>A further difficulty with such MAC curves is that it is frequently assumed that the supply options showing as "above cost" to the right will come at no cost to economic welfare if implemented, or at least these broad economic costs are rarely, if ever, accounted for in MAC curves. But simply put, one cannot force a more expensive energy supply into the system to displace a less expensive energy supply without reducing economic welfare. Such a strategy may be advantageous socially, environmentally, and even economically if climate change impacts forestalled are large enough, but these narrowly-construed economic welfare losses and costs need to be explicitly accounted for in specifying the associated costs on the y-axis if a true picture is to be given for policy makers. Numerous researchers account for such welfare losses as associated with, say, a carbon tax, but MAC curves rarely seem to. | No action - Good point; however, we can't get into a whole analysis of the McKinsey curve, and do our own analytical review of it, and cannot cite grey literature |
| 10234 | 3 | 51 | 8 | 51 | 8 | The text uses the phrase "highly controversial" with regard to the McKinsey cost curve analysis. We acknowledge there is debate around our approach, and indeed have engaged in discussion with numerous partners in academia, NGOs and international institutions on how to continue to improve it. The cost curve has been well received and proven a useful tool (one of many tools) for various constituencies. We would also welcome further debate with you and benefit from your expertise | Noted; will be addressed in SOD |
| 17275 | 3 | 51 | 8 | 51 | 10 | I agree with the fact that the weak point of the McKinsey cost curve is the lack of transparency, but if it is stated that it is controversial, there should be a reference to situations, reports, conferences, etc. where that is discussed. Otherwise, it should be just noted that lack of transparency is a weak point. | Noted; will be addressed in SOD |
| 17276 | 3 | 51 | 8 | 51 | 10 | The negative cost part is indeed heavily debated in the literature. Here lots of references can be provided (including earlier IPCC reports!). | No action; already addressed by other comments |
| 2211 | 3 | 51 | 8 | 52 | 2 | Avoid duplication of statements around "highly controversial" and respective reasons. Also not obvious why the McKinsey curve is regarded as "highly" controversial, compared to other work in the field, e.g. where customized CGE models are used to create cost curves. Two comments in the next lines of this xls | No action; already addressed by other comments |

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| 2212 | 3 | 51 | 8 | 52 | 2 | 1) On the comment of "metholodogy is proprietary the following should be noted: a) The general methodology is described on several pages in the reports, e.g. "McKinsey & Company, Pathways to a low-carbon economy - Version 2 of the Global Greenhouse Abatement Cost Curve, January 2009", Pages 145-149, b) The same report has a comprehensive appendix on input assumptions, pages 160-189, c) To enable transparency of methdology, assumptions and results for academics and other groups, McKinsey has put all calculation logic for each lever and all input assumptions by lever, region, time online in the webservice "Climate Desk" (solutions.mckinsey.com/climatedesk). Academic institutions have free access to the webservice- it requires a short registration registration process. McKinsey has contacted all IPCC WGIII directly to make them aware of this free service, some are using it. | Noted; will be addressed in SOD |
| 2213 | 3 | 51 | 8 | 52 | 2 | 2) On the comment of "not emerged from the refereed literature". Let me state what McKinsey did. An overall academic review panel has been formed for the entire report referenced above (which has been serving as the "blueprint" for the national studies) incl. several IPCC WGIII members, see page 139. This review panel has interacted intensively with the McKinsey team over the entire period of the study. For each sector, expert groups have been formed from industry, associations, and academics (incl. IPCC WGIII members) which have been developing and reviewing the methodology and assumptions for each lever, time and region (see page 140). | Noted; will be addressed in SOD |
| 15447 | 3 | 52 | | 54 | | This an excellent summary of metrics, but the policy-relevant points could be brought out more clearly, to respond to the focus of 4/CMP.7: "the GWP was not designed with a particular policy goal in mind and, depending on the specific policy goals, alternative metrics may be preferable." Some reference to one or more specific policy goals and their relationship to metrics therefore would be useful. It would be useful to have a couple of paragraphs on the question of the treatment of short lifetime gases, since this is a specific aspect that is to be covered in the 2015 SBSTA review . (4/CMP.7 " notes the limitations in the use of GWP based on the 100-year time horizon in evaluating the contribution to climate change of emissions of greenhouse gases with short lifetimes") There is clearly a policy discussion to be had on the broader issue of short versus long lifetime gases . There has been some discussion in the literature on short lived climate forcings - of which in the Kyoto basket, methane is the relevant one. The obvious specific policy goal here is limitation of global warming to a temperature target such as 2 degrees above pre-industrial levels or to a concentration target. | Noted; will be addressed in SOD |
| 10232 | 3 | 52 | 1 | 52 | 1 | The text uses the phrase "highly controversial" with regard to the McKinsey cost curve analysis. We acknowledge there is debate around our approach, and indeed have engaged in discussion with numerous partners in academia, NGOs and international institutions on how to continue to improve it. The cost curve has been well received and proven a useful tool (one of many tools) for various constituencies. We would also welcome further debate with you and benefit from your expertise. | Noted; will be addressed in SOD |
| 11730 | 3 | 52 | 1 | 52 | 2 | Delete.Same as the L8-9 at P51. | Noted; will be addressed in SOD |
| 9530 | 3 | 52 | 1 | 52 | 2 | Please, delete here due to duplication of line 8, page 51. | No action; already addressed by |
| 8254 | 3 | 52 | 1 | 52 | 14 | Another important drawback of MAC curves not mentionned in the paragraph is that they often include several abatement opportunities that, once adopted, make others ineffective. For instance, using the McKinsey MAC curve of Figure 3.6, if nuclear technology as a mean of producing electricity is adopted, the solar technology won't present an opportunity for reducing GHG emissions anymore. These interactions between abatement opportunities are often not specified in MAC curves. | Noted; will be addressed in SOD |
| 16244 | 3 | 52 | 1 | 52 | 14 | An additional, not mentioned, limitation of the McKinsey curves is the lack of addressing temporal aspects explicitly (or even stating the temporal assumptions explicitly), e.g, abatement costs for buildings with a very high energy consumption might be much lower than for energy-efficient buildings, however, this potential is declining over time once buildings are retrofited. | Noted; will be addressed in SOD |

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| 7381 | 3 | 52 | 15 | 55 | 3 | This section is a nice text book introduction on metrics, but it is not a comprehensive assessment of the metrics literature nor does it derive policy-relevant conclusions. It misses key aspects of the recent metrics literature, such as the potential for 2-basket approaches (Smith et al 2012), the use of metrics for Lifecycle Assessments (e.g. Peters et al 2011), the implications of metrics for the distribution of mitigation costs and potentials across regions (Reisinger et al 2012, accepted for Climatic Change). Also the links between metrics (not just Tol et al, also Azar and Johansson 2012, Peters et al 2012, Boucher 2012), and the key distinction between end-point and integrated metrics, and what this implies for the underlying policy goals and values. The draft is an introduction to metrics but not a policy-relevant assessment - all the assessment of whether and how important metrics actually are in a policy context, and who is most affected by different metrics choices, is currently contained in 5 lines on P54 L34-39. That's insufficient. It requires a fundamental re-structuring to shift from presenting the theory to assessing the implications. | Noted; will be addressed in SOD |
| 7382 | 3 | 52 | 15 | 55 | 3 | I'm looking for take-home policy messages from this section (how much do alternative choices matter, and to whom, and under what conditions), and find very few in the current draft. The authors should work to ensure there are real policy-relevant conclusions in this section, building on the literature (which is much wider than what the authors have reflected in their current draft). My suggestions for policy-relevant conclucions would be: in a first-best policy world, metrics are economically unimportant from a global perspective, but could be far more important on a regional and sectoral perspective. On the latter we have very little literature. A change in metrics would result in a large shift in the perceived contributions of different sectors to climate change, and hence their perceived need to participate and timing of their participation. It thus also interacts with R, D, D & D cycles. The latter has not been explored at all. Also the political economy of metrics, and of changing metrics, may be as important in considering metrics as the choice of metrics itself. Also consider implications of metrics changes on CDM projects and their viability. | Noted; will be addressed in SOD |
| 7383 | 3 | 52 | 15 | 55 | 3 | To make policy-implications of metrics more tangible, delete the table and simply reference Tanaka et al 2010 (and presumably Deuter et al 2012). Instead, spell out actual exchange rates under different metrics, and present a pie chart of the contribution of different sectors to current global emissions using different metrics to illustrate the importance of metrics on how different sectors and gases are perceived. Check whether chapter 5 does this and make sure it is done either there or here. The apparent major differences for different sectors under different metric choices should then be ontrasted with the relative unimportance of metrics in a first-best policy world from an economic perspective. However, the section should emphasise that most if not all economic evaluations of metrics have been based on first-best policy worlds, but that their relevance in second-best worlds, and their interaction with politics and behavioural change, has not been explored in detail at all (although there will be more literature coming out shortly, and the structure of the chapter should cater for that). | Noted; will be addressed in SOD |
| 4322 | 3 | 52 | 17 | 52 | 17 | "unit for unit" in this context is the expression not to use! You should state explicitly the unit you're talking about (presumably RF per unit concentration ?). | Noted; will be addressed in SOD |
| 10717 | 3 | 52 | 17 | 52 | 18 | The sentence "Unit for unit, methane is…" needs rewording. What is the unit? Per molecule in the atmosphere the ratio is roughly 25, but if you relate this to emissions the picture is more complicated due to the differences in time scales of removal. Then the time horizon issue is introudced, and as you discuss later, should the effects be measured by RF, integrated RF, dT etc? | Noted; will be addressed in SOD |
| 4323 | 3 | 52 | 18 | 52 | 19 | The issue of climate metrics has been and should be extended to short-lived species which are not greenhouse gases (eg black carbon). So the question here should be wider. | Noted; will be addressed in SOD |
| 10718 | 3 | 52 | 19 | 52 | 19 | Is this needed "(of which there are many)"? If so, make that clear earlier in the chapter. | Noted; will be addressed in SOD |
| 4324 | 3 | 52 | 22 | 52 | 23 | You provide two examples here, but are these the best examples? There is only 1 or 2 multi-gas emission trading scheme to my knowledge (CDM and New Zealand). One also needs an exchange rate in the case of a GHG tax. Moreover there is a question whether the same exchange rate is to be used for all these different usages (a question I do not really have the answer for). | Noted; will be addressed in SOD |

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| 4325 | 3 | 52 | 29 | 52 | 29 | C- D or C+D. If damages are counted as a positive cost, then shouldn't it be C+D that you're trying to minimise? | Noted; will be addressed in SOD |
| 12788 | 3 | 52 | 29 | 52 | 29 | Equation 3.7 should be adjusted to equation 3.8, i.e. the variables should be the same. | Noted; will be addressed in SOD |
| 2214 | 3 | 52 | 3 | 52 | 14 | On the notion of negative cost opportunities. It would be helpful that IPCC would include a bit more "flavor" from the elaborations from McKinsey on the matter (pages 39 to 41 in the McKinsey report). 1) the costs shown in the cost curve are pure technical project costs and exclude transaction and program costs (those were estimated with a wide range of 1-5 EUR/tCO2e). Also, the curve takes a societal perspective, a decision maker curve will experience changes in the costs (and to a lesser extent potentials). Also reasons for the implementation of efficiency solutions are mentioned. (Note: McKinsey likely publishes a v3.0 update in fall 2012, which has addressed several of those points with additional research.) | Noted; will be addressed in SOD |
| 10719 | 3 | 52 | 31 | 52 | 31 | Add "change" after "climate". | No action; do not feel this is essential |
| 10839 | 3 | 52 | 32 | 52 | 33 | "defines the appropriate exchange rate". This is an assumption, right? The assumption being Equation 3.7 is the only correct way to specify the problem. If that is the case, then okay to use "define", however if not the case, then I think the language needs to be weakened by replacing "define" with something like "is one way to determine" | Noted; will be addressed in SOD |
| 4326 | 3 | 52 | 34 | 52 | 36 | This is a very important point. A lot of the information that is needed is information on the future (climate change, emission pathway, etc). Foresight is needed to the "benevolent planner" to find the optimal solution, but foresight is also needed to the stakeholders on how the cost of carbon and the exchange rate will change in the future. The point that the optimum requires the exchange rate to evolve in time should be made more clearly. | Noted; will be addressed in SOD |
| 10849 | 3 | 52 | 34 | | | "The problem with 3.7 is that a great deal of information … is needed". Like what? Discount rate is an assumption. C as a function of emissions can be determined via a variety of means, such as SCMs coupled to economic models, and D could be estimated in a myriad of defendable ways. I therefore do not see what is stopping anyone from using it? In any problem we required a " great deal of information, some of which is not readily available, ", but that does not stop us making some simplifications and solving the problem the best we can. What is stopping us from doing this here? Because it is "difficult" do we just drop this approach and take an alternative? | Noted; will be addressed in SOD |
| 10720 | 3 | 52 | 36 | 52 | 36 | The term "second best metrics" is unclear. As I see it, the use of metrics is, in principle, second best, since in the case of optimal trajectory metrics for comparing emissions and deciding which gases to abate would ideally not be needed. So it is rather a second best _approach_ compared to the optimal trajectory. So the thinking behind the application of eq 3.7 and the exchanges rates or weights obtained should be made clear. If the point is to use these weights (i.e. distribute to the emitters) to obtain an approximation to the optimal trajectories then this should be made clear. | Noted; will be addressed in SOD |
| 10841 | 3 | 52 | 36 | 52 | 36 | "second best". What is the rationale that 3.7 is the first best and the others are simply poor alternatives? Clearly, the definition of which is best is a value judgement, so I think you need to state what values you use to define the "first best", or approach this from a different angle. | Noted; will be addressed in SOD |
| 4502 | 3 | 52 | 5 | 52 | 5 | Characterizing the negative net cost emissions reductions as a "free lunch" is unnecessarily pejorative, because everyone is familiar with the aphorism that there is no such thing as a free lunch. It should be pointed out that while such negative net cost possibilities may exist, there is no way that the goal of limiting temperature rise to 2 degrees C or less can be achieved without incurring substantial costs. | No action; we believe this is clear enough. |

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| 10233 | 3 | 52 | 6 | 52 | 14 | The text mentions that McKinsey's analysis of negative cost abatement opportunity "may be flawed" and that it ignores the distribution of costs and benefits that accrue to parties involved in implementing such abatement measures. We would like to clarify that the curves show technical potential and we acknowledge that regulatory and financial support are needed to actually capture this potential. We acknowledge the barriers 'in the field' to the implementation of technical abatement levers, including market imperfections such as agency issues (the accrual of benefits to parties who do not bear the costs, which you mention), lack of information for parties who would benefit and insufficient financing for upfront investment and also examine some of the ways in which these barriers can be overcome to realise the abatement potential identified (through for instance new policies, regulations, information campaigns and financing mechanisms). In our US Energy efficiency report (with EPA/DOE), for example, we explicitly dive into the negative cost portion and lay out why the potential is there, what the barriers are, and scenarios about how much of that potential might be realistically captured. For more detail please also see in particular pages 41, 56 and 110 in the publication "Pathways to a low carbon economy" at the following link: http://www.mckinsey.com/client_service/sustainability/latest_thinking/pathways_to_a_low_carbon_economy We would very much welcome a call with you to discuss this further | Noted; will be addressed in SOD |
| 4321 | 3 | 52 | | 55 | | I found the "emissions metrics" section to be relatively well written. It certainly reflects the state of affairs in the literature. However I would have expected the authors to i) discuss more the implications of using different metrics and ii) take sides a bit more (what do you think as informed Lead Authors is the right metric/approach to use?). | Noted; will be addressed in SOD |
| 4327 | 3 | 52 | | 55 | | The flow of the section could be improved. First the authors discuss metrics as an "exchange rate" (page 52, line 20ff), then the concepts of absolute metric and relative metric (ie the exchange rate previously discussed) are introduced (page 53, top), and then the discussion returns to the issue of exchange rate (or relative metric) on page 53, line 27 without really saying it. | Noted; will be addressed in SOD |
| 10716 | 3 | 52 | | | | It would be good with stronger links to physical metrics. (Some work has been done on this; e.g. Boucher 2012 (ESD) and Fuglestvedt et al. 2003, Climatic Change (pages 299-301) | Noted; will be addressed in SOD |
| 10840 | 3 | 52 | | 53 | | I do not understand the use of equation 3.7 AND 3.8. Are they analgous or alternatives? One includes costs, one doesnt? You confidently state (or imply) that 3.7 is the way to do things, and then come back to Equation 3.8. Logically, this would imply that they are analogous in which case you need only one. On the other hand, if they are different, when do I use one and when do I use the other? A few words on the connections betwee these equations and how one leads to the other would be useful. | Noted; will be addressed in SOD |
| 10855 | 3 | 52 | | 54 | | Overall, I feel this is an important section. Metrics have generally been the domain of WGI (though this is an unusual choice) and WGIII generally has little knowledge of metrics, despite the fact that the use of GWP100 is prevalent (such as in Life Cycle Assessment) and many economic models implicitly have metrics. This section, I believe, is extremely important to raise the importance of metrics in the WGIII community. At the moment, this section does not say much more than WGI and I see this as a missed opportunity. I think it is important to state how metrics are used in WGIII (links to many chapters, such as Life Cycle Assessment in many chapters, economic models, emission trading, etc, etc). Thus, it is imperative that WGIII has a deep and meaningful understanding of metrics and their issues. I think it is okay to show the different assumptions behind metrics, but at the moment the discussion is scattered, there does not seems to be a clear path linking 3.7, 3.8, GDP, CGP, cost effectiveness, etc. I think a systematic and more structured approach is needed (at the moment it seems to jump backwards and forwards). | Noted; will be addressed in SOD |

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| 10709 | 3 | 52 | 15 | | | I support that you approach the metric issue from a general perspective and then present some specific metrics (GWP, GTP and GDP) within this framework. But it would be good with some more “bridges” to or common ground with WGI. Thus, WGIII could give some more attention to the physical metrics and assess these from the point of view of economics. More focus on application of metrics in policy analysis and design of policies is, in my view, needed. I think direct references to the metric sections in chapter 8 of WGI would be useful. I also suggest that the authors read the section on metrics in WGI - and contact relevant LAs - to ensure consistency accross working groups in AR5. | Noted; will be addressed in SOD |
| 10710 | 3 | 52 | 15 | | | The discussion on metrics could go deeper in to the material published in the literature and do more critical assessment (and not only review). Some attention to which applications particular metrics are meant to serve would be useful. I also miss more discussion and assessment of how the various metrics behave and how they could function in various policy contexts. | Noted; space constraints are a real problem for us. |
| 10711 | 3 | 52 | 15 | | | To me it is not clear how the authors assess the state of the science in this field and the adequacy of the various metrics. Since metrics (i.e. GWP) plays a crucial role in calculations of contributions of various emissions, sectors/activities, nations, regions etc to climate change - as well as in design of policy regimes - it is of great importance to have this field properly assessed by other disciplines than natural science alone. There are many implicit value based choices in the design and application of metrics – and many users are not aware of this. Thus, I think, these aspects of metrics need to be made clear and discussed in an assessment like this. | No action; it's unclear how to make this point operational. The comment wants to make the assessment more clear, but the comment is not clear about how to do that. |
| 10712 | 3 | 52 | 15 | | | Furthermore, I think you could discuss more the use of fixed time horizons (which is common practice for GWP) vs use of a varying time horizon. Since GWP is the most common metric I think it would be good to give some more attention to this, and also show the formula, with a more explicit discussion of the weighting of effects over time. The adequacy of GWP in the context of a 2 deg C target should be assessed. | Noted; will be addressed in SOD |
| 10713 | 3 | 52 | 15 | | | The metric section would also benefit from more quantifications and examples; e.g. effects of using different metrics, different choices of discount rate or time horizon, different background conditions, damage functions etc. A table with some metric values would also be useful. This could be done for CH4, N2O, CF4 and some short-lived HFCs. | Noted; will be addressed in SOD |
| 11323 | 3 | 52 | 15 | 55 | 3 | To some extent this section overlaps a bit too much with the metric section in the WG1 report and it overlaps especially with the sub-section about new and refined metrics in the WG1 report. Not that I am against a metric discussion in WG3 as such, rather I think it could be very useful, but as the section is written now the overlaps are notable. Also, the beginning of the section is focused on placing metrics in a relative abstract economic framework. In principle I have no problem with that, it would be fine for a research paper or a textbook in climate economics, but I cannot see the point with doing it here, especially since the aim with chapter 3 is " intended as a resource for policymakers and researchers who are trying to solve normative questions. In that sense, the chapter is policy-relevant but not policy-prescriptive.". The introduction of section 3.10.3 it simply too abstract as it is now. Also, I think the section would benefit from a discussion on how one would can approach the mutligas problem in a policy context, i.e., a gas by gas approach, several different basket where gases with similar lifetimes are grouped in the same basket or one basket with the most important greenhouse gases (such as the approach is in the Kyoto protocol). As I presume the author(s) of the section is aware of there have been some recent papers written about this. Finallly, I think table 3-3 is an nice overview, but it needs some editing, see below for details about this. | Noted; will be addressed in SOD |
| 6888 | 3 | 52 | 15 | | | Suggest to have a look at and refer here to the WGI AR5 assessment of the physical science basis of emission metrics in Chapter 8, WGI AR5. | Noted; will be addressed in SOD |
| 11324 | 3 | 52 | 27 | 52 | 35 | Suggest deletion of this part plus equation 3.7. This is too theoretical and does not add much to the rest of section 3.10.3 | Noted; will be addressed in SOD |
| 12249 | 3 | 52 | 16 | | | This section is on a completely different complexity level than the previos sections. I would recommend to skip the mathemathics, and stick to qualitative discussions as done in all previos sections. | Noted; will be addressed in SOD |

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| 10845 | 3 | 53 | 17 | 53 | 20 | You say that the results will be different, but it really matters if they are slightly different or significantly different (you write "important difference"). Some references on this would be good. IPCC994 Report on Radiative Forcing, page 219, discusses this. They refer to a difference of 15% being small. Is 15% an "important difference"? | Noted; will be addressed in SOD |
| 10842 | 3 | 53 | 20 | 53 | 23 | I do not think there is anything necessarily wrong with this section, but I think it is fair to say that the metric literature would not phrase it this way. The reason for a fixed time horizon had absolutely nothing to do with discounting, but everything to do with the long-term behaviour of co2 making it a divergent problem. See, for example, your ref to Lashof and Ahuja (1990) and other literature around that time, including IPCC 1990. For more background, the GWP was based on the ODP which integrated to infinity and this is how the literature develops the concept of the GWP. See introduction and citations here, for example, Peters, G.P., Aamaas, B., Berntsen, T., Fuglestvedt, J.S., 2011. The integrated global temperature change potential (iGTP) and relationships between emission metrics. Environmental Research Letters 6, 044021. | No action; not clear what are the operational implications. |
| 10721 | 3 | 53 | 22 | 53 | 23 | The different ways of weighting effects over time needs more dicussion. And it is important to make it clearer how this is done in GWP which is used in almost all multi-gas assessments and comparisons of impacts of emissions and emission reductions. | No action; we discuss discounting earlier, and little space here. |
| 11358 | 3 | 53 | 24 | 53 | 26 | Choices of impact parameters etc. are discussed in Tanaka et al. (2010, Carbon Management, doi:10.4155/cmt.10.28), which can be introduced in this paragraph. | Noted; will consider this reference |
| 10722 | 3 | 53 | 25 | 53 | 26 | As this is written now it does not add much to the assessment of metrics. So I suggest telling more about what the Deuber et al study finds. | No action; space is limited. The point of the citation is for readers to go there for |
| 10723 | 3 | 53 | 27 | 53 | 36 | It would be good to explain more why GDP has a uniqe postion among the metrics. Since this chapter should also be (I assume) written for non-economists, it would be good with some more introduction to this. In addition, an assessment of how such a metric would function in various policy contexts is needed. | Noted; will be addressed in SOD |
| 10850 | 3 | 53 | 27 | | | "From an economic point of view". I am not sure you have the answer, but at least worth considering, what would one do from a "non-economic point of view"? | No action; that's the rest of the subsection, e.g. "physical metrics." |
| 10851 | 3 | 53 | 27 | | | "the first best approach", which was earlier stated to be Eqn 3.7? Thus, 3.7 is the GDP by deduction? If so state. If not, please explain why we have to "first best" approaches. | Noted; will be addressed in SOD |
| 12252 | 3 | 53 | 29 | 53 | 29 | If it is possible, it would be nice to use a different abbreviation for the "Global Damage Function". It is standard to use GDP for Gross Domestic Product, and it is used as such other places in this chapter. Even though it is ulikely that the two would be mixed up, it is better that GDP only means one thing throughout the chapter | Noted; will be addressed in SOD |
| 10843 | 3 | 53 | 31 | | | It is a problem, I think, that GDP also means Gross Domestic Product. This section is so short, just write Global Damage Potential in full and drop the GDP | No action; already addressed by comment 12252 |
| 10844 | 3 | 53 | 37 | | | A couple of words on why it is difficult to operationalise would be beneficial | Noted; will be addressed in SOD |
| 4328 | 3 | 53 | 39 | 53 | 39 | Unless I'm mistaken you mean "cost-benefit" here. | Noted; this is incorrect, but the reference to cost-effectiveness can be better |
| 10852 | 3 | 53 | 39 | | | Why is "cost effectiveness" a second best economic approach? Surely this is an assumption? Perhaps society would rather doing something in the cheapest way possible? I am not an economist, but the choice between GDP and cost-effectiveness seems more like an assumption than some undisputed law of nature (economics)? It would be good to expand on the reason for the choices here. This also gets mixed in with what is "politically feasible", and thus the economically preferably may not be politically feasible. | Noted; will be addressed in SOD |
| 12250 | 3 | 53 | 4 | 53 | 6 | The variables I and r are introduced, but they are never used again in this chapter. This leads to confusion, as one expects to find the variables just introduced in the subsequent equation. If this sentence is ment to be a more general description, it is not necessary to give the "pertubation" and the "pathway" variable names. It is also hard to find any link between this sentence and the equation it leads up to. | Noted; will be addressed in SOD |
| 10853 | 3 | 53 | 40 | | | But damges could be included physically (number of deaths from climate change) or in money (value of statistical life, for example) or other measures of damages as used in the GDP. Thus, I do not see that this class of metrics cant consider damages? | Noted; will be addressed in SOD |

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| 10724 | 3 | 53 | 43 | 53 | 44 | Is it correct to say that scenario uncertainty is avoided if you use a constant background? This is also a scenario (although a very unlikely one). | Noted; will be addressed in SOD |
| 11359 | 3 | 53 | 43 | 53 | 44 | An exception is the TEMP (Tanaka et al., 2009, Climatic Change, 10.1007/s10584-009-9566-6), which is defined by using actual emission trajectories. The idea of the TEMP is to equate the temperature consequences on realistic emission trajectories (Shine, 2009, Climatic Change, 10.1007/s10584-009-9647-6). Changing background concentration is also discussed in literature dealing with physical metrics (e.g. Gillett and Matthews, 2010, Environmental Research Letters, http://stacks.iop.org/1748-9326/5/i=3/a=034011; Reisinger et al., 2011, Environmental Research Letters, http://stacks.iop.org/1748-9326/6/i=2/a=024020). | Noted; will consider this reference |
| 10854 | 3 | 53 | 44 | 53 | 46 | A constant background is a choice, which may have valid reasons? A metric need not represent reality, but may be a defined set of rules (a game) for making comparisons. In any case, it is quite feasible to use a varying background and examples of this are in many places in the literature. Thus, if this is a "weakness" then it can be easily fixed. | Noted; will be addressed in SOD |
| 12251 | 3 | 53 | 9 | 53 | 9 | Probably just a fomatting error: Equation 3.8 is repeated twice on this line. | Noted; will be addressed in SOD |
| 11325 | 3 | 53 | 21 | 53 | 21 | Please make clear that the "standard approach" IN ECONOMCIS "would be to use exponential discounting". Exponential discounting may not be the standard approach outside economics. | Noted; will be addressed in SOD |
| 15449 | 3 | 54 | 1 | 54 | 2 | The fact that policy makers have used these metrics for purposes beyond what scientists envisaged should be brought out (through reference to recent material) and this will be helpful for the 2015 metrics review to increase awareness among the policy community of policy-metrics relationships that could be examined as part of this review. | Noted; will be addressed in SOD |
| 7384 | 3 | 54 | 1 | 54 | 2 | This could be strengthened - 100-year SAR GWPs are used near universally wherever different GHGs need to be compared or aggregated. They are also used for reporting under the UNFCCC, life cycle analysis, industry reporting tools, etc etc. Would be helpful to add and make clear that the IPCC never recommended using 100-year GWPs but presented them initially (Shine et al, 1990) to highlight the difficulties of aggregating gases via a single metric. | Noted; will be addressed in SOD |
| 10732 | 3 | 54 | 16 | 54 | 17 | "…excludes short- and medium time scales (as in the case of GTP)" needs rewording. The GTP may very well capture the effects on very short, short and medium time scales. That depends on which time horizon that is chosen. | Noted; will be addressed in SOD |
| 10846 | 3 | 54 | 16 | 54 | 17 | The temporal weighting function in the GTP. What is it? You mean the temperature IRF, then word it as though it is a physical weighting and not an economic discounting. | Noted; will be addressed in SOD |
| 10733 | 3 | 54 | 26 | 54 | 28 | It would be good if you could discuss the differences (pros and cons) of analytical and transparent metrics and model based metrics; see 8.7.1.5 and 8.7.1.6 in WGI chapter 8. | Noted; will be addressed in SOD |
| 15448 | 3 | 54 | 29 | 54 | 39 | These paras appear to assume a watertight, prefect, complete scenario. The discussion needs also to cover less than perfect scenarios- which is the policy-relevant world. Scenarios with less than 100 percent coverage of sectors and of gase are more likely. | Noted; will be addressed in SOD |
| 10967 | 3 | 54 | 29 | 54 | 33 | Metrics for comparing GHGs are very significant in the policy process and are still not being treated comprehensively in the IPCC assessments, despite the cross-WG meetings that have been held. But a more specific comment for this paragraph is that it should consider the recent evolution of ways for comparing CO2 and methane in the context of RCPs or stabilisation scenarios. For example, I recently reviewed and supported the paper: Lauder, A., I.G. Enting, J.O. Carter, N. Clisby, A.L. Cowie, B.K. Henry, and M.R. Raupach, "Offsetting methane emissions --- an alternative to emission equivalence metrics", International Journal of Greenhouse Gas Control, (submitted), 2012. This shows a credible way in which one-off sequestration of CO2 can offset continual emissions of methane, and is an extension of the treatment of the forcing equivalence index (FEI) in the context of stabilisation done in: Manning, M., and A. Reisinger, Broader perspectives for comparing different greenhouse gases Philosophical Transactions of the Royal Society A, 369, 1891-1905, 2011. In both cases variations in emissions that maintain a stabilisation scenario were being considered rather than the more academic approach of comparing pulse emissions of gases. | Noted; will be addressed in SOD |

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| 7385 | 3 | 54 | 29 | 54 | 39 | The draft is silent on a range of other things we also know about metrics in a first-best policy world (cite Reisinger et al 2012, amongst others): global cost differences are small; but effect on regional costs and production can be more significant, especially if metrics are considered in the context of global trade; metrics also affect the timing of cost-effective peak CO2 emissions to reach a defined long-term goal (i.e. higher metric value for CH4 allows a small delay in peak of CO2 emissions); metrics have a small but distinct effect on the amount of overshoot to meet a defined long-term goal in a cost-minimisation framework. These are all important and highly policy-relevant conclusions that are in the literature and need to be brought out in this section if it is to be a comprehensive policy-relevant assessment. Note all these are for a first best policy world. | No action; this section is not to be a comprehensive policy-relevant assessment. |
| 11360 | 3 | 54 | 3 | 54 | 3 | It is good to have an acronym comparable with other metrics, but the "price ratio", the original name proposed by Manne and Richels (2001, Nature, doi:10.1038/35070541), can be mentioned here. | Noted; will be addressed in SOD |
| 10734 | 3 | 54 | 31 | 54 | 31 | "shorter than that of CO2" needs rewording since CO2 does not have one single lifetime | Noted; will be addressed in SOD |
| 4333 | 3 | 54 | 32 | 54 | 32 | Please cite the final revised paper rather than the Discussions paper: Boucher, O., Comparison of physically- and economically-based CO2-equivalences for methane, Earth System Dynamics, 3, 49-61, 2012. | Noted; will be addressed in SOD |
| 10735 | 3 | 54 | 32 | 54 | 33 | Is it really as simple as this? | Noted; will be addressed in SOD |
| 7386 | 3 | 54 | 32 | 54 | 33 | The way that Reisinger et al 2012 is cited here is potentially misleading. That study explored higher values for CH4 in the context of a time-dependent GTP; hence the emphasis on CH4 gradually increases over time and becomes much higher only towards the end of the 21st century. Reisinger et al did not consider high metric values up-front as the current sentence could be seen to imply. | Noted; will be addressed in SOD |
| 4330 | 3 | 54 | 33 | 54 | 33 | and therefore on some countries. | Noted; will be addressed in SOD |
| 10968 | 3 | 54 | 34 | 54 | 39 | Table 3.3 is a very useful summary but another review paper on metrics is about to come out in Climatic Change and it has a very similar table covering some additional forms of comparison. See Tanaka, K., D.J.A. Johansson, B.C. O'Neill, and J.S. Fuglestvedt, Emission metrics under the 2°C climate stabilization, Climatic Change Letters, (submitted), 2012. | Noted; will be addressed in SOD |
| 7387 | 3 | 54 | 34 | 54 | 37 | This is the only really policy-relevant conclusion in the current draft, i.e. it tries to answer the question "so how much do different metrics actually matter?". Note it should not be "less than 5%" but "about 5%" once all relevant literature is taken into account, see Reisinger et al 2012 and Johansson 2006, 2012.) Please provide a confidence qualifier for this conclusion (given the number and consistency of studies, and consistency with theoretical expectations, I'd suggest "high confidence", but at a minimum "high agreement, robust evidence"). Also cite van Vuuren et al 2006, as the multi-model intercomparison further justifies the suggested high confidence rating. | Noted; will be addressed in SOD |
| 10736 | 3 | 54 | 35 | 54 | 35 | There is a recent paper by Reisinger et al (Climatic Change) that may be referred to here. | Noted; will be addressed in SOD |
| 4331 | 3 | 54 | 37 | 54 | 37 | 5% in the global mean. Is this small or large in relation to other imperfections of a real world climate mitigation policy? What about differences in costs at the country level? | Noted; will be addressed in SOD |
| 7388 | 3 | 54 | 38 | 54 | 39 | That's hardly the point; I think we have enough literature and detailed model studies to be highly confident that in a first-best policy world, metrics have little effect on global economic costs, and I doubt we need more studies to further assure us of that point. What has been far less explored and does deserve and require more study is (a) the regional and sectoral (rather than global) implications of metrics, and (b) to consider those implications within second-best policy scenarios, and (c) to link economic model studies with the political economy of mitigation, i.e. how metrics change the perceived importance of different sectors and their contribution to collective mitigation efforts. | Noted; will be addressed in SOD |
| 10730 | 3 | 54 | 7 | 54 | 7 | The Tol et 2008 paper has been revised and resubmitted. | Noted; will be addressed in SOD |
| 4329 | 3 | 54 | 8 | 54 | 10 | You should make it clear that you're *not* talking about the GTP with a fixed time horizon here, but a GTP with a decreasing time horizon as one approaches a target year (in comparison with a time-evoleving GCP along an optimum trajectory). Implicit here is the fact the exchange rate changes in time, which is something stressing as probably not obvious to most readers. | Noted; will be addressed in SOD |

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| 10731 | 3 | 54 | 8 | 54 | 8 | The similarity between GCP and GTP applies for a slightly different version of GTP and not the original standard version using chosen time horizons (e.g. Shine et al 2005 (Climatic Change)). In Shine et al. 2007, the GTP is given with a time horizon that is determined by the proximity to the target year. It is this version of GTP you refer to here, which should be made clear. The wording "...temperature change induced at a given point in time in the future..." needs to be changed. | Noted; will be addressed in SOD |
| 11326 | 3 | 54 | 21 | 54 | 39 | I think this part of the metrics section is relevant and do add to the discussion in the WG1 report and could be expanded in the WG3 section about metrics. | No action; not clear how to operationalize this comment. |
| 8395 | 3 | 54 | 37 | 54 | 37 | While it is accurate to say < 5%, many of these results are far less than 5%. An altered wording that conveys this would be useful. | Noted; will be addressed in SOD |
| 8396 | 3 | 54 | 37 | 54 | 39 | We have just published such a study which demonstrates that the impacts are quite small. In part this is due to inclusion in the IAM of indirect emission reductions that occur in methane due to the comprehensive climate policy. Reference: Smith SJ, JF Karas, JA Edmonds, J Eom, and A. Mizrahi (2012) Sensitivity of Multi-gas Climate Policy to Emission Metrics Climatic Change (2012, published on-line). DOI 10.1007/s10584-012-0565-7 | No action; cannot cite grey literature |
| 10737 | 3 | 55 | | | | Regarding the two first rows: It should be proportional to integrated RF not just RF. | Noted; will be addressed in SOD |
| 10738 | 3 | 55 | | | | Add "change" before "potential" in the GTP. | Noted; will be addressed in SOD |
| 10739 | 3 | 55 | | | | The version of GTP that is given with a time horizon determined by the proximity to the target year should also be inlcuded in the table (See figure 8.29 in WGI) | Noted; will be addressed in SOD |
| 10740 | 3 | 55 | | | | The metric integrated Global Temperature change Potential (iGTP) introduced by Peters et al. 2011 (Environmental Research Letters) | No action; comment unclear |
| 10847 | 3 | 55 | | | | I like this table, though, I have many comments. References are not in the reference list. GWP, "constant" I think might be incorrect. Check. From SAR it is definitely constant, but I dont think for FAR. GWP-LA is used mainly in one paper, and most would not agree to this approach in this context. There are also problems with this, as described in Fuglestvedt et al 2003 Climatic Change, in that different components require different discount rates. GTP, "exogenous scenario", I am not sure where you get that from, but generally, GTP IRFs are taken from existing literature and the most used by Boucher and Reddy is based on a 2xCO2 experiment. Or perhaps you meant this? MGTP uses constant and scenarios. Also see (Peters, G.P., Aamaas, B., Berntsen, T., Fuglestvedt, J.S., 2011. The integrated global temperature change potential (iGTP) and relationships between emission metrics. Environmental Research Letters 6, 044021.). More generally, the MGTP is just the integral of GTP in absolute form, and renormalised, and so it has the same background as GTP. Since GTP requires CO2 and temperature IRFs, then the background of CO2 is relavent to GTP. What is "theta"? I have never heard of "EGWP" and why do you reference it? A new column in the table which states which metrics are used often and which have been used once, or a few times, etc would be good. This would show GWP and GTP as the most important, currently. The point is, it is perhaps not so useful to alert people to metrics which have been otherwise disgarded or ignored in the literature, unless there is good reason to include them. Overall, keep the table, but make it better than it already is! | Noted; will be addressed in SOD |
| 11361 | 3 | 55 | | 55 | | To make the table more comprehensive, FEI can be added (Wigley, 1998, Geophysical Research Letters, 10.1029/98gl01855). As far as I am concerned, Gillett and Matthews (2010) is the first study that proposes a metric which has a form of the MGTP as correctly cited. MGTP is also called "integrated Global Temperature change Potential (iGTP) (Peters et al., 2011, Environmental Science and Technology, 10.1021/es200627s) or (IGTP) (Azar and Johansson, 2012, Earth System Dynamics Discussion, 10.5194/esdd-3-113-2012)). | Noted; will be addressed in SOD |
| 9809 | 3 | 55 | 22 | 55 | 24 | Not all impacts can be measured directly in terms of monetary values. Your example of heat stress might have an impact on productivity of the workers or it might cause more diseases and thus have an impact on the health system costs. | Noted; will be addressed in SOD |

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| 11327 | 3 | 55 | 2 | 55 | 3 | This table is nice and presents a nice overview, but all the parameters and variables need to be explained clearly. Also, I do not see the point why theta is divided by H for GWP (correct for MGTP though) and why the discount factor (exp-rt) is multiplied r in the temporal weighting functions. Also, I think (although I have only spent a minute on this) that the temporal weighting function for CETP should be written as theta(t-tx)*exp(-rt), where tx is the year the stabilization target is reached. | Noted; will be addressed in SOD |
| 8592 | 3 | 55 | 5 | 57 | 19 | This is a better discussion of WTP although it still glosses over the limitations of it. I would argue that the previous section be deleted (why have it discussed in two places in the same chapter), or at the very least, clearly pointing to this stronger coverage of the same ideas. | Noted; will be addressed in SOD |
| 6316 | 3 | 55 | 5 | 55 | 6 | This sentence sounds overly definitive and yet, is open to dispute. As it stands, it reads: "In order to assess a proposed mitigation policy, one needs to compare an economic measure of its 5 costs with an economic measure of its benefits." As chapter 2 amply shows, there are other ways of assessing mitigation policies than performing CBA. Re-word. | Noted; will be addressed in SOD |
| 13947 | 3 | 56 | 3 | 56 | 8 | WTP and WTA are already dealt with at the beginning of the chapter. No need to discuss it again. | Noted; will be addressed in SOD |
| 14849 | 3 | 57 | | | | This section, and the table 3-4, may be very problematic. First, it should be heavily caveated, explaining fully the numerous ways in which these estimates are idealized formulations, based on minimal empirical data, include only a subset of sectors, exclude the possibility of major non-linearities, high level of spatial aggregation, rely on paraeters that are completely uncalibrated, in many cases rely on estimates known to be hopelessly out of date and overtaken by science, etc., etc.<br><br>As these figures tend to be grossly underestimated. It is quite easy to envision this table being grossly misinterpretted in shorter, less careful written pieces (as in the media) of the results of the WGIII report. | Noted; will be addressed in SOD |
| 8255 | 3 | 57 | | | | To better illustrate how Integrated Assessment Models work, section 3.10.5 should contain a diagram illustrating how assumptions about climate, the economy and technology impact results. | No action; wgIII has a whole chapter later on IAMs. This is not the place. |
| 7301 | 3 | 57 | 21 | 59 | 5 | Section 3.10.5 includes important information on possible economic impact of climate change. Unfortunately, the information provided in the Table 3-4 lacks sufficient explanation as well as discussion. The major conclusions that could be made from the table are also unclear. It would help, if more explanation is provided to the information included in the Table 3-4. | Noted; will be addressed in SOD |
| 12253 | 3 | 57 | 20 | | | Please consider to shorten this section | Noted; will be addressed in SOD |
| 12257 | 3 | 59 | 11 | 59 | 12 | "… which are variables like temperature, precipitation, for costal areas, mean sea level etc."- It is confusing and uneccesary to specify "for costal areas". The way it is written now it is listed as one of the variables. | Noted; will be addressed in SOD |
| 12258 | 3 | 59 | 15 | 59 | 16 | "The damage measurement starts where the the climate modeling leaves of, with the Wckt's, and involves two mappings" - Fragmentet and difficult to understand. | Noted; will be addressed in SOD |
| 12259 | 3 | 59 | 17 | 59 | 17 | "… the that impact…" - Remove "that" | Noted; will be addressed in SOD |
| 12260 | 3 | 59 | 18 | 59 | 18 | Wrong indexing on the "W". | Noted; will be addressed in SOD |
| 12261 | 3 | 59 | 18 | 59 | 18 | Don't use T as a mapping. It is already used as a time-symbol: -T=starting time. The confusion becomes complete when the indices are removed in equation 3.9. | Noted; will be addressed in SOD |
| 12262 | 3 | 59 | 18 | 59 | 18 | Remove one of the "may depend"s. | Noted; will be addressed in SOD |
| 12263 | 3 | 59 | 18 | 59 | 21 | Please shorten this sentence. It would also be much easier to read if the variables were not mentioned with symbols. | Noted; will be addressed in SOD |
| 12266 | 3 | 59 | 19 | 59 | 19 | Same as above, but for the time index. In addition "tau<t" is not necessarily the past. t=0 is the present (as said in line 8), thus "tau<0" will be the past. | Noted; will be addressed in SOD |
| 12264 | 3 | 59 | 20 | 59 | 20 | Is upslope a different location? | Noted; will be addressed in SOD |
| 12265 | 3 | 59 | 20 | 59 | 24 | Why is it specified that the damage can happen at a place l different from k. k can be any location, so it is redundant to specify l as a location different from k. | Noted; will be addressed in SOD |
| 12267 | 3 | 59 | 24 | 59 | 24 | Footnote 55: The mappings in the equation are not called G and F, but V and T. | Noted; will be addressed in SOD |
| 12268 | 3 | 59 | 28 | 59 | 30 | Here it is referred to table 3-5, which does not exist. I presume it is suppose to be table 3-4? | Noted; will be addressed in SOD |

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| 12254 | 3 | 59 | 3 | 59 | 3 | Please explain what an "IAM" is. | Noted; will be addressed in SOD |
| 9008 | 3 | 59 | 3 | 59 | 5 | Despite the claim these models are not in the summary Table 3-4: "These are the DICE model (Nordhaus, 2008, 2010) 3 and its regional cousin, RICE (Nordhaus and Boyer, 2000); the FUND model (Tol and Yohe, 2009); and the PAGE model (Hope, 2006)." | Noted; will be addressed in SOD |
| 12269 | 3 | 59 | 40 | 59 | 40 | Wrong variable names are used: The mappings are not called G and H, but V and T. | Noted; will be addressed in SOD |
| 4503 | 3 | 59 | 5 | 59 | 5 | Footnote 54 referencing Ackerman et al. (2009) is entirely misleading. The Ackerman et al. paper was a critique of integrated assessment models. While it is true that the paper mentions models other than the ones listed in the text, the main point(s) of the Ackerman et al. paper had to do with fundamental limitations of all such models. Footnote 54 makes it appear that Ackerman et al. were entirely comfortable with the IAM approach to benefits estimation. The chapter should cite Ackerman et al., of course, but should put more emphasis on the weaknesses of the IAM approach to climate policy analysis. | Noted; will be addressed in SOD |
| 12255 | 3 | 59 | 6 | 59 | 24 | This entire paragraph needs to be rewritten as it is barely understandable as is. The "need to fix" are highlighted below. | Noted; will be addressed in SOD |
| 12256 | 3 | 59 | 7 | 59 | 8 | "...groups of decades, such as decades" | Noted; will be addressed in SOD |
| 4476 | 3 | 6 | 1 | 6 | 6 | This paragraph seems to imply that utilitarianism and prioritarianism are the only possible ethical stances. But this is surely wrong. What about ethical systems involving absolute rights, transcendental values, and/or obligations that cannot be gauged in material terms? It may be more straightforward to justify action to stabilize the climate on religious grounds than on utilitarian grounds, for example. | Noted; will be addressed in SOD |
| 8576 | 3 | 6 | 1 | 6 | 26 | At no point is this fairly detailed discussion of CBA framed within the substantive literature on the limitations of CBA for complex decisions like climate change and the ethical challenges of doing this! Considering that this chapter is supposedly an integration of discussions of ethics and economics this is a profound problem. By simply jumping into CBA discussions without any caveats, the IPCC is essentially imposing a framework in which CBA is the default option for assessing decisions, and in which the profound limitations of CBA for non-linear and multi-dimensional contexts become invisible in debate. Considering the attention the IPCC has invested in communicating uncertainty elsewhere, overlooking these discussions of how econonimcs deals with uncertainty (of multiple kinds) is problemtic. | The chapter has been reorganized in response to this comment and others like it, to make the limitations of cba more explicit. |
| 10962 | 3 | 6 | 1 | 6 | 26 | The Executive summary puts too much emphasis on discounting. This does not reflect the balance of issues being covered in the whole chapter, but also my reading of the literature in this area suggests there is now growing recognition that discounting ignores intergenerational equity and so is not a sensible basis for long term planning. Even from a more practical basis, investment in infrastructure that has to support an increasing population for more than 100 years can be seen as appreciating in value, not depreciating. | No action; disagree with comment |
| 16626 | 3 | 6 | 1 | 6 | 11 | 2. How to allocate the costs of action or inaction amongst states or countries? | No action; comment unclear |
| 4746 | 3 | 6 | 11 | 6 | 11 | Add "and people" at the end of the sentence. | Will be addressed in SOD |
| 12130 | 3 | 6 | 12 | 6 | 13 | This implies that discounting is *necessary* for comparison. But comparison is possible with a zero D.R. | No action. Disagree with comment; this |
| 3911 | 3 | 6 | 14 | 6 | 14 | What would be the ethical basis for using a discount rate chosen by a policy elite to determine what sacrifice voters today should make 'for the benefit of future generations'? Surely, the role of the policy elite is to explain the trade-offs and allow citizens to determine for themselves what sacrifice they are willing to make, both in the form of personal initiatives and through collective processes? | No action; comment unclear |
| 4747 | 3 | 6 | 15 | 6 | 19 | A reference to Stern report may be useful according to me. | No action. It is referenced in the text, though it is grey literature |
| 3912 | 3 | 6 | 15 | 6 | 17 | This sentence also has a connotation that a policy elite is capable of making decisions about a discount rate in order to determine what sacrifices today's voters should make, whether they like it or not. Again the question arises as to the ethical and democratic basis for such an attitude to democratic decison-making. | Will be addressed in SOD; this is not our intended meaning |

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| 4618 | 3 | 6 | 17 | | 17 | It should be pointed out that efficient intertemporal allocation of resources is the purpose of the discount rate and not intergenerational equity; the discount factor is the price (trade-off rate) of present consumption in terms of future consumption a spointed out on p. 27 (l. 28-30); it's the social welfare function which deals with distributive justice | No action. Disagree with comment |
| 3910 | 3 | 6 | 2 | 6 | 2 | Is not the word 'appropriately' a cop out? Is not any weighting scheme fundamentally arbitrary from an ethical perspective? Is it ethical to propose that one person's well-being is more important than another's, and if so what implications does this have for the democratic notion of universal suffrage based on one vote person? My impression is that the mainstream view in economics is that any given social welfare function is subjective, making the choice between them fundamentally arbtitrary. If the chaper envisages that the choice is made through political processes then doubtless, it will reflect the preferences of those with the greatest political clout at the time. Would not it be useful for the chapter to comment on the ethical basis for thus politicising such decisions? | No action. Mistaken comment; chapter discusses what is appropriate |
| 4477 | 3 | 6 | 20 | 6 | 26 | Invoking the "Ramsey rule" as a way of normatively determining the appropriate discount rate is simply incorrect. The Ramsey rule must be generalized in the real-world in which there are different investments having different risks and different rates of return (including insurance that may have a negative rate of return). The discount rate also depends on the degree of substitutability of different goods, present and future. The different goods (such as produced goods and the unproduced environment, for example) may have different discount rates appropriate for comparing present and future values. Finally, the entire expected utility framework within which Ramsey-like discount rates are derived may break down if there is some potential for future catastrophic events (see the alternative approaches to the catastrophic risk issue of Weitzman and Chichilnisky, for example). | No action. The Ramsey rule determines a normative discount rate for safe project. It just states “price=MRS”, an efficiency condition that holds independent of the existence of risk, insurance, multiple goods, and so on. As shown for example by Gollier (JET, 2010), but also many other authors before him (Sterner, Guesnerie,…), it is equivalent to use a single DR on money together with a set of relative prices of goods that evolve over time, or to use a set of different DR, one for each good |
| 3914 | 3 | 6 | 24 | 6 | 26 | Given the interest in this chapter on distributional issues, should it not point out that low income investors are more likely to be paying credit card rates of interest on debts than they are to receiving returns on bills and bonds? Expressed more technically, the rate of return on bills and bonds is not an opportunity cost for those who don't own bills or bonds. The opportunity cost to this group of an extra dollar spent on fuel bills, for example, might be more like a credit card rate of interest. | No action; comment unclear |
| 16629 | 3 | 6 | 27 | 6 | 27 | Link this discussion to the previous discussion on social welfare functions. Merge these two paragraphs together into a shorter paragraph. Maybe delete the sentence that starts in line 3 and ends in line 5. | Will be addressed in SOD |
| 5123 | 3 | 6 | 27 | | 32 | Unlike above comment, this para usefully notes the need for flexibility, but presents it a static when a more likely scenario will require dynamic adjustments in the suite of policies in use | Will be addressed in SOD |
| 4748 | 3 | 6 | 33 | 6 | 35 | I was wondering of the term "social" or "societal" should be included. Is it also behind the term "environmental"? | No action; goes in distributional or institutional. |
| 8577 | 3 | 6 | 33 | 6 | 43 | I am very confused by the discussion on policy evaluation. Is this trying to say that tehse are the criteria countries SHOULD use? That they are using? That they are 'allowed' to use? | No action; see longer section for more detailed discussion on criteria that |
| 13564 | 3 | 6 | 33 | | 39 | wondering if it would be useful to clarify how 'mitigation' policy and 'carbon' policy are being defined as they're both being used | No action; carbon policy is somewhat broader than mitigation policy. But this |

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| 6083 | 3 | 6 | 33 | 6 | 34 | Criterion of promotion effect of technological innovation and diffusion is missing. In line 21-24 of page 6 of Chapter 3, there are sentences such as "Meeting aggressive emission reduction targets will be difficult without major changes in the technology of producing and consuming energy" and "Markets, left to their own devices, will underprovide technological change, even in the presence of a carbon price. Studies suggest that environmental and technology policies work best in tandem". Also in Chapter 1 (page 3, from line 47), there are sentences that "it is likely that deep cuts in emissions will require a diverse portfolio of policies and technologies. It is very likely that here are many different development trajectories, but it is virtually certain that the ability to meet those trajectories will be constrained if particular technologies are removed from consideration or are given excessive emphasis". Also in Chapter 2 (page 38, lines 23-24), there is a description that "Several researchers suggest that future pathways for RDD&D will be the determining factor for emissions reductions (Prins and Rayner, 2007; Lilliestam et al., 2012)". In any case without rapid technological innovation and diffusion, deep emission cut will be impossible. This is pointed out in Chapter 6 (6.4.1) that "autonomous technology might not be sufficient to limit climate change and dedicated resources and policies might be needed to induce it" (p.60, lines 22-23). It is highly appreciated that this Chapter has an independent section (3.12) on technological change. As pointed out in that section, policy can play a key role in shaping both the derection and magnitude of climate-friendly technological change. With this in mind, whether a certain policy has such effect as to promote technology innovation/diffusion is absolutely important criteria for policy evaluation. Please add "promotion effect for technological innovation/diffusion as fifth criteria. | We added mention of technology, as part of economic efficiency, but must point mostly to other sections for more substantial discussion; see section 3.12 |
| 11005 | 3 | 6 | 41 | | 43 | Delete ‘legitimately”. As a description of reality the sentence is fine. ‘Legitimately’ turns statement into a normative judgment, and it is not IPCC’s role to say what is or is not legitimate policy for any state. | Will be addressed in SOD |
| 8578 | 3 | 6 | 44 | 6 | 48 | This paragraph is confusing. The first lines seem to discuss behavioural changes. The rest of it discusses WTP without any recognition of the severe limitations of these techniques for valuation. Again, this paragraph illustates the ongoing tendency of this chapter to jump into hihgly contentious economic metrics (from the perspective of many discussions of ethics and from the perspective of the practical and methodological challenges of using these metrics of value) without any recognition of these debates, of the limitations of the techniques or of some of the implications of these limitations. Not only does the paragraph not make logical sense, but also does it not help in a respectful integration of ethics and economics. | No action; comment unclear |
| 13565 | 3 | 6 | 44 | | 48 | In addition to pertaining to this specific section, this comment is more of an 'overall' comment on my behalf - while the text points out that that GHG emissions aren't only a technical issue, metrics used to ascertain impacts of 'behaviour' and 'substitution' stem from economics (change in income, Willingness To Pay, etc). Economics are obviously important, but it seems rather heavily skewed towards modes of measurements used in economics -- there are other dimensions and disciplines uesd to determine the role of other factors (e.g. social, culture, political). Justice and equity are a part of this (as is noted) but also would like to flag alternative lenses. For instance, more systematic approaches to assessing steering change (including reducing GHG levels on a grand scale) include the work of Geels and others (e.g. http://pubs.e-contentmanagement.com/doi/abs/10.5172/impp.2004.6.2.344) and transitions; Smith et al (2005) Research Policy http://www.sciencedirect.com/science/article/pii/S0048733305001721; and Rogers (2003) Diffusion of innovation which attempt to examine socio-technical 'fit'. See also chapter 1 Ockwell and Mallett (2012) "Introduction: Low carbon technology transfer: from rhetoric to reality" in Ockwell and Mallett (eds) Low Carbon Technology Transfer: from Rhetoric to Reality. Routledge: Abigndon. http://www.routledge.com/books/details/9781849712699/ | No action; no change implied |

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| 5124 | 3 | 6 | 44 | | 48 | A massive literature now exists ciriticising an economic definition of wellbeing. See, eg: MJC Forgeard, et al. 2011. Doing the right thing: Measuring wellbeing for public policy. International Journal of Wellbeing 1(1), 79-106; and Stiglitz, Sen and Fitousi. 2009. Report by the Commission on the Measurement of economic performance and social progress. Later uses in the chapter recognise the broader definition of wellbeing in principle, but the default remains economic. | No action; we do not believe this issue is appropriate to address in this chapter |
| 4478 | 3 | 6 | 47 | 6 | 48 | WTP and WTA may not be appropriate measures (and may not even exist) for certain kinds of problems, including the possibility of environmental catastrophe. WTP and WTA implicitly assume substitutability of income and everything else, and WTP and WTA are wealth-dependent. Respondents in contingent valuation surveys have been known to case "protest votes" by answering "zero" to a question about their valuation of some event that is either inconceivable or so far outside their experience that they are unable to put a dollar value on avoiding it. | No action; disagree with comment |
| 4749 | 3 | 6 | 48 | 6 | 48 | Please explicit acronyms: WTP "willingness to pay", and WTA "willingness to accept" | Will be addressed in SOD |
| 3913 | 3 | 6 | 5 | 6 | 6 | Should a sentence be added that points out in this context that future generations are commonly projected to be wealthier than today's generations? | No action. We do mention this in the text. |
| 16627 | 3 | 6 | 8 | 6 | 8 | Authors could also choose to include individuals and/or a time component in the second question above. | No action; comment unclear |
| 16628 | 3 | 6 | 9 | 6 | 11 | Before the discussion about social welfare functions, add a sentence that explains why it is important to have economics provide an anthropocentric measure of value and how this can be an input to decision- or policy-making. This sentence can help lead the discussion of social welfare functions and the following concepts. | Noted; will be addressed in SOD |
| 12272 | 3 | 60 | 12 | 60 | 26 | Check the wording of this paragraph. There are several strange choices of words which might make the reader draw the wrong conclusions, e.g. "...extrapolation from studies in literature to other countries and regions." and "damages from energy". | Noted; will be addressed in SOD |
| 12270 | 3 | 60 | 3 | 60 | 3 | Wrong variable names are used: The mappings are not called G and H, but V and T. | Noted; will be addressed in SOD |
| 12273 | 3 | 60 | 32 | 60 | 33 | Please remove the reference to "Jensens's inequality". Few people will know the inequaliy in question, and the reference is not necessary. | No action; disagree with comment |
| 12274 | 3 | 60 | 33 | 60 | 36 | "…expected damages of" This sentence is incomplete. | Noted; will be addressed in SOD |
| 12271 | 3 | 60 | 7 | 60 | 7 | If Equation 3.11 is suppose to be presented, the parameters a and b needs to be explained. | Noted; will be addressed in SOD |
| 8828 | 3 | 61 | | | | the discussion of “behavioral economics and culture” should also include citations to Kahneman’s 2011 book, Thinking, Fast and Slow and to the 2008 book by Thaler and Sunstein titled Nudge: Improving Decisions about Health, Wealth and Happiness. | AGREE action will be taken |
| 9356 | 3 | 61 | 10 | 61 | 11 | p61line 10: this very important argument with respect to ' fat tails' does not come up very clearly: expand it | Noted; will be addressed in SOD |
| 4505 | 3 | 61 | 13 | 61 | 24 | The Weitzman approach should also be mentioned here; Weitzman develops the consequences of employing a Bayesian framework for learning about the structural uncertainties. | No action; comment unclear |
| 12275 | 3 | 61 | 18 | 61 | 18 | What is "...rate of time preferences..."? | Noted; will be addressed in SOD |
| 4506 | 3 | 61 | 20 | 61 | 20 | Again, the Ackerman et al. paper cited in footnote 60 is not the same as the one given in the bibliography. | Noted; will be addressed in SOD |
| 12276 | 3 | 61 | 22 | 61 | 24 | Fragmentet sentence: "...this approach, which was adopted by… and is computatationally more demanding." | Noted; will be addressed in SOD |
| 13948 | 3 | 61 | 25 | | | Behavioural economics and culture section is too long. At least suggest deletion of Box 3.7 and 3.8 | AGREE action will be taken |
| 9187 | 3 | 61 | 25 | 68 | | good text on behaviorial economics. Please mention to efficiency regulation and energy management systems, if possible. My chapter Ch 15 has a lot of relevant discussons. (15.5.2 regulation and information section), also relevant are 15.5.5 Voluntary agreement, and 15.13 Frequently asked questions. - please take a look. | Noted. |
| 9214 | 3 | 61 | 25 | 68 | | please also summarize the following terminologies - organizational economics, evolutionary economics, new institutinoal economics, to the extent they are relevant with the energy efficiency policies. Much energy efficiency policies (such as energy audit , enegy management systems, see ch15 for details) are meant to influence on the bevariour of organiations (such as firms), not individual citizen. | NOTED general action in other sections of the chapter |

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| 4504 | 3 | 61 | 3 | 61 | 12 | The findings reported in footnote 59 are more important than a footnote and should be included in the text itself. (In addition, the chapter authors should check the Ackerman reference; the paper by Ackerman and co-authors that makes the point discussed in footnote 59 it is not the same as the Ackerman et al. (2009) reference given in the bibliography. The papers are different and the co-authors are different.) In addition, it is not entirely accurate to say that the Weitzman results stem from a fat right tail in the probability distribution of temperature increases and damages. The Weitzman result arises from a combination of deep structural uncertainty and the impossibility of learning enough about the underlying structure within the necessary decision-making time frame. | Noted; will be addressed in SOD |
| 9810 | 3 | 61 | 35 | 61 | 38 | See the systematic review on LCC: Eric Korpi, Timo Ala-Risku, (2008) "Life cycle costing: a review of published case studies", Managerial Auditing Journal, Vol. 23 Iss: 3, pp.240 - 261 | AGREE action will be taken |
| 8084 | 3 | 61 | 22 | 61 | 24 | As the alternative approach mentioned here is an important one, both methodologically and computationally, it could be useful to add in the list of papers mentioned on line 24 : “Bréchet, Thénié, Zeimes and Zuber (2012)” and, space permitting, it would be instructive to add the comment: “these last authors obtain the result that cooperation among countries induces risk reduction.”<br>Reference:Bréchet, Th., J. Thénié, Th. Zeimes and S. Zuber (2012). The Benefits of Cooperation Under Uncertainty: the Case of Climate Change, Environmental Modeling Assessment 17,149–162. DOI 10.1007/s10666-011-9281-3. | Noted; will be addressed in SOD |
| 8593 | 3 | 61 | | 63 | | This is a better discussion than some of the previous ones. It could be helpful to tie it to some of the earlier sections (ie. pointing out the gaps between theoretical ideals of how neoclassical economcs should work in terms of providing advice, and how people actually behave). Clearer road marking to this section would help authors develop text that more appropriately establishes the boundaries of economics knowledge about climate policy. | AGREE action will be taken |
| 7936 | 3 | 61 | | | | This is an innovative section that raises new and interesting points (with respect to SAR, TAR, and FAR). The results of 3.11 should encroach on the preceeding sections. | AGREE |
| 3140 | 3 | 61 | 25 | | | Section 3.11 seems like a grab bag of issues. Can they be woven into the text earlier; put in the later chapter on energy systems (e.g., the discussion of consumer undervaluation of energy costs), etc.<br><br>There is a huge overlap with chapter 4. I suggest that authors of both chapters review the other carefully and make some decisions about the strategy.<br><br>The discussion of policy infeasibilty is very important but highly diffuse. To narrow, let me repeat a comment I make in chapter 6: "BECCS plays a huge role in the IAMs that can meet goals like 2 degrees. Given that, why not use BECCS as a case study/box in chapter 3 since that would help tie together the issues discussed there with the large role that is assumed for BECCS in some scenarios. □ | AGREE with first and second comment, action will be taken. Third point in the comment unclear. |
| 8393 | 3 | 61 | 37 | 61 | 36 | The section seems to assume that "experienced utility" ("subjective well-being" of happiness studies) is the conception of wellbeing that policy should foster. This is not the usual view in economics, which is that welfare is the satisfaction of preferences, not subjective wellbeing. So there is some tension between this part and section 3.4.3 where it is stated that "we do not try to assess these differing views about the nature of wellbeing." it would help to make the conflicting goals of happiness-maximization vs. preference-satisfaction explicit to see how this part relates to the main body of the chapter on values and policy objectives (cf. Fleurbaey, M. (2009). Beyond GDP: The quest for a measure of social welfare.<br>Journal of Economic Literature 47(4), 1029–1075, particularly section 6.3.) | AGREE action will be taken |
| 8397 | 3 | 61 | 27 | 61 | 27 | Not clear what "the positive dimensions .." means. Suggest re-wording. | AGREE action will be taken |

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| 8159 | 3 | 61 | | 62 | | See the discussion in the FOD Chap. 2 Sect. 2.4.4.3 for a more detailed discussion of some of the behavioral biases that impact on investment in energy-efficiency appliances as it relates to System 1 behavior. | AGREE action will be taken |
| 11536 | 3 | 61 | | 62 | | See the discussion in the FOD Chap. 2 Sect. 2.4.4.3 for a more detailed discussion of some of the behavioral biases that impact on investment in energy-efficiency appliances as it relates to System 1 behavior. | No action; duplicate |
| 12564 | 3 | 62 | 11 | 62 | 18 | An ACEE white paper (http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&sqi=2&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.aceee.org%2Ffiles%2Fpdf%2Fwhite-paper%2Fcomments-on-is-there-an-energy-efficiency-gap.pdf&ei=YhtSUPzYMYjZ0QG1kYDACQ&usg=AFQjCNGiGZ5RlDty-ZdF-fZGCr81cyDTQw) makes the point that both this Alcott paper and the Alcott & Greenstone 2012 paper make "selective and otherwise misleading citations to the literature to make their case" [for more rationality on the part of energy consumers than is, in fact, observed]. these concerns should be acknowledged somewhere, or use of these references reduced. If there are unobservables that make it difficult to prove that consumers are misoptimizing, then surely the same applies to the claim that they are optimizing? | NOTED general action. |
| 11013 | 3 | 62 | 42 | | 44 | At the same time, low costs to the operator may be accompanied by high net costs to society. The costs of such programs are often obscure to both the policy maker and the public. As a result, mistakes are quite possible. Furthermore, the public often has great difficulty in assessing the costs and benefits of non-market policies (Arnold, R. Douglas. The Logic of Congressional Action. New Haven: Yale University Press, 1990). The result may be that the normal institutional checks on ill-advised public policies may function poorly or not at all. | NOTED general action |
| 12565 | 3 | 62 | 42 | | | the person to reference for social norms and energy use is robert (bob) cialdini and his collaborators, not Alcott, who is only one of many people who have since discussed this work. | NOTED general action. |
| 13685 | 3 | 63 | 19 | 63 | 19 | Insert after "... Administration 2010.": "The possibilities of a voluntary reduction of consumption have been assessed by Jackson (2005) and Schrader and Thøgersen (2011)." References: Jackson, T. (2005): Live better by consuming less? Is there a double dividend in sustainable consumption, in: Journal of Industrial Ecology 9, p. 19-36, and Schrader, U.; Thøgersen, J. (2011): Putting Sustainable Consumption into Practice, in: Journal of Consumer Policy, 34, p. 3-8 | AGREE action will be taken |
| 9399 | 3 | 63 | 28 | | 30 | The authors lay emphasis on the "deviations from the neoclassical model". Yet, they do not develop or cite alternatives, i.e. theories on public goods (climate is a public good) or theories on the commons. | NOTED general action will be taken in others sections of the chapter. |
| 12568 | 3 | 63 | 32 | 63 | 35 | Chapter 2's Section 2.2.1.1 Learning from personal experience vs. statistical description is clearly very relevant here, as it makes the point that the phenomenon described in this paragraph (that people overweight low probability events (e.g., catastrophic events as the result of climate change) is only true when people learn about such events by statistical description. The opposite (i.e., an underweighting of low probability events) is true when people learn about such events by personal experience, and also when personal experience is paired with statistical summaries. Given that personal experience with local weather has a strong influence on predictions of climate and climate change (see e.g., Psychol Sci. 2011 Apr;22(4):454-9. Local warming: daily temperature change influences belief in global warming.<br>Li Y, Johnson EJ, Zaval L.), one would predict that policy makers and voters will be less receptive to climate policy, the opposite of what this paragraph predicts, but more in line with reality. | AGREE action will be taken |

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| 12569 | 3 | 63 | 36 | 63 | 43 | This section on loss aversion may want to refer back to Chapter 2's section 2.2.3 on the topic, and also remind repeat the point made there that it is loss aversion that is at least in part responsible for the strong status quo biases exhibited by both policy makers and the general public. Related to the last point that it is not clear how empirally relevant behavioral factors are to climate-related decisions, there is a small but growing psychological literature onthe impact of green vs. grey/brown defaults on energy decisions with climate change impacts, both in the lab (e.g., on CFL purchase decisions, Dinner, I., Johnson, E. J., Goldstein, D. G., & Liu, K. (2011, June 27). Partitioning Default Effects: Why People Choose Not to Choose. Journal of Experimental Psychology: Applied.17(4), 332-341) and in field settings (e.g., on paying for green energy providers, Pichert, D., and Katsikopoulos, K. V. (2008). Green defaults: Information presentation and pro-environmental behavior, Journal of Environmental Psychology, 28,63-73) | AGREE action will be taken |
| 5324 | 3 | 63 | 7 | 63 | 10 | Enhancing by changing the consumers' preferences deviates from the fundamental principle in welfare economics of consumer sovereignty. The statement also rests on the heroic assumption that education of consumers and influencing their preferences is costless. | AGREE action will be taken |
| 12566 | 3 | 63 | 9f | | | Fortunately economic science (which has little to say about persuasion and marketing programs) is not the only social science at the table, and other sciences do, so perhaps refer the reader to other sections in other chapters? | AGREE action will be taken |
| 6317 | 3 | 63 | 3 | 63 | 4 | The sentence that currently reads: "consumer expenditures on energy efficient products may be unobserved, as well as the 3 time spent to turn lights off or guilt from being informed that they waste energy" - seems unclear to me. I suggest re-wording. | AGREE action will be taken |
| 7937 | 3 | 63 | | | | One should not equate commitments and/or moral obligation to reduce emisisons with altrusitic behavior. To fulfill moral or legal norms ist not just altruistic behavior. There is a categorial difference between these types of actions. | NOTED general action will be taken in others sections of the chapter |
| 8160 | 3 | 63 | | 64 | | There are a number of other biases related to lp-hp events (e.g. a tendency to say it will not happen to me if it is below a threshold level of concern); myopic behavior so that climate change is not on the agenda. These are discussed in the FOD Chap. 2 Sect. 2.2.4 | AGREE action will be taken |
| 11537 | 3 | 63 | | 64 | | There are a number of other biases related to lp-hp events (e.g. a tendency to say it will not happen to me if it is below a threshold level of concern); myopic behavior so that climate change is not on the agenda. These are discussed in the FOD Chap. 2 Sect. 2.2.4 | No action; duplicate |
| 12567 | 3 | 63 | | | | a good summary of human barriers to the understanding of climate change can be found in Weber, E.U. & Stern, P. (2011). The American public's understanding of climate change. American Psychologist, 66, 315-328. | AGREE action will be taken |
| 17334 | 3 | 63 | 27 | 64 | 5 | This session should make a cross-reference to Chapter 2 where the issue of human ability to understand climate change is explained at length. | AGREE action will be taken |
| 6318 | 3 | 63 | 27 | 68 | 26 | Finally: some discussion of ethics that does not rely upon a neoclassical economic model. This whole section of the report is refreshing and frankly, it reflects ways of thinking that are operating in a force way amongst communities, NGOs etc. Readers of the draft IPCC report who are similarly inclined toward a neoclassical economic model may suggest shortening this section of the report. I strongly urge against any cutting here but on the contrary, welcome the discussion and feel strongly that it must be preserved and even enlarged. | NOTED Thank you. |
| 8829 | 3 | 64 | | | | the discussion of Social and Cultural Issues should also include recent work by N. Pidgeon and A. Corner on public perceptions of GeoEngineering and other policies that are under consideration as a response to climate change. | AGREE action will be taken |
| 13579 | 3 | 64 | | | | akin to comment 4 just to flag that there are a number of alternative lenses (Rogers 2003, transitions literature, etc.) - in other words suggest examining these other lenses -- otherwise it appears very skewed towards economics | Noted (comment unclear). |

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| 12570 | 3 | 64 | 1 | 64 | 5 | the first sentence here is ambiguous. It could be read to suggest that in "other parts of the world" public assessments of climate change DO agree with scientific assessments, which is by in large not the case. Instead, public assessments diverge from scientific ones, and increasingly so over time, contrary to rational Bayesian updating, in pretty much all parts of the world where public assessments have been collected, albeit to different degrees. The statistics in the second part, which come from a relatively small sample by Leiserowitz et al., 2011, could and probably should be replaced by the larger Gallup and Pew poll results. Some of such figures are cited in the Weber & Stern reference in Comment 11 above. | AGREE action will be taken |
| 12571 | 3 | 64 | 11 | 64 | 22 | This paragraph needs references to its various assertions and also some examples, e.g., what experiences with indigenous people, what cultural movement initiatives that provide new meaning? Refer to Section 3.11.2.3 for the point on gender equity. | AGREE action will be taken |
| 9811 | 3 | 64 | 12 | | | The study "Europeans' attitudes towards climate change" Special Eurobarometer 313 and 322, Brussels 2009 should be referred to. | AGREE action will be taken |
| 11218 | 3 | 64 | 13 | | | add s to people, ie experiences with indigenous peoples. | AGREE action will be taken |
| 13684 | 3 | 64 | 13 | 64 | 13 | Insert after "... life is conducted": "For example, household energy use patterns for space and water heating differ massively between Japan and Norway due to a frugal lifestyle with regards to space heating in Japan compared to profligacy in Norway, but a massive energy use for hot baths in Japan not seen in Norway (see Wilhite et al. 1996). Even within cultures, differences between social groups can be massive (see Gram-Hanssen 2010)." References: Wilhite, H.; Nakagami, H.; Masuda, T.; Yamaga, Y., Haneda, H. (1996): A cross-cultural analysis of household energy use behaviour in Japan and Norway, in: Energy Policy, 24, p. 795–803. Gram-Hanssen, K. (2010): Residential heat comfort practices: understanding users, in: Building Research & Information, 38, p. 175-186 | AGREE action will be taken |
| 17141 | 3 | 64 | 16 | | | Reference to Wallerstein 1998 is very outdated - a lot of literature exists on indigenous peoples and climate change mitigation that is more relevant/recent. For instance: Kronik and Verner (2010) The Role of Indigenous Knowledge in Crafting Adaptation and MItigation Strategies for Climate Change in Latin America. In Social Dimensions of Climate Change: Equity and Vulnerability in a Changing World. Edited by Robin Mearns and Andrew Norton. The World Bank Washington DC. See also: Russell-Smith, J., Whithead, P., Cooke, P., (2009) Culture, Ecology and Economy of Fire Managemnet in North Australian Savannas: Rekindling the Wurrk Tradition | AGREE action will be taken |
| 9400 | 3 | 64 | 24 | | 42 | "Buen Vivir" is also part of the discussion of chapter 4. In the context of ethics, it would be more appropriate to cite recent approches in virtue ethics which elaborate on attitudes which mirror "respect for nature". There are authors who work on "virtue ethics and the environment". | DISAGREE "Buen Vivir" doesn't refer only to respect for nature as a virtue ethic, because that approach stills anthropocentric. Buen Vivir and Vivir Bien have in its bases a biocentrism approach, so they mean much more |
| 6088 | 3 | 64 | 24 | 64 | 25 | This attitude is quite common throughout the world except region that believes in monotheism. You may be able to cite from Buddhist country literatures. | DISAGREE We don't think that a religious discussion is appropriate here. |
| 7938 | 3 | 64 | 6 | 67 | 44 | Please outline the consequences for climate policies from the different perspectives briefly portrayed here. Wouldn't they reject neoclassical calculation of maximizatzion of welfare altogether? | AGREE action will be taken |
| 8594 | 3 | 64 | 6 | 67 | 44 | A better integration of this section - and moving it to earlier in the chapter - would be helpful in presenting a more balanced palate of options for thinking about value and what is important to measure and consider in climate policy than is currently included in the chapter. Also -- the better discussion of indigenous people and gender issues could be used to balance the earlier significantly weaker sections on distibution within economic analysis (bc any recognition of the characteristics of individuals that influence distirbution was entirely excluded in BOX 3.5 on page 40). | NOTED general actions will be taken in other sections of the chapter |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13578 | 3 | 64 | | | | on Buen Vivir, I recently (August 2012) was a PhD external examiner for an interesting thesis which examined the inherent contradiction involved in attemtping to incorporate Buen Vivir into aspects of Bolivia's industrial strategy based around developing lithium (University of Zacatecas, Roberto del Barco, the role of Lithium in Bolivian Development (in Spanish) | Noted. |
| 15125 | 3 | 64 | 23 | 64 | | 3.11.2.1 Buen Vivir, Vivir Bien | AGREE action will be taken |
| 15126 | 3 | 64 | 24 | 64 | 41 | There is a difference betwen Vivir bien (Bolivia) and Buen Vivir (Ecuador), It will be a good practice to distinguish both concepts or write both words. | AGREE action will be taken |
| 15127 | 3 | 64 | 41 | 64 | 42 | "Whether such an approach has any effect on GHG emissions without reducing quality of life is unclear". It´s just a commentary. | AGREE action will be taken |
| 8830 | 3 | 65 | | | | The section on measures of “Gross National Happiness,” although interesting, again seems to be a tutorial and should be omitted from this chapter. | Noted. |
| 17312 | 3 | 66 | | 67 | | I don't think that it makes sense to treat gender within this chapter. "Women as a sector of society" (page 66 line 45) sounds weird. Gender is a cross-cutting issue and relates to women and men in terms of their respective roles in society. Gender indicates the differences between women and men that are socially constructed. It involves gender identities and attributes, roles and relationships, including power relations. Gender roles vary substantially across different cultures and societies and can be changed over time.<br>The gender dimension of mitigation should receive more attention, e.g. by including a separate chapter. | Noted. |
| 9401 | 3 | 66 | | | | Indigenous communities are portrayed in a very rosy picture. Other authors say that they are particularly endangered and vulnerable. Even though the authors mention this, it looks as if indigenous communities are in a situation to carry burdens regarding climate change. I doubt this. Moreover, not all practices of indigenous communities really contribute to the preservation of nature. | Noted. |
| 7448 | 3 | 66 | 1 | 66 | 21 | This blueprint should be a goal for every country. | NOTED but this comment could be |
| 7449 | 3 | 66 | 24 | 66 | 47 | This is an excellent example of what some people can do. | NOTED Thank you. |
| 7450 | 3 | 66 | 24 | 66 | 47 | If the vast areas of forests are to be managed better, their ownership should be vested with the local people. Simple training for such people should be provided. | Noted. |
| 12572 | 3 | 66 | 34 | 66 | 44 | In the context of "strong geographic identity" and "alternatives to monitoring at the local scale", i would definitely cite the work of Elinor Ostrom and different empirical studies inspired by it, as summarized or collected, for example, in her book that downscales the "tragedy" of the commons to a "drama": Ostrom, E., Dietz, T., Dolsak, N., Stern P. C., Stonich, S., & Weber, E. U. (Eds.) (2002). The Drama of the Commons. Washington, D. C.: National Academies Press. This work is also very relevant for the final (very short) section 3.11.3 on Institutions for collective social action. | Noted |
| 17142 | 3 | 66 | 37 | 66 | 39 | For more accuracy consider rephrasing to: Some indigenous peoples are integreated into dominant societies and other continue to exist on the margins of dominant society and many have reproduced and safeguarded their cultures to various degrees. | Noted. |
| 17143 | 3 | 66 | 39 | | | Might be relevant and important to note that indigenous peoples also own 11% of the worlds territories where a majority of climate mitigation projects are being implemented - for full reference see: Sobrevila, M. (2008). The Role of Indigenous Peoples in Biodiversity Conservation: The Natural and Often Forgotten Partners. Washington DC: The World Bank. | Noted. |
| 17313 | 3 | 66 | 46 | 66 | 47 | Today, much more recent literature on gender and climate change is available. A review of existing literature related to industrialized countries is provided in EIGE (European Institute for Gender Equality: "Review of the Implementation in the EU of area K of the Beijing Platform for Action: Women and the Environment Gender Equality and Climate Change", 2012, available at http://www.eige.europa.eu/sites/default/files/Gender-Equality-and-Climate-Change-Report.pdf | AGREE action will be taken |
| 12145 | 3 | 66 | 46 | 66 | 47 | Needs to specify how 'the relation[ship] between communities and the environment is not gender-neutral'. | AGREE action will be taken |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11219 | 3 | 66 | 30 | 66 | 44 | The following material is a suggested rewrite for the part of this section on indigenous peoles (lines 30-66). It expands on the points made in the original text, adds more references and includes their rights vis a vis mitigation activities.<br><br>Indigenous peoples, numbering around 500 million across the globe (Chao 2012), are peoples who self-identify as a collectivity based on their distinct culture and history, and have priority in the occupation and use of the customary land and natural resources (Daes 1996) on which they depend primarily for their livelihoods. Land and the natural environment are integral aspects to indigenous peoples' sense of identity, culture and belonging, and hold fundamental importance for their collective physical and cultural survival as peoples (Gilbert 2006:115; Xanthaki 2007: 237 - 279).<br><br>The rights of indigenous peoples are enshrined in international law and most clearly expressed in the United Nations Declaration on the Rights of Indigenous Peoples which gives prominent place to indigenous peoples' rights to lands, territories and resources (UNDRIP 2007 inter alia Art. 3, 4, 8, 11, 19, 25 – 29, 32) and requires States to obtain the right to Free, Prior and Informed Consent of indigenous peoples (as an expression of their right to self-determination) prior to any development on their lands and territories (UNDRIP, Art. 32).<br><br>The customary lands of indigenous peoples contain 80% of the earth's remaining healthy ecosystems and global biodiversity priority areas, including the world's largest tropical forests in the Americas, Africa and Asia (GEF 2008, Sobrevila 2008:xii). Primarily dependent on natural resources and inhabiting biodiversity-rich but fragile ecosystems, indigenous peoples find themselves particularly vulnerable in the face of climate change, with little access to resources to cope with these changes (Henriksen 2007, UNPFII 2008). They continue to be marginalised in decision-making and unable to participate fully and actively in local, national, regional and international climate change mechanisms (Tauli-Corpuz & Lynge 2008, Griffiths 2009; Dooley et alii 2011). And yet mitigation is not only critical to the preservation of their environment, but to that of their traditional knowledge, culture, livelihoods, food security, customary lands and self-determined development, all of which are protected under international human rights law (Tauli-Corpuz et alii 2009).<br><br>Climate change mitigation is therefore not only an environmental issue but also a human rights issue in which indigenous peoples are key stakeholders (Kang Kyung-wha 2008, Diaz 2008, Rogue 2009) and where international standard-setting processes that affect indigenous peoples, such as those related to climate change, should abide fully to the standards of the United Nations Declaration on the Rights of Indigenous Peoples, both in terms of the participation of indigenous peoples in these processes and their results (Anaya 2012).<br><br>At the same time, it is increasingly recognised that valuable insights into mitigation can be drawn from indigenous peoples' customary knowledge of environmental phenomena and change, which they have accumulated over centuries of coexistence with and inter-dependence with, the natural environment (Nakashima et alii 2012). Successful strategies of adaptation, such as community-based forest governance (Friends of the Earth 2008, Persha 2011, Nepstad 2006, Hayes 2008) and the management of ecosystem services (Galloway McKlean | AGREE action will be taken |
| 17335 | 3 | 66 | 45 | 67 | 8 | One additional half line could be added somewhere here to say that studies using demographic categories for analysis (not only gender but also age) can allow visualization of so far invisible aspects that may prove important (targeting education, and policies) for mitigation efforts. | AGREE action will be taken |
| 12146 | 3 | 67 | | | | The discussion of social capital is the passage in this report that seems to me the best candidate for cutting. That's not to say that social capital might not be worth discussing—however, the present treatment contributes little of value. | NOTED coordination across framing chapters will be taken |
| 4508 | 3 | 67 | 1 | 67 | 8 | This paragraph appears to be largely a statement of feminist ideology rather than any sort of scientific contribution (e.g., "the social construction of gender"). | Noted. |
| 12147 | 3 | 67 | 1 | 67 | 8 | This paragraph either needs to be expanded or deleted. As it presently stands, it's not clear what it's talking about. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12148 | 3 | 67 | 14 | 67 | 23 | This vaguely written passage fails to convey a clear definition of what social capital *is*. What does 'with temporal and spatial variability' mean? Wouldn't '[t]he sum of all the resources of each individual or social group in relation to their position in the social structure and their way of establishing social relationships' refer to just about anything an individual or group could possess? How does anyone ever interact except as part of an 'associative network of iindividuals [or] groups'? How is 'solidarity' defined and measured? | Noted. |
| 12149 | 3 | 67 | 28 | 67 | 29 | The causal logic of this claim needs to be specified. If A (social capital), B (human capital) and C (social development) all cause fluctuation in D (community empowerment), this does not ipso facto imply feedback effects among A, B, C and D. Such feedback may exist, but the passage needs to explain how. | Noted. |
| 12150 | 3 | 67 | 30 | 67 | 43 | The link to climate change needs to be made more explicit. Is the point that social capital can assist communities in adapting, or what? | Noted. |
| 11220 | 3 | 67 | 7 | | | I disagree with the statement that it is unclear how effective a gender approach to mitigation will be. Women from rural poor communities are and will, in general, suffers disproportionately from climate change, due to changes in seasons, rainfall, temperature etc. Without careful planning, such women will also be negatively affected by mitigation activiites, losing access to lands, forests, water etc. On the other hand, successful mitigation activities in forests under threat from large scale clearance will be most successful where the women who presently depend on those resources are closely involved in mitigation efforts.. | Noted. |
| 18604 | 3 | 68 | | | | Technological Change is discussed (p 68 ….) but should be linked to social change and social innovation (the social element is probably huge but hard to measure and when it comes to cc values will have to be a driver). Policies are needed to price emissions (?). Would be really interesting to compare what can be the expected outcome of a strategy/approach without any direct element pricing externalities (i.e. beyond supporting R&D) and an approach with a combination of “social” and technological innovation | No action; these aspects are addressed in either previous chapters (eg. 2) or subsequent assessment chapters (e.g. 13, 15) |
| 4626 | 3 | 68 | 26 | 68 | 26 | The concepts of social learning and policy learning are relevant here. Social learning is the set of activities which depend on the participation of the group members in discourse, imitation, or shared collective or individaul actions while policy leazrning is adaptation to external change by organizations which attempt to retain and strengthen their own objectives and their domination over existing socio-economic structures; policy learning can be done through new new coalitions of advisors and technical knowledge (Adger W.N. and P.M. Kelly, Social vulnerability to climate change and the architecture of entitlements, Mitigation and Adaptation Strategies for Global Change, 1999, 4:253-66) | AGREE action will be taken |
| 13949 | 3 | 68 | 28 | | | The Technology section is far too long. It may be shortened by reorganizing it under 2 main subsections: efficiency considerations and equity considerations. | Will be addressed in SOD |
| 13581 | 3 | 68 | 39 | | | You may wish to have a look at Ockwell and Mallett (2012) (eds) book Low Carbon technology transfer from rhetoric to reality (chapter 1) as one thing that is argued that low carbon techs are unique in certain aspects (urgent - cannot 'wait' for the market; climate change is a public good; and many of these technologies are at varying stages of development - points particularly germane to developing country settings) | Dealt with better in other chapters |
| 13582 | 3 | 68 | 39 | | | Like comment 4, just to point out that while a lot of attention goes on market failures alternative lenses take a more systematic approach (Mallett 2012 Technology Cooperation for Sustainable Energy– a review of pathways, Wiley Interdisciplinary Reviews on Energy and Environment (WIREs); Ockwell and Mallett (eds) book above; Rogers (2003) Diffusion of Innovations on social aspects; co-evolution (Smith, Sterling); carbon lock in (Unruh 2000 Understanding Carbon lock-in Energy Policy http://www.sciencedirect.com/science/article/pii/S0301421500000707); etc. These more systematic approaches try account for 'energy systems' and hence the various infrastructure and actors in place to do directly or more marginally with these technologies | Dealt with better in other chapters |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6089 | 3 | 68 | 44 | 68 | 44 | Very minor point. The text says "because pollution is not priced by the market". This should be changed to "because pollution is not fully priced by the market". Reason; There exists EU ETS. Also even under direct regulations, firms spend money to reduce pollution. This means pollution is partially priced, though it is not through market. | Addressed in SOD |
| 12573 | 3 | 68 | | | | see comment 16 | No action; comment unclear; don't know |
| 17336 | 3 | 68 | 2 | 68 | 26 | What are the structures that could give impetus to action? The question for example of the role that media has in creating interest around the topic of climate chage is here not mentioned or elaborated in any manner. However, the media in general have had episodes of rising alertness toward climate followed by total avoidance of the topic. There most be some studies reflecting on the effects on public perceptions given this patterns. The strong role media has played in the difussion of climate information is not discussed in the report in any manner. This is like omitting the elephant in the room. This session offers a space where to have a substantitated in research paragraph about this. | AGREE but media role should be discussed in other sectorial or assessment chapters. Perception from a conceptual point of view is treated in section 3.11.1.4. |
| 8161 | 3 | 68 | | 76 | | Technological Change. This is a well-written section that provides a complementary perspective to some of the material in Chap. 2 on choice and design of policy instruments under certainty (FOD Chap 2 Sect. 2.4.4) | Thank you for your comment. |
| 17298 | 3 | 68 | | | | The concept that changes in technology enhances interactions and communication, which strengthens societal exchanges and optimizes pricing. | No action; no change implied, confirming |
| 3288 | 3 | 68 | 27 | 75 | 11 | This is good, solid, strong material and should not be shortened. | Thank you for your comment. |
| 13580 | 3 | 68 | 27 | | | while some may consider this aspect to be a part of diffusion, just to note Rogers (2003) diffusion of innovations that a distinction is made between initial use and confirmation -- when the person decides to continue using the technology or note. Others also flag that this confirmation concept may change over time and that a negative experience may have further, deeper negative implications on a technology's use than a positive one (see Mallett (2007) the social acceptance of renewable energy innovations: the role of technology cooperation in urban Mexico, Energy Policy 35, 2790–2798 | Not central to section |
| 10788 | 3 | 68 | 27 | | | The whole section could be replaced with a table summurizing the different technology systems | Noted for reorganizing section in SOD |
| 11407 | 3 | 69 | 1-5&26 | | | the argument here and in other paragraphs of this chapter center on the compensation of the original innovator, and seems to overlook the impact of appropriation regimes on follow-on innovators: 'Since every generation is both 'the first' to future producers, and 'the second' to prior producers, the conflict is pervasive and sets limits on the extent to which, even in a dynamic analysis, it is efficient to recognize and enforce rights in information products. As Arrow put it, 'precisely to the extent that [property rights in information are] successful, there is an underutilization of the information (Benkler, 2001: 270). The impact of lead-time (now only mentioned in lines 28-29) should also be referred to in lines 1-5. | No action - not central to section |
| 12151 | 3 | 69 | 33 | 69 | 33 | Please define the 'winner's curse'. | Will be addressed in SOD |
| 12530 | 3 | 69 | 9 | | | "Appropriability" is not a constraint in network economics. This is particularly important for innovation and diffusion of knowledge. However, development is subject to path dependence. These insights are particularly important in assessing and accelerating learning as an adaptive governance and management strategy for climate response. See Yochai Benkler, Coase's Penguin, or, Linux and "The Nature of the Firm," The Yale Law Journal, Vol. 112, No. 3 (Dec., 2002), pp. 369-446. | Will be addressed in SOD |
| 18605 | 3 | 69, 76 | | | | The IP "problem" is discussed on p 69 (indirectly) – no clear conclusions<br>The same issue is also discussed on page 76. IP is discussed in several chapters (among them 3 and 15). Different material is used and different conclusions are drawn. | Addressed elsewhere as cross-referenced |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8579 | 3 | 7 | 1 | 7 | 20 | This entire section needs to be reframed. As it stands lines 19-20 are tacked on without any context allowing the reader to see what the point it -- that sometimes we would like to have information about aggregate wellbeing and that there are many ways of trying to do this. ONE (among many) ways of trying to generate information about wellbing is to use income as a partial indicator of wellbing and then model is in MAC curves. Other ways of looking at wellbeing might include measurements of happiness, such as those in Bhutan. Any model of aggregation necessarily imposes assumptions about what is important and how it should be measured. And then it could get into the details of the neo-classical eocnomics worldview. | Will be addressed in SOD |
| 10692 | 3 | 7 | 11 | 7 | 13 | I think the word "emission metric" and the concept GWP should be mentioned in this para in order to make this more concrete and related to applications. | No action. It is in the text; this is just the executive summary. |
| 10963 | 3 | 7 | 11 | 7 | 13 | Methods for considering tradeoffs between CO2 and methane are not being very well considered in this chapter - see my comments on pages 54 & 55, but I think that the text can be clearer here without being much longer. For example, the current UNFCCC approach has become locked into the use of GWPs which were never designed to achieve climate stabilisation. | No action; we already address these tradeoffs. |
| 14838 | 3 | 7 | 14 | | | "Aggregate measures…" this is a particularly important statement, with implications for use of economic methods such as CBA and E(U) that should be drawn out. | No action. It is in the text; this is just the executive summary. |
| 11006 | 3 | 7 | 16 | | 18 | But there is also much evidence that many public policies decrease welfare. There are several ways in which policies purporting to avoid non-optimal energy consumption can lead to net welfare losses. Regulators may misread either consumer preferences or producer costs. Standards based on broad averages may deprive some consumers of valued options. Standards may also act as entry barriers that augment producer market power. Thus, as Coase long ago warned in “The Theory of Social Cost”, the simple existence of a market failure is insufficient grounds for state intervention. The costs of the likely policy imperfections must be weighed against the costs of the market failure. | Noted; will be addressed in SOD |
| 6955 | 3 | 7 | 19 | 7 | 20 | Integral to what? | Will be addressed in SOD. |
| 4750 | 3 | 7 | 21 | 7 | 22 | According to me, not only "energy" should be mention … other sources/sectors should be addressed | Will be addressed in SOD |
| 10420 | 3 | 7 | 25 | 17 | 11 | This section is too theoretical. I do see some applicability of social justice here, but applied research in climate change of this social justice concept should be the focus here. | Noted. This is a difficult section and we are trying to increase the use of |
| 7903 | 3 | 7 | 26 | 7 | 45 | Please make more clear at this point that economic theory entails normative assumptions and, hence, ethics. These assumptions must be made explicit and analysed. There is a huge literature on the normative foundations of economics (instead of many see Hausmann/McPherson 1996). Since the 90ies there is an ongoing discussion of the ethical basis of climate economics and problems that arise if one tries to calculate an "optimal" climate policy. See comments 36 and 44. | No action. This suggestion is too vague to be of use. We treat ethics and economics at some length in the chapter. |
| 2107 | 3 | 7 | 28 | 7 | 29 | *Resolved* how? This might not be obvious to those unfamiliar with previous IPCC reports. | wording will be clarified in SOD |
| 15279 | 3 | 7 | 29 | 7 | 29 | "peoples" to be "people"? | Will be addressed in SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8416 | 3 | 7 | 31 | 7 | 32 | It would be fantastic if we could say that the primary questions confronting the society with regard to climate change are issues of economics and ethics, and that the people is aware of what is happening to the climate. Unfortunately, in the society there are widespread doubts related to the reality of climate change and the responsibilities of human activities, and this has a great influence on mitigation actions. There are a lot of references that show that an important part of our society, between 20-25% (In Europe – see Eurobarometer surveys) and 40-45% in USA (i.e. see works by Leiserowitz – Yale University http://environment.yale.edu/leiserowitz/climatechange/US.html) doesn't see climate change as a very serious problem.<br>There are a lot of reasons why people don't recognize the gravity of the climate crisis; and also it is of great importance from an ethical perspective an analysis of how should the public be informed on the climate problem (see. Sommerville R. , 2010, How much should the public know about climate science?, Climatic Change, editorial)<br>I suggest that the chapter considers this issue, discussing also the necessity to face the problem at the root, evaluating whether to find remediation to the climate crisis, together with technological and economical matters actions to combat climate changes, is necessary bring into question a deeper level, a thinking over the meaning of this continuous run to the increase of productions, consumptions and the use of Earth's no renewable resources. (see Caserini S., 2008, Climate denialism evolution and the delay of mitigation actions. VI International Conference on Ethics and Environmental Policies. Ethics and climate change scenarios for justice and sustainability) | No action. Commenter makes a good point but communication of IPCC summaries and natural science research is not the subject of the chapter. |
| 4920 | 3 | 7 | 31 | | 32 | I question this very categorical argument e.g. because of huge sci. tasks related to the future behaviour of the climate system at global and regional level that is crucial for setting proper actions. "primary questions confronting society with regard to climate 31 change are issues of economics and ethics, not natural science." | wording will be clarified in SOD |
| 12131 | 3 | 7 | 31 | 7 | 32 | Such a claim would not be very persuasive, because while there is little doubt that climate change is occurring, there remains the crucial questions of how much and what kinds. | Good point. Will be reflected in SOD. |
| 2108 | 3 | 7 | 35 | 7 | 38 | Shouldn't *benefits*, and not only costs, also be mentioned here? | That is what is meant by the costs of inaction. Will try to clarify in SOD. |
| 7904 | 3 | 7 | 37 | 7 | 40 | Mitigation of and adapting to climate change will contribute to poverty alleviation stratagies and related social goals. Unmitigated climate change will only worsen the situation of the global poor. The IPCC should not adopt the artificially cunstructed trade-off between mitigating/adapting to climate change and other valuable social goals. See also comment 36. | No action. This is not something we can address here |
| 10693 | 3 | 7 | 43 | 7 | 43 | The wording "…reasonable people have differing views on this issues…" sounds strange. Please consider rewording or removing this. | Will be addressed in SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15632 | 3 | 7 | 44 | | 45 | The text could make a clearer statement here or in section 3.2. or 3.3 about how its role in reviewing the literature compares with previous efforts to do the same in earlier IPCC assessment reports. Is it principally providing an update on the literature since AR4, or is it attempting to provide a more comprehensive review than any previous ARs, in which case it would be valid to reach further back into earlier literature? It seems that both objectives would be valid (a still valid but less valuable task would be simply to provide a 'primer' on the issues solely for the purpose of framing future chapters - at times the ethical discussion seems to be doing little more than this). However, in doing so the chapter should demonstrate more clearly the sense in which it is building on previous ARs. It seems to me that the major advances that the IPCC can make in the overall area of equity are more in the quantitative comparison of different ways of translating moral principles into specific burden-sharing approaches (this is more a matter for Chapter 4). However, chapter 3 could still make some important contributions at the level of overall ethical principles. For example, it could give more of a sense of how some key moral principles have been most recently understood. eg have there been any advances in the last 5-6 years on how the polluter pays principle is understood, or have any objections to it been strengthened or refuted? A further contribution that the chapter could make is highlighting ways in which certain principles may take on particular salience in the light of recent trends, including (a) changing patterns of emissions across developed / developing countries; and (b) increasing realisation of the urgency of mitigation (which may have considerable implications for whether a "fair" approach - such as one including full historical responsibility - is even feasible (see eg Tavoni, M., S. Chakravarty, and R. Socolow. 2012. Safe Vs. Fair: A Formidable Trade-Off in Tackling Climate Change. Sustainability 4 (2):210-26). | Since this is a framing chapter and since there have not been ethics and economics chapters before, we are not simply doing an update from AR4. Will make this clearer in SOD. |
| 10694 | 3 | 7 | 45 | 7 | 45 | I suggest adding "…and assessing" after "reviewing". (See also my comment on the need for more assessment and not only review). | Will be addressed in SOD |
| 4479 | 3 | 7 | 6 | 7 | 10 | This paragraph asserts a tautology with "low confidence." Either the negative net cost opportunities exist or they do not, with the magnitudes in dispute in either case. How can there be "low confidence" in a statement that covers all possibilities? | Good point; will be addressed in SOD. The modifier applies to the existence of negative costs as well as why they might |
| 10691 | 3 | 7 | 7 | 7 | 7 | "carbon emissions" is often used synonymously with GHG emissions. When possible, I think one should use the latter since there are significant contributions from non-CO2 gases. In any case, the terms used need to be clearly defined. | Will be addressed in SOD |
| 17330 | 3 | 7 | 30 | 7 | 30 | …solutions that are both just and cost effective". What about socially acceptable? | Socially acceptable is implicit in "just" though we will try to clarify in SOD. |
| 13931 | 3 | 7 | 41 | 7 | 45 | I think that the distinction between economics and ethics is not very clear on this page. I say so because the paragraph I mention states: "What ought to be done, at least in contexts that involve values and human interests, is the subject matter of ethics". I would say the same of economics. Economics states what markets do (what "is") and what "ought to be done" to fulfill pareto optimality (efficiency in resource allocation considering costs and benefits) or minimize costs to reach a given environmental goal. You may need to rephrase that sentence to make differences among normative statements in economics and ethics clearer. This is correctly done on page 8 lines 11 to 21. | Good point. Will be reflected in SOD. |
| 6306 | 3 | 7 | 41 | 7 | 42 | The report states: "One might ask why there is a discussion of ethics in an IPCC assessment. The answer is simple." It seems eminently reasonable to me (and many others) that there be a discussion of ethics in the IPCC assessment. The authors' statement here implicitly undervalues the role of ethics by making it sound as if it is unreasonable to include it. I suggest re-wording, to say something like: "Discussions of ethics constititute an essential part of an IPCC assessment because...." | Will be addressed in SOD |
| 13263 | 3 | 7 | 19 | 7 | 19 | Ecuador also as example of coutries including direct reference to life integrity in its constitution | Will be addressed in SOD. Text can be modified as follows: Several countries (such as Bhutan, Ecuador and Bolivia) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17329 | 3 | 7 | 19 | 7 | 20 | This reads as a very vague statement not worth for an executive summary. If policy makers are to read only the Summary, then it is only just to make the issue that alternative worldviews focusing on lifestyle changes and attitudes toward nature have gone from debate form to become specific "constitutional" mandates in a couple of countries. What is missing is a better formulation at the moment. Consider re-writing. | Will be addressed in SOD |
| 3263 | 3 | 70 | 43 | 71 | 5 | Dechezleprêtre et al. (2011) cites China as the 4th most important inventor country ahead of many industrialized countries, therefore the claim here that "most climate friendly innovation occcurs in developed countries" fails to provide a full picture of the actual story. | Will be addressed in SOD |
| 13583 | 3 | 71 | 1 | | | another study (Abdel Latif 2012 Chapter 5, the UNEP-EPO-ICTSD study on patents and clean energy: key findings and policy implications in Ockwell and Mallett (eds) low carbon TT, also echoes that while low carbon / clean tech patents are concentrated in developed countries when assessed vis a vis patenting activities as a whole, some emerging economies have been leaders (India on PV, and Brazil and Mexico on hydro and marine) | Addressed elsewhere |
| 13584 | 3 | 71 | 34 | 73 | | much discussion on exogenous versus endogenous growth tends to focus on firms versus people and households and other institutions (e.g. schools, hospitals), communities, etc. and other actors which have different characteristics and motivations than firms. See IPCC 2000 Section 1.5 Methodological and Technical Issues on TT | No action; not central to section |
| 9812 | 3 | 71 | 36 | 71 | 40 | The use of the terms exogenous and endogenous is opposite to their usual meaning, exogenous meaning coming from outside, whereas endogenous means coming from inside: "Exogenous technological change is assumed to progress at a steady rate over time, independent of changes in market incentives. One drawback of exogenous technological change is that it ignores potential feedbacks between climate policy and the development of new technologies. Models with endogenous technological change address this limitation. Endogenous technological change models relate technological improvements in the energy sector to changes in energy prices and policy." and thus might be misleading. | We believe this is clear |
| 15379 | 3 | 72 | | | | This is a good mention of Nordhaus critique, that due to multi-collinearity we have no idea whether LBD happens in general or in the way described | Thank you for your comment. |
| 12791 | 3 | 72 | 5 | 72 | 5 | You might like to add some more words on the Nordhaus-Model (DICE) as it is mentioned a lot of times. | Addressed elsewhere |
| 12152 | 3 | 73 | 33 | 73 | 33 | The phrase 'productivity of fossil fuels' is confusing: One can easily take it to mean how much a given unit of fuel *contributes*. Would it be better to say *production*? | Will be addressed in SOD |
| 17299 | 3 | 73 | | | | The example of cell phone technology in developing countries is worth noting. | No action; out of the scope of section |
| 10952 | 3 | 73 | 39 | 75 | 11 | Confer: Fischer, Torvanger, Shrivastava, Sterner, Stigson (2012), How should support for climate-friendly technologies be designed?, Ambio, 41(Suppl. 1), 33-45. | Relevant to other chapters |
| 4509 | 3 | 74 | 19 | 74 | 23 | Work by Nathan Lewis suggests the opposite---that there is quite adequate room for deployment of solar sources. Lewis's work should be cited and the contrast noted. | Will be addressed in SOD |
| 13585 | 3 | 74 | 35 | | 36 | I think this point is very important and so would suggest highlighting it earlier on, and more throughout so that the message doesn't get 'lost in the weeds' | Will be addressed in SOD |
| 7310 | 3 | 74 | 44 | 74 | 45 | "waste to energy technologies which are further from being competitive with traditional energy technologies". This statement is not correct. Several "energy-from-waste" technologies have been "competitive" for many decades, including 1) waste combustion systems for district heating, elec. gen. in Europe, Japan and elsewhere; 2) landfill gas recovery for biogas use, elec. gen. [fully commercial since the first U.S. project in 1975]; and 3) anaerobic digestion of wastewater and wastewater biosolids for biogas production & use. Please update; suggest using references in AR4.WGIII.Chapter 10. | Will be addressed in SOD |
| 13417 | 3 | 75 | | 76 | | This subsection on technology transfer is far too brief, since it is a critical issue in the discussion of climate change and climate negotiations and agreements. It was agreed that Chapter 3 as a framing chapter would give the fundamental concept and treatment of this issue. Providing less than 2 pages out of 77 pages to this topic is too little. (See general comments on chapter for more comments on this) | Good point, but this issue is addressed in more detail in subsequent assessment chapters (e.g. 13, 14, 15 and 16) |
| 15380 | 3 | 75 | | | | This is a good conclusion | Thank you for your comments. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18389 | 3 | 75 | | 76 | | I found the whole section on technology transfer very week, old fashioned, impling that developing countries have benified from the evolution of the patent systems when they, with the liited capacities they have to engage in research or learn through licensing have little access to the knowledge they need to innovate and where their engagement in international collaborative research has mainly consisted of accepting to be in projects they have not designed and projects in which the research is mainly carried out in the industrialized countries. There are exceptions, of course (see the Global Energy Assessment (2012) Cambridge U.P. especially section 25.7) and it would be useful to revise this small section and provide some examples of what could , in fact, be done. | We believe this is adequately addressed |
| 2336 | 3 | 75 | | | | There are some consideration when technological is transferred to developing countries.<br>1. Appropriate technological transfer- some methods and equipment are not bearable or cannot be maintained in long run by developing countries themselves.<br>2. There should be financial aid for technologies which are already innovated in developing countries. □ | No action; we believe the issue is already dealt with adequately |
| 13586 | 3 | 75 | 1 | | 2 | while it is not clear exactly where political feasibility is captured (perhaps that is how institutional aspects mentioned on page 6 in Chapte 3 - suggest making clearer) I would suggest that this point be stressed. As an example, in our NBS study (Auld et al. 2011) - we found from Sawin 2004 there was a program to promote Renewables in the Netherlands which was cancelled as 75% of the credits and subsidies were being given to foreign versus domestic players Sawin, Janet L. 2004. Policy Lessons for the Advancement & Diffusion of Renewable Energy Technologies Around the World. Paper presented at International Conference for Renewable Energies, Bonn. | Good point, but this issue is more relevant to subsequent assessment chapters (e.g. 15 and 16) |
| 13588 | 3 | 75 | 19 | | 26 | I think Comment 20 is relevant here (that low carbon technologies are unique in a number of ways as stated above) | No action; addressed elsewhere |
| 13589 | 3 | 75 | 19 | | 26 | Haselip et al 2011 make a distinction between transfer and diffusion http://www.tech-action.org/Guidebooks/TNA_Guidebook_OvercomingBarriersTechTransfer.pdf | Grey literature |
| 14850 | 3 | 75 | 2 | | | The sentence "However…" seems to directly contradict the sentence on p. 74 line 24 "in general,…" | Will be addressed in SOD |
| 13591 | 3 | 75 | 22 | | 24 | How is trade being defined? E.g. where can the work of NGOs / communities (capacity building, equipment, skills, etc.) be captured? | No action; not relevant to section. |
| 11408 | 3 | 75 | 22 | | | it is misleading to state that 'trade in products' is a modality of transfer of technology, which requires the transmission of knowledge and the opportunity for the recipient to actually learn why and how a certain technology works. The chapter should be based on a more rigorous concept of transfer of technology. For instance, the Draft International Code Of Conduct On The Transfer Of Technology [1985 Version] defined it as follows: "Transfer of technology … is the transfer of systematic knowledge for the manufacture of a product, for the application of a process or for the rendering of a service and does not extend to the transactions involving the mere sale or mere lease of goods." | Adequately addressed |
| 13590 | 3 | 75 | 31 | | 33 | Sauter and Watson's report on Leapfrogging (which is noted in Chapter 14, page 48 lines 1-2) http://www.ingentaconnect.com/content/ind/ijtg/2011/00000005/f0020003/art00001 and Gallagher (2006) http://www.sciencedirect.com/science/article/pii/S0301421504001739 may be helpful | Will be addressed in SOD |
| 11409 | 3 | 75 | 33 | | | technological 'catch up' is not equivalent to 'leap-frogging' as suggested here. The latter concept assumes that certain stages of technological development and learning can be omitted; Carlota Perez, for instance, has argued that this is only possible when new techno-economic paradigms emerge. | Will be addressed in SOD |
| 13592 | 3 | 75 | 40 | | | suggest alternative word such as appropriate, relevant, pertinent, versus 'right' | Will be addressed in SOD |
| 13593 | 3 | 75 | 40+ | | | Suggest having a look at Bell (1990) cited in Ockwell et al. 2007 UK-India Collaborative study on technology transfer. Phase I http://www.sussex.ac.uk/sussexenergygroup/documents/uk-india-full-pb12473.pdf and also Sanjaya Lall's - awareness, know how and know why skills (http://www.g24.org/Publications/Dpseries/28.pdf | Grey literature |

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| 13587 | 3 | 75 | | | | Just to say that while the term technology transfer is still prevalent, alternative terms such as technology cooperation are gaining more currency -- see Heaton, G. R., R.D. Banks, D. W. Ditz (1994). Missing Links: Technology and Environmental Improvement in the Industrializing World. Washington D.C., World Resources Institute (WRI): 1-53.; Martinot, E., J. E. Sinton, B. M. Haddad (1997). "International Technology Transfer for Climate Change Mitigation and the Cases of Russia and China." Annual Review of Energy and Environment 22: 357-401. (as also noted in IPCC 2000) - also Mallett (2007) the social acceptance of renewable energy innovations: the role of technology cooperation in urban Mexico, Energy Policy 35, 2790–2798 and Mallett 2012 Technology Cooperation for Sustainable Energy– a review of pathways, Wiley Interdisciplinary Reviews on Energy and Environment (WIREs) http://wires.wiley.com/WileyCDA/WiresJournal/wisId-WENE.html | Not central to section |
| 3289 | 3 | 75 | 12 | 76 | 38 | This should be deleted because of overlap and replaced by a reference to chapter 13, International Cooperation | Only the framing is maintained here |
| 17300 | 3 | 75 | | | | Informal Research and development as practiced by non-literate farmers with seeds or fertilizer applications and observation to climate stress offer interesting examples. In fact some of these informal technology development could be extremely significant. These can be of major economic value. These are not patented hence can reach other farmers faster. | Not central to framing chapter |
| 18606 | 3 | 76 | | | | Page 76: “As is clear from even a causal reading of this chapter, there are many questions that are not completely answered by the literature.” What sort of conclusion should be drawn from that statement? The conclusion drawn here is to try to formulate issues/themes where research is needed during the coming decade as a prep. action for AR6 (!!!) so it can say more about the ethics and economics of climate change (the chance is slim! Some issues raised have no single answer and have been discussed/penetrated for 100s or 1000s of years). | Noted; this section has not been written yet. Text is a placeholder. |
| 11414 | 3 | 76 | | | | More generally, the chapter fails to reflect important academic work regarding the limitations of IP as an incentive for innovation. One increasingly widespread view is that the role of the patent system in promoting innovation is less substantial than usually claimed (Landes and Posner, 2003; Levin et al., 1987). Patents may even stifle the very innovation they are supposed to foster (Jaffe and Lerner, 2004). There is compelling evidence indicating that ‘collective invention’ based on sharing innovations is more efficient than patenting them (Bessen and Meurer, 2008); some studies suggest that innovation not only thrives in a competitive environment, but that more profit can be generated by inventors in a system based on the broad diffusion and common use and improvement on innovations (Torrance and Tomlinson, 2009). | Addressed elsewhere as cross-referenced |
| 13594 | 3 | 76 | 1 | | 4 | Suggest a line denoting that IPRs are more than patents (trademarks, copyright, etc.) but that most discussion to do with low carbon technology focuses on patents due to the potential for preventing access - you may wish to have a look at Mallett et al. 2009 UK-India Collaborative study on technology transfer. Phase II for further discussion on IPRs and how carbon technology http://www.sussex.ac.uk/sussexenergygroup/documents/decc-uk-india-carbon-technology-web.pdf | Good point, but this issue is addressed in more detail in subsequent assessment chapters (e.g. 13 and 15) |
| 11411 | 3 | 76 | 12 | | | the reference to ‘adjustments’ excludes the consideration of an overhauling of the IP system to respond to current social, economic and technological needs, as well as alternative models to promote innovation, such as open innovation systems that are proving to be efficient in various areas (e.g. medical research, food and agriculture, software) | Will be addressed in SOD |

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| 13419 | 3 | 76 | 14 | 76 | 21 | This paragraph is taken from the zero draft. However in the zero draft the paragraph is part of a long discussion on the debate in the literature on the significance and effects of IPRs on climate related technologies. This paragraph describes the argument that IP is not a problem. This had been followed by several paragraphs in the zero draft that dealt with findings in the literature on why and how IPRs are and can be a barrier to technology development and transfer. However all these other paragraphs have been eliminated, thus giving the mislead. Also, paragraphs in the zero draft on the potential use of flexibilities in the IPR regime and the regulation of conditions in voluntary licenses have been eliminated.ing impression that the literature does not recognize the potential of IPRs to be a barrier. | Will be addressed in SOD |
| 7364 | 3 | 76 | 14 | 76 | 24 | Despite referring to only one study in contrast to three, much more discussion is dedicated to the argument that IP regimes assist technology transfer. It would be helpful to draw out more of the analysis of how they (IPRs) may hinder technology transfer. | Will be addressed in SOD |
| 11412 | 3 | 76 | 19 | 76 | 21 | the reference to Barton's study does not properly take into account other considerations made by the author on barriers to the access of climate change relevant technologies. | Will be addressed in SOD |
| 13420 | 3 | 76 | 22 | 76 | 24 | This very short paragraph is all that remains from the zero draft which had given details of research findings on the barriers that IPRs can pose to technology transfer. | No action; already addressed in 13419 |
| 13595 | 3 | 76 | 22 | | 24 | As a follow up to my colleague David Ockwell's work, Phase II http://www.sussex.ac.uk/sussexenergygroup/documents/decc-uk-india-carbon-technology-web.pdf shed some further insights which may be helpful. 1) that IPRs weren't preventing access to these technologies but were playing a role on the rate of diffusion (NOTE a number of sources indicated that this may change and that access would likely decrease as Indian firms moved farther up (and down) the value chain 2) that internationa lsources of R&D cooperation were increasing rates of development and diffusion (e.g. university or industry experience abroad and coming back to India; Indian firms acquiring the majority share or outright ownership of firms in developed countries; that there were strong linkages which may not be as apparent on the surfacesuch as diaspora communities e.g. one interviewee told me pl. 72 of Phase II that 60-70% of researchers working on PV in the US (firms, govt institutes, unis) were of India origin more or less, and 3) a creative way in which to attend to IPR concerns and R&D efforts are to establish collaborations early on between partners and where the role of IPR-sharing (or not) is made clear at the outset -- see Phase II for details | Noted. We avoid grey literature. |
| 11658 | 3 | 76 | 22 | | | The IPRs are not the only barrier to technology transfer and diffusion. As shown in Ockwell et al. 2010 and UNEP, EPO&ICTSD 2010, other issues, such as absorptive capacity of recipient firms, infrastracuture, initial cost of new technologies and market conditions will play an eually important role in facilitating access to technology. As Chapter 13 also describes the relationship between IPRs and technology transfer, the related text in Chapter 13 should be referred in Chapter 3. Reference: Ockwell et al. (2010) Intellectual property rights and low carbon technology transfer: Conflicting discourses of diffusion and development, Global Environmental Change, 20, pp. 729-738, UNEP, EPO and ICTSD (2010) Patents and clean energy: Bridging the gap between evidence and policy, UNEP, EPO and ICTSD. | Good point, but this issue is addressed in more detail in subsequent assessment chapters (e.g. 13 and 15) |
| 11413 | 3 | 76 | 22 | 76 | 24 | this brief reference to IP as a potential barrier is insufficient to reflect the view of developing countries' governments and academics who have highlighted how IP can be a barrier for access to technology in this and other fields, as shown by Watal, 1998, Anderson &Sarma, 2007, Zhou Yuanchuan, Zou Ji et Wang Ke (2010), among others. | Addressed elsewhere as cross-referenced |
| 13418 | 3 | 76 | 3 | 76 | 4 | Although the subject title is technologies in the public domain and patented technologies, there is no treatment of the significance of technologies in the public domain, or expansion of public domain technologies. References to this in the zero draft were eliminated. | Good point, but this issue is addressed in more detail in subsequent assessment chapters (e.g. 15 and 16) |

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| 13421 | 3 | 76 | 32 | 76 | 38 | This paragraph is retained from the zero order draft but the reference to Correa (2011) as the source of this paragraph's ideas should be re-instated. The two other subsequent paragraphs in the zero order draft that give examples of innovative technology cooperation models, and on establishing R and D networks of research institutions in developing countries are significant and may be re-instated. Shortage of space should not be a reason for such a brief treatment to the technology transfer issue. | Addressed elsewhere as cross-referenced |
| 11410 | 3 | 76 | 7 | | | the statement that 'It is widely accepted that patents have the function of providing incentives for innovation…' needs to be qualified, since this function is strongly dependent on the context where the IP regime applies. IP does not work in the same way in a country with a sophisticated R&D infrastructure, availability of human resources and risk capital and in poor countries where IP has no real impact in promoting innovation. | Will be addressed in SOD |
| 14851 | 3 | 76 | 1 | | | This section is important and could be elaborated. | Noted for reorganizing section in SOD |
| 6319 | 3 | 76 | 22 | 76 | 24 | Could the authors add one additional sentence to explain how, or to provide an example, as to how IP protection can prove to be a barrier to technology transfer? | Addressed elsewhere as cross-referenced |
| 14852 | 3 | 76 | 25 | | | This section is important and could be elaborated. | Adressed elsewhere as cross-referenced |
| 4354 | 3 | 77 | | 111 | | The bibliography omits Donald Brown et al., 'White Paper on the Ethical Dimensions of Climate Change', College Park: Rock Ethics Institute, Penn State University, 2006, and this is a serious omission. | No action; this is grey literature, and cannot be used in the report |
| 12792 | 3 | 77 | | 77 | | You may like to add that a just distribution of costs and benefits is a central point of discussion in international climate change negotiations. Regarding COP15 it even hampered the negotiation. | Good point |
| 12793 | 3 | 77 | | 77 | | What about the justice motive? | Answers to FAQs are inevitably |
| 12794 | 3 | 77 | | 77 | | Maybe there is more to mention than "poverty". | No action. This is not meant to be an |
| 6090 | 3 | 77 | 22 | 77 | 30 | Add as fifth category "technological promotion aspect". | No action. That is covered in the text. |
| 11221 | 3 | 77 | 27 | | | It will also need to respect the right of indigenous peopels and local communities in threatened forest areas to play a decisive role in mitigation planning and implementation, so that they are not empoverished or disadvantaged, and so that their knowledge of the ecosystem is incorporated into mitigation activities. | No action. Already covered in text. |
| 14853 | 3 | 77 | 9 | | | The answer to the FAQ 3.2 is not sufficient. The distinguish between states and firms (or individuals) is relevant. | Answers to FAQs are inevitably abbreviated. |
| 3915 | 3 | 77 | | | | FAQ 3.1 says that the chapter reviews how the literature views the ethical aspects of what should be done about climate change, but FAQ 3.2 and FAQ 3.3 don't invoke any ethical issues. | No action. Ethics is not the only subject of the chapter. |
| 6320 | 3 | 77 | 2 | 77 | 30 | Given the fact that the authors have described the value of indigenous perspectives, could a question be added regarding the need to respect cultural differences in discussions of climate change policy? | No action; that is embodied in the first FAQ |
| 12153 | 3 | 79 | 20 | 79 | 20 | I cannot find any evidence that Arrhenius 2011 has yet appeared in print. | Noted; it was accepted long ago by the publisher. The author promises it by |
| 8821 | 3 | 8 | | | | at the top of this page a focus on individual well-being is clearly stated, yet communities also can be impacted – and values or ethics of communities can be quite different from those of individuals, as can the required evaluation mechanisms. | This is mentioned in the text of 3.4, and now with more stress. |
| 13001 | 3 | 8 | 1 | 8 | 10 | It would be helpful to signal that other matters, such as rights and nonhuman nature (e.g., animals, plants, species), are relevant too. These are mentioned later, but are significant enough to warrant inclusion from the outset. | No action. As noted, these are already addressed. |

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| 8788 | 3 | 8 | 11 | 8 | 14 | Questions of at least conventional economics are always at least based on normative ethical assumptions. That is, in examining 'how firms have reacted in the past to cap-and-trade programs for limiting emissions' is done through the lens of economics would typically look at the relative increase or reduction in utility, GDP or simply money. A deontological approach could look at whether legal duties have been met and whether there has been a change more generally in considering and abiding by duties, rights and responsibilities. A virtue approach could consider whether individual and groups have a better understanding of virtue, have acted more virtuously in the specifics and more generally. With great hazard of being misunderstood, but to put the last point in language that economists and those committed to that ethical position might understand; have and will virtues such as wisdom (or prudence), humility, justice, compassion, courage and moderation of consumption increased or decreased. To summarise, questions of economics are never 'positive', they are always normative and this applies throughout the draft AR5 reports and previous IPCC reports. | No action. Wording is adequate in text. |
| 8789 | 3 | 8 | 17 | 8 | 19 | It is stated 'This chapter does not attempt to answer normative questions, but rather provides policymakers with the tools (concepts, principles, arguments and methods) to make such decisions using their own values.' As already stated the chapter itself is framed by barely recognised ethical and epistemological assumptions which are likely to reinforce the assumptions of many of the most influential policy making organisations and policymakers which are unlikely to be the assumptions the majority of the global population. Popper's 'Open Society' raises questions about the possibility and benefits of separating normative questions from social science and the dangers of this turning into historicist justification for closed totalising ideologies. Whether this is the case with the dominance of conventional in current policy processes I will leave the reader to judge. | No action. Outside the scope of the chapter. |
| 3917 | 3 | 8 | 17 | 8 | 21 | The ethical basis for the proposition in this sentence that decision-makers should make public policy decisions using their own values should be examined in this chapter. The implication is that the policy makers' values are more important than voters' values. This may be particularly dangerous for civil society when dissenting voters' values are strongly held. Another problem is that the rest of the chapter seems to fail to provide the promised guidance. For example, where in the chapter does it tell policy makers how to use their own values to determine an 'intergenerationally just emissions trajectory" (see line 18 on page 5)? | We agree with the comment and the wording will be changed for the SOD. |
| 9012 | 3 | 8 | 18 | 8 | 21 | The self-stated claim of the chapter is "not to attempt to answer normative questions" (line 17 page 8). The authors intend the chapter to be a "resource for policymakers and researchers who are trying to solve normative questions. In that sense, the chapter is policy-relevant but not policy-prescriptive". The chapter as written privileges market-based policies that are effective mainly in developed countries. Because of this bias, much of the literature it surveys is irrelevant to its self-stated intention. There is a need to recognize more of the literature to pertains to development. | No action. We state the limits of our discussion but we are constrained to look at the existing literature. |
| 4933 | 3 | 8 | 20 | | 21 | This is a common principle for the whole IPCC work: "In that sense, the chapter is policy-relevant but not policy-prescriptive.", i.e. it could be e.g: "In that sense, the chapter closely follows the general IPCC guidelines on being policy-relevant but not policy-prescriptive." | Good point. Will be reflected in rewriting for SOD. |
| 8144 | 3 | 8 | 22 | | 26 | Where does descriptive behavior fit into the characterization of ethical issues? Individuals may behave differently than either normative or positive models suggest they should act. | No action. We discuss this in section 3.11 |
| 11531 | 3 | 8 | 22 | | 26 | Where does descriptive behavior fit into the characterization of ethical issues? Individuals may behave differently than either normative or positive models suggest they should act. | No action; duplicate |
| 6956 | 3 | 8 | 26 | 8 | 26 | outcome-based' is a better term than 'criteria-based'. | Will be addressed in SOD |
| 13563 | 3 | 8 | 27 | | 28 | in supporting the above comment, and to do with consistency, the text here states that human values include wellbeing and cultural values | No action; same comment as previous comment. |
| 4934 | 3 | 8 | 33 | | | {Add} mitigation of greenhouse gases {}emissions | Will be addressed in SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3918 | 3 | 8 | 44 | 8 | 45 | This presentation is a bit confusing. Can ethics really determine that outcomes are ethically unfair if the process has been ethically fair? If so, how can ethics to choose between an ethically unfair process leading to the ethically fair outcome and the opposite conjunction? | No action. The text assumes that the outcome of a fair (e.g. democratic) decision procedure can be unjust (e.g. by denying human rights to a minority of the inhabitants or by externalizing the |
| 7905 | 3 | 8 | 46 | 9 | 3 | Please clarify the relationship between axiological and deontological dimension of ethics. In our opinion it is claerly misleading to see justice as one value among others. At least to Kantians and Rawlsians justice is on another level as "values of different sorts". | More space has been given to the variety of views about the relation between justice and value. |
| 3916 | 3 | 8 | 9 | 8 | 10 | Can any authority be cited in support of the assertion that developing real policy solutions inevitably involves creating efficient, just and fair policy solutions? A Google search of the words 'Pork Barrel US Congress' or earmarks with demonstrate the very real concerns about the tendency for legislators to favour interest groups at the expense of the overall public interest, even in the US. Again this sentence suggests the absence of a positive theory of government action. | wording will be clarified in SOD |
| 6307 | 3 | 8 | 11 | 8 | 14 | I suggest rethinking the reliance upon the notion of the term "value-neutral." The example given here of "how firms have reacted in the past to cap-and-trade programs" may not be as value-neutral as it first appears. After all, the term "how" may imply value (i.e. was it a "good" reaction or a "bad" one?!) Perhaps using terms such as "empirically descriptive" would avoid challenges of finding truly "value-neutral" examples. | Slight rewording necessary for SOD. |
| 15633 | 3 | 8 | 25 | | | Re "historic responsibility" - I believe "historical responsibility" is the more common (and preferable term) despite the former being used in some literature (e.g. Mueller et al 2009). For example, "historical responsibility" is the term used in the Cancun Agreements (LCA decision, Part III A, Preamble). It is also used elsewhere in the chapter (eg heading for 3.3.4). | Word changed noted. |
| 6308 | 3 | 8 | 27 | 8 | 28 | This chapter makes an awkward distinction between "human" and "non-human" values. I would suggest that all values are human, although of course, non-human objects (animals, ecosystems, the planet) can, of course, be "valued." Here, as in chapter 2, I would opt for the anthropocentric (or human-centred) vs. non-anthropocentric (or ecocentric or biocentric) distinctions, rather than using inaccurate terms such as "non-human values." | Will be addressed in SOD |
| 10786 | 3 | 8 | 40 | | | Leonardo Boff, the Brazilian philosopher, has raised some ethical principles to be applicable to humanity, life, nature, and the environment, with startling views on the Earth planet. Please refer to his several papers in English and other languages. | We considered this point but feel no reference to Boff required. Boff is known for ecologically-oriented liberation theology; the points he has made about ecology are much broader than the issues on mitigation we cover, and we |

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| 15634 | 3 | 8 | 41 | | | This comment encapsulates what I see as a fundamental structural issue that the chapter needs to address. The conceptual framework for the discussion of ethics is unclear and impedes the clarity of the overall discussion in this chapter. While it makes sense to distinguish broader questions of value from more specific questions (eg justice), several problems remain.<br>The first is that key concepts such as "justice", "equity" and "fairness" are not defined or placed in a clear relationship to one another.<br>Second, it is arguably erroneous to treat fairness as "a part of justice" (page 9, line 3). Despite Rawls's well-known theory of "justice as fairness", Rawls himself did not see the two as purely synonymous (Rawls [1999]. A theory of justice. Revised edition, p.11), nor did he see fairness as a subset of justice. If anything, Rawls saw fairness as potentially reaching beyond justice to broader considerations of what is "right" (Rawls 1999, p.15). This distinction is not of merely theoretical interest but is of broader relevance to the applicability of discussions of justice and fairness to climate policy. The framing of climate change as a matter of "justice" may be theoretically valid, but the question of its scope beyond national borders is subject to considerable debate among theorists. Moreover, the applicability of ideas of justice in policy arenas is highly contentious (as evinced by the reluctance of developed countries to countenance many positions advocated by the civil society "climate justice movement").<br>By contrast, the principle of "equity" is firmly enshrined in the UNFCCC. "Fairness" is arguably also widely accepted as a criterion that is synonymous with equity. However, if fairness (and by implication equity) is seen as a subset of justice, there is a risk that those who reject the frame of justice will be more inclined to find considerations of equity and fairness unpersuasive. The more preferable view I believe is the converse view, namely that justice is a part of fairness (or, at a wider degree of consensus, that they overlap but are not identical). Accordingly, if the concept of justice is defined as giving people their due (Campbell (2010), Justice, 3rd edition, p.13), or what they are owed / have a right to, and fairness is defined as a broader criterion of even-handedness or proportionality in the treatment of people, then it becomes clearer that not every instance that is unfair is thereby also unjust (whereas the converse could hold true). | Some further explanation of the concepts has been added. Only a few theorists share the commentator's understanding of justice and fairness. Some wording has been altered to allow for it. |
| 16959 | 3 | 8 | 41 | | | To supplement my previous comment about the relationship between justice, equity and fairness, note that the structural distinction between outcomes and process could apply to fairness as well (as in the distinction between substantive and procedural fairness). I do not suggest jettisoning the discussion of justice, particularly since much research on climate ethics is framed in terms of justice. Rather it should be noted that principles discussed with specific reference to climate "justice" could also inform broader considerations of fairness as well, such as the polluter pays principle, ability to pay and so on. | See response to 15634 |
| 6309 | 3 | 8 | 46 | 9 | 4 | Distinguishing between criteria of value (strange term) and criteria of justice seems awkward to me. I recommend deleting these lines. Separating issues of justice from "values" is hardly uncontroversial. | No action. This text is just explaing how the chapter is organized |
| 4332 | 3 | 82 | 20 | 82 | 21 | Please cite the final revised paper rather than the Discussions paper: Boucher, O., Comparison of physically- and economically-based CO2-equivalences for methane, Earth System Dynamics, 3, 49-61, 2012. | Noted; change made in SOD |
| 9382 | 3 | 9 | | | | The interpretation of ethics as primarily being focused on human well-being and fairness is quite contested. Ethics is about normative standards of what each person deserves and about principles which mediate between ecological necessities and justified claims. This includes approaches from the camp of pollitical ethics. | No action; comment unclear |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8580 | 3 | 9 | 13 | 9 | 25 | One of the problems of this chapter is that the conversation repeatedly gives preference to a neo-classical perspective without balancing or even recognizing that it is doing it. For instance, dividing the ethics as "theoretical" and the economics as "practical" is deeply problematic. This language infers that ethics has nothing useful or real to contribute (this attitude permeates this chapter in so many small ways I simply cannot identify them all). If nothing else this movement from broad discussion of a range of values and a range of ways of thinking about values to a very narrow focus only on those values that are represented in social welfare functions and then an even further narrowing into CBA should be acocmpanied by CLEAR and explicit recognitions of teh limitations of this. The text could read something like, "Sections 3.3.3 to 3.3.6 concentrate on the value of human wellbeing. This is a more narrow focus that excludes many values, such as that of non-human nature. However, this more narrow focus can be useful in certain sitations because it can more easily accomodate the aggregation of human wellbeing, as long as this is represented in constrained terms such as income". This much more appropriate indicate clear understanding of the limitations and narrowing of the chapter. As for lines 22-25 - why is CBA "particularly crucial for climate change"? This seems like a strong NORMATIVE statement when in fact the utility of CBA for situations as complex as cliamte change as been well disputed in both the ethics and economics literature. This would be much more accurately framed as ; "Section 3.5 then focuses on assessing the strenghts and weaknesses of one specific strategy that has been used in climate change policy making, CBA". Also - why is discounting the only debate covered in this section when the representation of rights and the challenges rights pose to aggregation is another central debate in ethical reflections on the use of CBA? | Some of this comment represents a misreading, particularly the comment on 22-25. However, the comment rightly identifies the progressive narrowing of the analysis, which leaves out particular considerations at each point. This structure of assumptions has been given more stress. |
| 9799 | 3 | 9 | 26 | | | I really enjoyed reading this section from a scholars point of view. For decision makers it might be too much like a textbook. Stress for each section why this chapter is important for the IPCC AR5 and the decision makers it addresses. | Will add practical examples in SOD |
| 2109 | 3 | 9 | 26 | 9 | 26 | Something seems to be wrong with the numbering here (should be 2.3?) | Will be fixed in SOD |
| 10696 | 3 | 9 | 29 | 9 | 29 | I suggest adding "… and assess" after "review" and that you put more emphasis on this. | Agreed |
| 9337 | 3 | 9 | 3 | | | tFairness as a part of justice??? The idea contained in this needs to be explained | This sentence has been removed |
| 9384 | 3 | 9 | 32 | | 34 | In the context of climate change, concepts of environmental justice and ecological justice are equally important. They are not exclusively inter-personal concepts, but integrate justice to the environment. | Will be addressed in SOD |
| 8792 | 3 | 9 | 36 | 9 | 39 | Despite considering justice 'a political virtue' this chapter does not appear to consider virtue notions of justice. This severely limits the chapter's attempts to 'indicate where there are differences of opinion in the literature' about justice and clearly makes the 'review of the literature in this section ... policy relevant [and] policy prescriptive'. | Will be addressed in SOD |
| 16674 | 3 | 9 | 36 | | | Why the scare quotes on 'just' and 'correct'? | Agreed. Will remove scare quotes |
| 11008 | 3 | 9 | 36 | | 37 | The authors note the great diversity of ethical views. However, in framing ethical issues, the draft relies heavily on what appears to be a fairly limited slice of the western philosophic tradition. In fact, many of the leading lights in the history of western ethical thought would reject the entire framework in which the discussion is cast. The Buddhist or Confucian traditions might tend to the same result. What grounds are there, other than convenience for selecting this ethical framework rather than some other? | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15635 | 3 | 9 | 4 | 12 | | The categorisation of forms of justice could be considerably clearer. First, the forms of justice could be mapped more clearly onto the distinction made on the previous page between processes and outcomes. A more systematic and coherent classification would be as follows: justice is composed of the following forms: (a) outcome-focused justice [or "substantive" justice] which includes (i) distributive justice and (ii) compensatory [or "rectificatory" / "corrective" justice; and (b) procedural justice. Second, referring to "rectificatory" or "corrective" justice rather than "compensatory" justice arguably avoids the implication that compensation is the exclusive remedy for this type of injustice (when other remedies such as restitution or preventing future harm may be possible or preferable). In addition, it is common among luck egalitarians to see compensation as a part of distributive justice (as in the idea of compensating for undeserved inequalities). | We do distinguish outcome justice and procedural justice. Section 3.3 contains a taxonomy of forms of justice |
| 4935 | 3 | 9 | 41 | | | Avoid interpretation that the goal is the GHG-emission, instead: .. benefits from various activities which (unintentionally) also generate GHG-emissions | Will be addressed in SOD; will rewrite this sentence |
| 10697 | 3 | 9 | 42 | 9 | 43 | The statement "…, it makes no difference where on the globe the emissions occur" is only true for long-lived and thus well-mixed GHGs. For the short-lived gases (and aerosols like black carbon) the location of emissions is very important. There is an extensive literature on this and there are many papers I could refer (some examples are given below). I suggest adding a clarification in the text of this issue (with references) and that you also point to chapter 8 of IPCC WGI report. | Agreed. Will delete this sentence |
| 10698 | 3 | 9 | 42 | 9 | 43 | 1) Berntsen et al., 2006. Abatement of greenhouse gases: Does location matter?. Climatic Change, 74 (4): pp. 377-411.<br>2) Collins et al., 2012: Global and regional temperature-change potentials for near-term climate forcers. Atmos. Chem. Phys. Discuss., 12, 23261-23290, 2012 | Noted. As we deleted the sentence we do not review this literature |
| 2201 | 3 | 9 | 43 | 9 | 44 | The term 'several decades' denotes a misleadingly short interval. Climate continues for centuries, probably millennia. | Agreed. Change to 'long after'. |
| 17701 | 3 | 9 | 44 | 10 | 5 | Could some countries from the North could possibly even benefit from climate change. Deicing of permafrost, better agriculture, etc? | Agreed. Added 'and even some benefits' |
| 10699 | 3 | 9 | 45 | 9 | 45 | In addition to the reference given here there are other references that may be used; see next comment | No action; will be addressed by |
| 10700 | 3 | 9 | 45 | 9 | 45 | Two relevant references: 1) Höhne, N. et al., 2010. Contributions of individual countries' emissions to climate change and their uncertainty. Climatic Change, 106 (3): pp. 359-391. 2) den Elzen, Michel, Jan S. Fuglestvedt, Niklas Höhne, Cathy Trudinger, Jason Lowe, Ben Matthews, Bård Romstad, Christiano Pires de Campos and Natalia Andronova, 2005. Analysing countries' contribution to climate change: Scientific and policy-related choices. Environmental Science and Policy, 8 (6): pp. 614-636. | Will consider these references |
| 9383 | 3 | 9 | 5 | | | The distribution of costs and benefits is pivotal in a utilitarian framework in ethics; yet, in Kantian or Aristotelian approaches to ethics it is not accepted as part of the ethical framework, but criticized as a pragmatic parameter. | This is not appropriate objection to the mention of costs and benefits at this point. |
| 3606 | 3 | 9 | 6 | 9 | 7 | The issue of "common, but differentiated responsibilities" should already be mentioned here going beyond the historical emissions. | No action; "common, but differentiated responsibilities" is a conception of responsibility to be introduced later in |
| 7906 | 3 | 9 | 6 | 9 | 7 | In our understanding the historical dimesion is important but not central. | The word 'central' has been changed |
| 8791 | 3 | 9 | 7 | 9 | 10 | The section numbering here appears to be incorrect - there is no 3.2.1 to 3.2.7 as discussed. | Cross-referencing has been corrected |
| 10695 | 3 | 9 | 7 | 9 | 8 | The references to sections here seems to be wrong. | Cross-referencing has been corrected |
| 3919 | 3 | 9 | 8 | 9 | 10 | Should all these section 3.2 references be to section 3.3? | Cross-referencing has been corrected |
| 6310 | 3 | 9 | 14 | 9 | 14 | Again, it is awkward language and problematic to describe biodiversity as a "non-human value." At best, refer to is as a non-anthropocentric set of values or something of that nature. See comment #10 above. | Anthropocentric' and 'non-human' appear to be synonyms in this context. |
| 4353 | 3 | 9 | 4 | 9 | 12 | The execution of this programme is apparently absent from the draft text. | Cross-referencing has been corrected |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8247 | 3 | 9 | 4 | 9 | 25 | The references about sections and subsections provided in these lines are not matching with the contents of this chapter | Cross-referencing has been corrected |
| 10964 | 3 | 9 | 26 | 15 | 10 | I think that this section is too long. A good range of the literature is being mentioned but it could be summarised more briefly and the key point is that equity issues do not seem to be able to achieve any simple form of consensus. Sometimes it can be more an issue of what is an acceptable level of inequity, before a revolution starts. | Organization of the multiple ethics sections and lengths needs discsussion |
| 17155 | 3 | 9 | 26 | | | Balance of ethical topics inappropriate: reduce the length of all the sections on historical emissions and compensatory justice (within ch. 3.3) by about 50 %. This is of course an important climate ethical topic (particularly from the perspective of developing countries). But compared with other climate ethical topics discussed in the literature, it bulks quite large in ch 3 here! Compare in contrast, for example, the only little space dedicated to procedural justice. Moreover, there are some ethical approaches denying that compensatory issues should play any role at all (on a general ethical level). For instance: Kowarsch, M./Gösele, A.: Chapter 7: Triangle of Justice, in Edenhofer, O./Wallacher, J./Lotze-Campen, H./Reder, M./Knopf, B./Müller, J. (eds.): Climate Change, Justice and Sustainability: Linking Climate and Development Policy, Dordrecht: Springer 2012, pp. 73-90. | Only issue relevant here is balance and length of ethics sections (see comment 10964). Reference is grey. |
| 10787 | 3 | 9 | 26 | | | The section 3.3 is written in a highly theoretical manner without reaching a meaningful conclusion. It could be rewritten in Plain English. | Will be addressed in SOD |
| 17331 | 3 | 9 | 38 | 9 | 39 | repetitive consider erasing. | Will be addressed in SOD |
| 15636 | 3 | 9 | 42 | | | "effects of GHG emissions" - should specify that these are the effects 'on global temperatures' (or the like), as GHG emissions may have various other local effects (e.g. particulate pollution). | Will be addressed. This point is strictly correct. The sentence will be deleted. |
| 13264 | 3 | 9 | 41 | 10 | 7 | It is not easy to assess how much damage a country, developed or developing, will suffer from climate change. Maybe it is easier to express the idea in terms of how vulnerable regarding climate change is a country, as vulnerability is a combination of the natural phenomena and the preparedness to cope with it from each country. The consequences of an huracan or a typhoon in a developing and a developed country are good examples of this difference | Will be addressed in SOD; will add 'vulnerability' in the text, as appropriate |
| 12606 | 4 | | | | | There could be more on the issues of fuel poverty amongst rich nations, as the rich/poor divide is still large even there. I will send through a draft chapter from a report I am writing which could help, though it is UK centric. If required a could write a page on these issues for the WG. | Accepted<br>Introduce briefly in 4.1.2.1<br>Discuss in 4.4.1 |
| 4137 | 4 | | | | | Please review sections 4.3 and 4.4. in light of chapter 5 discussions. If you feel that these sections contain redundant and/or inconsistent duplications of chapter 5 discussions, please revise your sections. | Noted. Chapter 5 has been reviewed with a view to avoiding reduncies and |
| 3084 | 4 | | | | | Figure heading says 'residential sector' but the figure itself suggests it covers the residential and other sectors. Needs to be clear what's meant by 'other sectors' (see next point) | Accepted. Figure and caption have been reivsed. |
| 17337 | 4 | | | | | The good effort this chapter is doing to link to the concepts presented in Chapter 2 and 3 should continue and link with visions of sustainable development applicable to sectors, where the SD debate has become quite specific. A clear link with the chapters work need to be coming through this chapter in this regard as well. | Accepted, table has been introduced for better linkage of chapters. |
| 8496 | 4 | | | | | Model 3 - (focus shits vs shifts) | OK |
| 2578 | 4 | | | | | No mention to greenwashing, a powerful driver to derailing climate commitments | Accepted.<br>(Esteve, Chuks) |
| 2564 | 4 | | | | | Meaningless without references and some minimal empirical data | This is just an illustration of the notion. |
| 2565 | 4 | | | | | Meaningless without references and some minimal empirical data | OK, this is an illustration of the notion. |
| 12776 | 4 | | | | | Please check, whether the question is sufficiently adressed by the answer given. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16262 | 4 | | | | | To shorten the chapter I find the following two sections to be of less relevance to the focus of the chapter (i.e. the two way relationship between SD and equity on the one hand and climate change on the other): Section 4.3 Determinants, drivers and barriers (of SD) - this is a rather general and non-exhaustive list of factors impacting on SD. The intention to 'emphasize their relationship with mitigation and adaptation' does not come across clearly. The focus seems to be on determinants of SD rather than on the determinants of the nexus between climate and SD/equity. The section could be significantly shortened by strengthening its focus and omit general talk about determinants of SD. Section 4.6: Mitigative capacity and mitigation and link to adaptive capacity and adaptation - this section also looses its focus by only dealing with climate issues without relating it to SD and equity issues. | Accepted but the sections can be shortened, not deleted. |
| 15458 | 4 | | | | | In many countries around the world, the issues of sustainable development and equity are critically linked to problems of accountability, transparency and corruption. Esepcially when it comes to resource management, management of resource crisis, inequality of resource access, and mitigation strategies, corruption is a huge impediment. Bringing in this issue will create a new focus in limking sustainability and equity issues to climate change debates within the larger context of democratic deliberation. | Accepted.<br>We can include this in a more general section about political economy; i.e., distribution of decision-making power and how it is wielded, and what effect this has in the feasibility of implementing |
| 7367 | 4 | | | | | The distinction based on the Annexes of the Convention makes sense but I am unsure the inclusion of the "LDCs" is important here. Perhaps someway of reflecting regional contributions, and not just one group of countries? | intention is to show the relative value of indicators, not suggest value is substantial. |
| 7366 | 4 | | | | | The figure runs counter-clockwise which is confusing, the labels should also be above the graphics. | Noted, will improve figure |
| 17301 | 4 | | | | | The chapter is well designed. It brings together the concepts of equity and SD in some details. The chapter attempts to do justice to the vast emerging literature.<br><br>Most of the practice and innovation of both SD and equity is being undertaken in the developing world and mostly as projects. Hence the literature of this area is weak and the assessment in this chapter does not show it well. Attempts may be made to reach out and find the literature on this. As several authors of the chapter probably have access to quality and reliable grey literature.<br><br>Despite the IPCC strict guideline of inclusion of grey literature, attempts may be made to enrich the chapter with examples.<br><br>General remark is that the two recent IPCC special reports on (a) Disaster and (b) Renewable Energy can offer input for this chapter.<br><br>An approach on equity in<br>(a) mitigation<br>(b) adaptation<br>(c) capacity building and<br>(d) finance<br><br>may form a good basis for supplementing the existing texts.<br><br>Since the authors have identified a number of gaps where more text will be analyzed and several tables and diagrams, which will be developed further, I am making general comments at this stage of chapter writing. More detailed analysis and review comments will be given to the subsequent drafts. | Taken into account. Ambuj will provide examples to be put in various sections. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2924 | 4 | | | | | Is het possible to illustrate only the year 2005? and additional to illustrate a figure from for a limited value of pathways? | Noted, Figure to be revised |
| 2925 | 4 | | | | | Is it possible to add a timeschedule of the evolution of conceptional thinking? | Noted, will improve figure |
| 3957 | 4 | | | | | A general comment is that this chapter, is that like chapters 1-3, it ignores the problems of incentives and inadequate information that bedevil political processes and the centralised direction of the activities of vast numbers of individuals. When discussing moral and equity issues they also seem to ignore the critical issue of when it is moral and ethical to use the coercive powers of the state to throw dissenters into prison, or worse. | Taken into account. The governance subsection will be sharpened (Chuks) |
| 4044 | 4 | | | | | This section could be substantially shortened if it just dealt with and elaborated on those approaches that consider Sustainable Development and Equity in the context of climate change mitigation/adaptation, rather than discussing the whole raft of 'various' approaches. Particularly section 4.2.1 could do with more extensive editing to just a few sentences that outline key concepts/trends. | Taken into account in the new version of 4.2. |
| 18345 | 4 | | | | | The discussion of drivers needs to be coordinated with Chapter 5 (section 5.3) to sharpen specific SD focus. Please think about how your discussion of determinants, drivers and barriers should be taken up in subsequent chapters and how it is actually taken up. | Coordination with ch5 to be improved (Esteve). |
| 4840 | 4 | | | | | Again, this section is too long and should be presented in a more concise manner. | Will shorten and/or make more clear. |
| 8257 | 4 | | | | | It should be more consistent or linked with section 4.2.1 in which the definition of sustainability is given and three pillars are spelled out. Similarly, the equity may be explicitly defined in the three broad categories - intergenerational, intra-generational, and procedural. | Taken into account in the revision of 4.2. |
| 8492 | 4 | | | | | As noted above, this tends to frame SD as an outcome, rather than a process. Similarly, it may be helpful to discuss proximal and distal drivers in this context, and the importance/relevance of interaction effects between the different determinants | Accepted. We acknowledge the need to show further the interactions between the different determinants. However, we would not support the writing of an additional sub-section on interactions, but rather stressing the interconnections in existing sub-sections. Regarding the "proximal" and "distal" terminology, we |
| 8258 | 4 | | | | | It discusses about the determinants, drivers and barriers of sustainable development, but less about those of equitable development. It would be nice if the authors can discuss about the barriers and drivers of equitable development. | Accepted. We are in agreement with this comment. We need to stress the equity dimension of SD more prominently in each sub-section and we |
| 13751 | 4 | | | | | I miss a bit the role of knowledge as a driver or barrier of change for sustainable development in this section. Isn't in particular scientific knowledge an important driver to address sustainable development issues? This is one of the core ideas behind sustainability science and I would recommend to add a sub-section on knowledge. | Accepted. We agree that the role of knowledge is important and that it may need to be more stressed and highlighted in the text. However, we are |
| 9253 | 4 | | | | | There is no mention of the effects on population migration etc due to parts of the northern hemisphere warming more than most of the southern hemisphere. This could be a key factor in changes of resource use, local sustainability and survival. Certainly an issue for small southern hemisphere countries; a mere 4M immigrants to NZ would double the population/demand for food/electricity/water etc. | Accepted. The SOD's section on population and demography will pick up on migration issues and build on existing evidence of climate-induced migration |
| 4841 | 4 | | | | | Again, this section is too long and should be presented in a more concise manner. | Accepted. The section will be |
| 12707 | 4 | | | | | Please take a climat change fokus when addressing the issues (esp. the first two which may also be skipped) | Rejected. We are inclined to think that an introductory paragraph is needed to frame the issue beyond the climate |
| 4842 | 4 | | | | | Again, this section is too long and should be presented in a more concise manner. | Accepted. The section will be |
| 12708 | 4 | | | | | This section can be shortened (you may like to delete all parts which are not directly linked with climate change issues) | Accepted. The section will be synthesized in the SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4843 | 4 | | | | | This section is very lengthy. The length should og down considerably here to make it fit into the framework of the report. | Accepted. The section will be synthesized in the SOD. |
| 12710 | 4 | | | | | This section can be shortened (you may like to delete all parts which are not directly linked with climate change issues) | Accepted. The section will be synthesized in the SOD. |
| 12714 | 4 | | | | | This section can be shortened (you may like to delete all parts which are not directly linked with climate change issues) | Accepted. The section will be synthesized in the SOD. |
| 3233 | 4 | | | | | Section is fine as such. But it should be better integrated into the topic of the chapter. | Accepted. The overall SOD, including this section, will strive for further |
| 17641 | 4 | | | | | Please summarize again this section. The section seems to be long. | Accepted. The overall SOD, including this section, will strive for further |
| 12715 | 4 | | | | | This section can be shortened (you may like to delete all parts which are not directly linked with climate change issues) | Accepted. The overall SOD, including this section, will strive for further |
| 12194 | 4 | | | | | I recommend to shorten the descriptive parts of this chapter and instead focus on the analysis of determinants, drivers and barriers with regard to sustainable development and equity. | Accepted. There is generally a need to strike a balance between the framing of SD and equity, the weight we give to these dimensions in each sub-section, |
| 12195 | 4 | | | | | In the context of chapter 4: how do you approach the topic of finance, what is the analytical framework and object of analysis of chapter 4.3.8? Does this chapter aim to cover UN related finance initiatives/literature only? (you refer to the UNCSD and UNFCCC) | Accepted. We agree with the reviewer's comment. There is a need to recognize what sources of finance in the UNFCCC and beyond exist, but we need to place emphasis on how finance is determinant or how it influences SD and equity in the context of climate change. We need to |
| 4844 | 4 | | | | | This section is again lengthy and is only summing up existing financing fonds. There are very few scientific results reported about their impact. | Accepted. See comment above. |
| 12716 | 4 | | | | | No comments since it will be rewritten. | Noted. |
| 18337 | 4 | | | | | Guiding question: Please think clearly about the purpose of the consumption debate within the AR5 report and liaise with Chapters 5, 12 and 14 regarding a clear and suitable division of labour. What are the relevant insights to be gained from this debate and as discussed in the literature, for e.g. burden sharing proposals? What role does the consumption debate in context of behavioural change play? How should the issue of 'embedded emissions' be taken up in connection with the discussion on trade in Chapters 13 and 14? | Accepted. Meetings organised in Vigo with relevant authors from Chapters 5, 12, and 14. In Chapter 4 we discuss empirical and conceptual aspects of 'consumption' more broadly, focusing on |
| 16245 | 4 | | | | | This section makes an implicit assumption that consumption is reflected by flows of goods or services, while ignoring the role of stocks. This neglect of a stocks perspective can be very misleading, because equity, quality of life, and well-being are often better reflected by the stocks of the natural and built environment than by consumption flows into these stocks. This difference is also relevant for carbon accounting: countries that have built up their infrastructure stocks in the past (typically industrialized countries) usually have large stocks but a low demand for emission-intensive materials such as steel and cement, while emerging market economies have still relatively small but rapidly growing stocks, which leads to higher emissions in the production of these key materials (which constitute about half of all industry emissions). | Accepted. We will retain the focus on consumption and also consider the role of stocks in level of consumption, and discuss critically the apparent neglct of life-cycle approaches to consider stocks. Would have been useful with a reference, but we will search for some. |
| 12720 | 4 | | | | | The relevance for climate change issues should come out more clearly. In this regard there should also be some words on the decoupling of growth and emission development. The relationships mentioned, here, also calls climate policy to come up with a shift in current income distributions. This should be made transparent. | Ok, but avoid overlap with other chapters. |
| 12722 | 4 | | | | | I miss the link to climate change issues. | Admittedly, the link is indirect, but it is there: Inequality (supposedly) affects consumption patterns, which in turn affect GHG emissions. We will explain the links more clearly in the beginning of |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8494 | 4 | | | | | There is a significant literature in public health relating to this issue, and the importance of relative deprivation, and in turn the implications for health and well-being. This extends beyond consumption, to broader questions of income, social gradient and equity. See for example the WHO Commission on the Social Determinants of Health, Marmot (2007) in the Lancet, and the Whitehall Studies (Marmot I 1978) Journal of Epid. and Community Health | Accepted. We will review some references on the general health aspects of well being and the link to consumption levels and inequality, but not literature on the socio-economic determinants of specific diseases. These references will include (Jakab and Marmot, 14; Marmot; |
| 12725 | 4 | | | | | The link to climat change issues is not obvious. The chapter should be shortened and more focused. | We can shorten this sub section and make the climate linkage explicit. Also need to consider that the link between production and climate change is not treated with as much detail as the consumption discussion, but this is partly due to the initial description of the |
| 4845 | 4 | | | | | For me this section could be most interesting (given my background). Unfortunately, the contributions of John and Tim are not included yet but I trust the two will deliver a good summary of the psychological research in the field. | Accepted. |
| 12727 | 4 | | | | | The link to climat change issues is not obvious. The chapter should be shortened and more focused. | There is a link and this can be made more explicit. Check if John and Tim |
| 4846 | 4 | | | | | The usually weak correlation between consumer attitudes in population surveys and consumer behaviour needs to be discussed in this section. | Not relevant. |
| 13689 | 4 | | | | | Please add text regarding the importance of voluntary choice of frugal lifestyles, often linked to religious beliefs (see e.g. Lastovicka, J.; Bettencourt, L.; Shaw Hughner, R.; . Kuntze, J. (1999): Lifestyle of the Tight and Frugal: Theory and Measurement, in: Journal of Consumer Research, 26, p. 85-98; Pepper, M.; Jackson, T.; Uzzell, D. (2009): An examination of the values that motivate socially conscious and frugal consumer behaviours, in: International Journal of Consumer Studies, 33, p.126–136); Shaw, D.; Newholm, T. (2002): Voluntary simplicity and the ethics of consumption, in: Psychology and Marketing, 19, p. 167–185; Etzioni (1998): Voluntary simplicity: Characterization, select psychological implications, and societal consequences, in:Journal of Economic Psychology, 19, p. 619-643. | Accepted. We will review the following references on 'voluntary simplicity': (Lastovicka et al., 1999; Shaw and Newholm, 2002; Etzioni, 2004; McDonald et al., 2006; Pepper et al., 2009; Shaw and Moraes, 2009). I included this in section 4.4.3 [JT] |
| 16340 | 4 | | | | | A suggestion for evidence for this section which has yet to be written. Residents living in a sustainable communty in London report high levels of well being and quality of life even though they are consuming fewer resources than the local average "BedZED seven years on" http://www.bioregional.com/news-views/publications/bedzed-seven-years-on/ | Accepted. We will read the suggested report and review scientific literature that reports on similar experiments. Half paragraph on the "attitude-behavior" or "values-action" gap moved from section |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16341 | 4 | | | | | I think a reference to the useful application of the forthcoming sustainable development goals would be a good signpost here. It was agreed at Rio+20 (paragraphs 245-251) that a set of "Sustainable Development Goals" will be developed. I think that this should be mentioned in WGIII report, as I think this will be an important way that nations will be delivering truly sustainable development and so mitigation strategies post 2015. The document says that the SDG's should be "action oriented, concise and easy to communicate, limited in number, aspirational, global in nature and universally applicable to all countries while taking into account different national realities, capacities and levels of development and respecting national policies and priorities. (...) Governments should drive implementation with the active involvement of all relevant stakeholders (.....) progress towards the achievement of the goals needs to be assessed and accompanied by targets and indicators (....) The document states that a working group will be set up of experts to report to the 68th session of the UN. There is a process where stakeholders will be able to input to this expert panel and to the UN. IPCC and readers of the IPCC report should be making sure that they have the right science to base the goals on. The UN will be looking for this. The SDG's are expected to be the mainstay of the post 2015 development agenda | Accepted. This comment should probably be addressed sooner Chapter 4 than in Section 4.4.3.2, such as in Section 4.2, and hence by Yokeling. |
| 12730 | 4 | | | | | The link to climat change issues is not obvious. The chapter should be shortened and more focused. | Noted. |
| 4847 | 4 | | | | | Why is this section included in chapter 4? I do not understand how it fits in here. Since Edgar Hertwich is a lead author in one of the other reports I assume that this topic will be handled in another report much more thoroughly than it can be here. Can 4.4.5 be edited out of report 3? | Not accepted. The reason is that we were asked by the IPCC to do so. The whole section will be better coordinated with Chapter 6 (and 14) through |
| 4848 | 4 | | | | | This section overlaps to a substantial degree with 4.4.5 | Accepted. In the SOD, Section 4.4.6 will be limited to a conceptual and methodological discussion of spatial considerations in sustainability assessment (currently the title of section 4.4.6.2) to serve as a guide to the reviews of such assessments throughout the rest of the report. The discussion of GHG emissions embodied in trade will be more generic (not only GHG emissions but a wide range of resources |
| 18338 | 4 | | | | | Guiding question: In how far is your development pathways discussion relevant for preparing the discussions in Chapters 5 and 6 (in particular as Chapter 6 does not discuss specific sustainable development pathways)? Also, it would be useful to discuss the risks and SD implications of different transformation pathways and related response measures (leapfrogging evidence, trade-offs, synergies, positive and negative co-effects), in particular with a view to the subsequent sectoral analyses. | Link to Ch.5 and 6 critical, explored during LAM3 with relevant chapter authors. |
| 18139 | 4 | | | | | Title: Given the preference for using development path in the text as explained in footnote 9, title should also reflect this and state "development paths" instead of "pathways"). | Will keep pathway in title (as imposed by IPCC plenary). If necessary, will |
| 16342 | 4 | | | | | An example of a civil society approach to implementing sustainable development paths based on limit to resources and equity is "one planet living" http://www.bioregional.com/oneplanetliving/what-is-one-planet-living/ | it is better to not quote specific initiatives such as "one planet living" because there is a huge list of similar initiatives. |
| 8495 | 4 | | | | | Note the importance of institutions, institutional design and institutional inertia as part of this 'equation' | Good point. Will look for peer reviewed |
| 18346 | 4 | | | | | Please link your discussion of different modeling approaches to relevant section in Chapter 3 (3.10.2) to avoid redundancies and sharpen specific chapter-relevant focus. | Will explore link and overlap with Chapter 3 |
| 18349 | 4 | | | | | Please link this discussion to the relevant section in Chapter 3 (3.12) to sharpen specific SD focus and to avoid redundancies. | Will explore link with Ch.3 but 4.5.3.2 has a priori a different approach so it's |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10431 | 4 | | | | | Remove this section or rewrite it as a shorter more applied section | 4.5.3.2 is very short. Presents interesting concept of Technological Innovation Systems but can be |
| 12739 | 4 | | | | | Maybe you like to add an introductory sentence (pointing out that mitigation requires technological transition, so the question arises how to foster). | Accepted. |
| 12198 | 4 | | | | | General comment: it is not clear what exactly you are referring to if you speak of 'repsonse capacity' as you do not insert any references; see e.g. the related article by Gallopin (Gallopín, G. C., 2006, Linkages between vulnerability, resilience and adaptive capacity, in: Global Environmental Change 16, 293-303.) on the conceptual interlinkages between vulnerability, resilience, adaptive capacity that outlines part of the respective scientific debate. | Noted. Response capacity is just a catchword for mitigative and adaptive capacity. |
| 8265 | 4 | | | | | Section 4.6 could develop more on the differences between reactive adaptation measures and anticipatory adaptation, and provide examples of policies for each type, as well as the pros and cons of each of them (with regard to costs, avoided climate change costs, and how they cope with risk and uncertainty). The section could also develop on planned vs autonomous adaptation. An overview of these types of adaptation can be found at: http://know.climateofconcern.org/index.php?option=com_content&task=article&id=148#; | Accepted (Dick). |
| 12199 | 4 | | | | | What are the references the definition of 'adaptive capacity' is based on? | Noted. (Dick) |
| 12202 | 4 | | | | | General comment: The title of this sub-chapter is 'mitigative and adaptive capacities'. Yet in the text you write about 'mitigation' and 'adaptation' and not about 'capacities' | Rejected. |
| 18334 | 4 | | | | | The chapter almost seems to begin again from this point, and proceeds with considerable clarity. Almost tempted to say cut and start from here. | Noted. |
| 18339 | 4 | | | | | Guiding question: As most of the results presented in the AR5 rely on neoclassical approaches, please think about how to frame your discussion of SD adjustments to existing economic tools (4.7.2) so that it provides a useful framing for the reader? | Noted. |
| 3617 | 4 | | | | | Delete or integrate with Chapter 3 (see comment 9 above) | Taken into account. |
| 12750 | 4 | | | | | You may like to consider to make either crossreference to Chap. 3 or to place the chapter there. | Taken into account. |
| 3618 | 4 | | | | | Delete or integrate with Chapter 3 (see comment 9 above) | Noted. |
| 8935 | 4 | | | | | This section can potentially be considerbly shortened by summarizing the different aproaches in Chaper 13 | Coordination with ch 13 is under way. |
| 3619 | 4 | | | | | Delete or integrate with Chapter 3 (see comment 9 above) | Noted. |
| 2563 | 4 | | | | | Needs more referencing. Too subjective | Accepted. |
| 8498 | 4 | | | | | Note that some sustainability planning kits, etc. have added culture and governance as pillars of sustainable development. Most recently, the UN has inluded institutions | Noted. (Yoke Ling) |
| 4839 | 4 | | | | | Especially the first half of the summary is too long and too narrative (too little concrete). It should be edited by at least 1/3 | Accepted. |
| 17091 | 4 | | | | | should specify more clearly state the limitations of modelling in making the transition between pathways AND in addition to technology it must consider lifestyle shifts (demand management) as well | Noted (Franck) |
| 17094 | 4 | | | | | 'equity and burden sharing in the context of climate policy' should also consider sharing of the global carbon budget and not just costs | See "Resources sharing approaches" |
| 17092 | 4 | | | | | "Why sustainability and equity matter" should not be considered in terms of the three pillars of sustainable development because they deal with the integration of policies and not with "equitable access to sustainable development" as agreed at Cancun by all countries, that is, sustainability and equity matter because they are about comparable standards of living and equality within global ecological limits. Please see the 'core principles' in this text in page7 lines 17 – 27 | Will reference EASD (in 4.7.3). Insufficient literature on EASD to form basis of this section. |
| 17093 | 4 | | | | | the key gap is how all can achieve comparable standards of living within the global carbon budget. The Rio + 20 World Conference of Sustainable Development agreed that people are at the center of sustainable development | Useful overall framing for key gap. |

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| 17090 | 4 | | | | | not relevant in framing issues with respect to global sustainability, which is the concern here with reference to global equity. If these are retained then the distinction between global and national equity must be made clearly. | Noted. |
| 10274 | 4 | 0 | | | | K. Akimoto et al., "Consistent assessments of pathways toward sustainable development and climate stabilization", Natural Resource Forum (forthcoming) will provide beneficial information on climate change and sustainable development including their trade-offs and synergies. Please see the paper. | Noted. Will check this paper (Yoke Ling) |
| 3203 | 4 | 0 | | | | The relationship between avoiding climate change and ensuring sustainable development is commented upon at the beginning of Chapter 4, but not discussed properly later. There is clear evidence for the claim that serious climate change may well undermine future generation's well-being, and thereby undermine sustainability. Hence, avoiding serious climate change is necessary for sustainability. In the report it is also argued that sustainable development is necessary for avoing climate change (see comments below). For this, no empirical evidence is offered. E.g., one might hope that changing consumption patterns so that wellbeing is generated in a more sustainable manner will be an important ingredience in combating climate change. However, the last couple of decades have seen a spread of the consumption patterns of North-America and Western Europe to newly developed countries. Is it at all feasible to implement the required change in consumption patterns during the time available before climate change becomes serious and irreversible? I strongly suggests that Chapter 4 discuss in a serious manner the possibility that effective policies, supported and enforced by a sufficient coalition of countries, that succeed in combating climate change might undermine short-term development in parts of the world and hence, the potential wellbeing of people living there. Also, the emphasis at some instances seems to be whether combating climate change is a means to sustainable development and equity; it should be the overriding goal in this context. | Accepted. We specify the interrelation SD-climate change and policy in the new version (section 4.1,4.2) |
| 8795 | 4 | 0 | | | | The tenor of much of the chapter makes barely recognised predictive epistemological and utilitarian ethical assumptions. | Taken into account (more references). |
| 8796 | 4 | 0 | | | | There is a danger that Human capital is an unexamined concept in this chapter and the usage typically makes humans and their relationships little more than cogs in the machinery of industrialism and capitalism. Some uses do suggest a less utilitarian view - e.g. where increased human capital could promote 'for changing consumption patterns'. | Will edit the executive summary to avoid such interpretations. (Esteve) |

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| 18295 | 4 | 0 | | | | There is much that is terrific about this draft chapter - it is ambitious, scholarly and informative, and often a fine guide to the relevant literature. I want to acknowledge this at the outset, because for brevity's sake I concentrate on my criticisms which will therefore make my response seem unduly negative and tough. Overall I find the chapter is too long and tests endurance. Its overall argument unclear. It crammed with detail but also has sections that are over-elaborated and seem poorly tied to the main task of the chapter and of the IPCC5. Too often I wondered why I was reading what I was - even when it was interesting. Stylistically, the chapter still needs further work to make it less staccato and lumpy. Numerous sections feel as though they are simply parked there rather than part of a larger argument or narrative and its material on climate change could almost be separated out. By contrast, the executive summary does not read as clearly as it must, recognising that this is often all people read of a chapter, and this may also be a reflection on the problem of the clarity of purpose of the chapter overall. The summary presentation of equity principles is confusing and needs clarification. Discussions of sustainable development (SD) are intrinsically fascinating but I feel the chapter sometimes loses itself and is not clear enough about where and how SD and climate change overlap and influence each other. The chapter should be edited with a view to clarifying, enhancing and reinforcing this connection. Its contents needs work to eliminate repetition (for instance, discussions of ethics, and of indicators) crop up several times. The foundational material on ethical principles for both SD and CC should be dealt with once, and early on. The chapter requires a conceptual summary of SD at the outset, introducing the main elements which are then elaborated upon. The reading of the literature on SD is sometimes superficial and needs to be both toughened and deepened, using Brundtland Report more prominently. There are five core principles guiding SD: i) intragenerational equity, ii) intergenerational equity, iii) biodiversity preservation, iv) precaution, v) ecological/planetary limits to growth. The last three are not given full enough consideration. Inparticular, the chapter offers little comment on three significant related bodies of research: on 'limits to growth' (both in the original debate and more recent revisitations) which has been an important driver of the SD debate, on dematerialisation, or on ecological modernisation. A discussion of critiques of conventional (material-based) economic growth and of green growth is vital, especially post Rio+20. The chapter also underplays the importance of institutions (political, legal and social) as factors guiding and occasionally determining the capacity for social and technological transitions/development. | Agreed: need clarity and coherent narrative.<br><br>On conceptual summary of SD: 4.2 should address the reviewer's point.<br><br>Will add a discussion of green growth and its contested relationship with equity (Chuks in 4.2).<br>Also the connection between degrowth and SD, the general decoupling question (Esteve, Franck) in 4.5.<br><br>Importance of institutions: part of political economy discussion 4.3.4. (Chuks) |
| 3276 | 4 | 0 | | | | The use of the term “luxury” is misleading (see e.g. Sections 4.4.1 and 4.7.3.1): I suggest it is replaced by “non-essential” or “inessential”. This is because luxury consumption can refer to purchase of goods that are higher than average price per unit, such as a Burberry coat or expensive cheese. In fact the purchase of luxury goods by consumers is generally less environmentally damaging than average consumption (Girod and De Haan 2010). The reason is that consumers have income, and once they have it they will either spend it or save (invest) it. But whatever they do with it, it’s use will give rise, directly or indirectly, to GHG emissions. So if consumers purchase luxury items which have below average GHG intensity of expenditure (kgCO2e/$), emissions will be lower than if they spend the same amount of money on cheaper goods. Also, luxury items are likely to have higher durability and hence longer product lifetimes, which can also reduce the throughput of goods and contribute to reducing emissions. Thus whereas in general the purchase of “inessential” items should be discouraged, the purchase of “luxury” goods by consumers with excess income should be encouraged.<br>This discussion does, of course, lead on to a discussion concerning incomes and and economic growth, which Tim Jackson will, I believe, be adding to the report.<br>Reference: Girod, B. and P. De Haan (2010). "More or Better? A Model for Changes in Household Greenhouse Gas Emissions due to Higher Income." Journal of Industrial Ecology 14(1): 31-49. | We agree that the concept of luxury consumption is imprecisely defined; what is considered luxury today can be considered a necessity tomorrow. It is a value loaded termm, which is diffult to apply in an objective way [JT, translation from Danish by Simon]. Yes, luxury consumption may have lower GHG emissions, but not always (e.g. driving a speedboat or a large car, causes large emissions). Over-consumption versus under-consumption, is the main issue, and is linked to inequality. "Essential" versus "In-essential" consumption also lends itself to normative interpretation. The main point is to examine what effect inequality has on emissions. (Simon) |

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| 16935 | 4 | 0 | | | | Despite the flagged sections "to be completed" and some points of disagreement noted below, this chapter is in a superb state for a FOD: congratulations to the authors. The starting review of previous IPCC reports is extremely helpful. As someone not well versed in this area, I found it all an enjoyable and informative read. My comments are correspondingly limited.<br>I have one overall stylistic criticism which is that – in sharp contrast with many of the other chapters – the absence of Figures is striking. Almost the only numeric Figure in this chapter at present (Figure 4.1) is so complex as to be almost incomprehensible. I understand that some more Figures are due to be included in the SOD; give careful thought to this, and also to the clarity of their message.<br>This chapter should potentially have particularly close intellectual relationships to chapters 3, 5, 12 and 14, some way of fostering links could be useful (and possibly it might make sense to move / adapt one or two figures from these). | Noted. More figures will be added. |
| 18335 | 4 | 0 | | | | General comment: Chapter 4 still fails to provide a clear and easily accessible framing of sustainable development that can be taken up by subsequent chapters. The TSU is thus submitting a range of questions that can guide the author team in focusing their discussions in the relevant sections. | Taken into account in particular by a new table linking to other chapters. |
| 18336 | 4 | 0 | | | | Guiding question: Please think carefully about how other chapters, such as Chapter 6, should be read with a view to the SD debate presented in your chapter? Here, you should think about how to provide a vision of what will be discussed (such as the decoupling of growth and emissions, mitigation reductions, the weak and strong SD debate within the context of stabilization scenarios), and clearly outline what is beyond the scope of the AR5. Could you also please develop a clear vision in how far your guiding narrative regarding consumption and wellbeing, equity and capacity building should be taken up in subsequent chapters? | We will connect better to the other chapters (new table).<br><br>The framing definitions will be improved (4.2). |
| 18340 | 4 | 0 | | | | The chapter strongly requires the introduction of formal definitions of SD such as those presented in the excellent paper by Fleurbaey, 2009. In this context relevant indicators should be introduced and discussed. | Some formulae can be introduced. (Marc) |
| 18341 | 4 | 0 | | | | The chapter needs to include the co-benefit debate (incl. green growth) and elaborate its importance in the SD context. In this context, linkage to Chapter 3 needs to be improved by highlighting the multi-objective nature of the welfare function. Also, relevant sustainability indicators should be introduced to be taken up in the relevant sections of the sector chapters. | Taken into account. A box on co-benefits and some discussion, coordinated with ch3, will appear in 4.2. (Marc)<br><br>Noted. A key message is that there are no sector indicators of SD, apart from |
| 18342 | 4 | 0 | | | | The chapter needs to improve its usage of relevant literature in several sections. | Noted. |
| 18343 | 4 | 0 | | | | The consistency of the equity and justice discussion needs to be improved and better linked to Chapter 3 (please note the currently unclear distinction/interchangeable use of terms intergenerational justice and intergenerational equity). Following on from this, better guidance on how equity issue could be operationalized for policy making would be useful. | Taken into account in 4.2 and 4.7. |
| 18344 | 4 | 0 | | | | Regarding the policy and finance context, the chapter should address the following aspects more clearly: a) Access to climate finance for developing countries to avoid lock-in; b) Public-private partnership discussion should be expanded and better linked to SD, c) SD perspective on CDM should be included, d) SD objectives as emerging from international arena (Rio+20 update) should be covered. | Taken into account in the new finance subsection 4.3.8 and the revised 4.7.3 (Yoke Ling, Sivan, Esteve) CDM might go to finance or technology (Yoke Ling; example of double goal mechanism in |
| 17636 | 4 | 0 | | | | This chapter was organized previous studies in a careful manner. However it the chapter was seemed to be long. Please try to summarize for each sections for being shortened. The reviewer suggests to make tables for organizing previous studies in order for readers to understand clearly. | Accepted. |
| 18609 | 4 | 0 | | | | Hard to read since big parts of the intended material is either un-written or will be revised (will be hard since the chapter is already sustantially over the target). | Noted. |
| 18610 | 4 | 0 | | | | An endless overview but leading us to …? | Noted. |
| 18611 | 4 | 0 | | | | A practical approach to sustainability isnot indicated/presented. | Noted. |

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| 18612 | 4 | 0 | | | | In reality it is probably very hard to agree upon what is sustainable in an absolute sense (sustainable to whom, given what and in which time perspective?) | Noted. We already say there are different meanings provoking different |
| 18613 | 4 | 0 | | | | Would be more fruitful to relate sustainablility to choices to be made and to discuss sustainability in relative terms? | Noted. This is already done to a large extent (indicators). |
| 18614 | 4 | 0 | | | | Equity is even harder. There is a huge difference between taking equity related issues into account or to use cc measures as tools to achieve equity but the difference is not made. The latter will make it even harder to agree on any sort of progress in the cc area. | Noted. The former is indeed the focus of this chapter, as far as equity is concerned. |
| 18615 | 4 | 0 | | | | FAQs much clearer in message – why? | Noted. |
| 9018 | 4 | 0 | | | | There is a need to revise the executive summary to capture the relationship between mitigation and adaptation and sustainable development, particularly the relationship between the last two concepts. | Accepted. |
| 9019 | 4 | 0 | | | | The Chapter must elaborate on the relationship among the three pillars – economic, social and the environment - in sustainable development. Potential policy instruments – such as carbon taxes, trade policy, international financial mechanisms – have each their own differential impact on these three pillars. | True but not directly relevant, as policy instruments are not the topic of this chapter. |
| 9020 | 4 | 0 | | | | There should be greater use of tables and figures in the Chapter to illustrate concepts such as the equitable access to sustainable development. | Accepted. |
| 9021 | 4 | 0 | | | | It is important to expand the discussion on the role of inequality, burden sharing, and the concept of common but differentiated responsibility in this chapter on sustainable development. Income inequality is the driver of inequality in consumption and inequality in consumption is in turn the main determinant of the availability of development space for poor countries. Excess or luxury consumption is needed in order to sustain jobs and exports among developing countries. Luxury consumption in turn closes off development space. | Accepted. Sections 4.2 and 4.4 will clarify, as well as 4.7. |
| 9023 | 4 | 0 | | | | There should be a broader discussion of technological development and transfer within the framework of sustainable development. There should be a a discussion of why relying on voluntary, private channels will be inadequate to provide the scale and affordability of the transfer needed to developing countries. The precedents of the green revolution and the Montreal protocol can be recognized as successful precedents on the role of international public policy and resources to transfer technology commensurate to the scale and timeliness required. | 1) The technology point can be integrated into our sub section on sustainable production 2) The mechanism (policy and resources) of spreading the green revolution was effective. |
| 9024 | 4 | 0 | | | | There is inadequate coverage of the financial transfers required for sustainable development. The Convention has set out the responsibilities for developed and developing countries in terms of technology transfer and financial support for realizing sustainable development goals | Transfers required for SD -- is it well defined? For CC -- should be taken up in Ch 16. In Ch 4, can raise issue and connect to equity discussion (4.7.3) and |
| 11126 | 4 | 0 | | | | It would be beneficial if it were substantially reduced, in particular sections 4.2.1, 4.2.2 and 4.3.5. In particular, discussion of equity is too long and the same is true for the concept of PAT and how it's componentes are presented in this chapter. | Noted (accepted re shortening). |
| 12841 | 4 | 0 | | | | In English speaking countries the word sustainable means ecological sustainable where as in Brasil it means economical sustainable. I propose to add a new FAQ "Is economical sustainable equal to ecological sustainable?" The content could be: in the long term it is, but for the short term it is not always true. | Taken into account in 4.2 (Yoke Ling) |

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| 3143 | 4 | 0 | | | | There is a huge overlap with chapter 3. I suggest that authors of both chapters review the other carefully and make some decisions about the strategy. For example, much of section 4.7 overlaps chapter 3. Discussions of justice also overlap.<br><br>The chapter is massively over limit; maybe it could be trimmed by focusing more squarely on what's new since AR4.<br><br>The chapter is very heavy on theory and large passages of text and has much too little real empirical information.<br><br>Section 4.3 and 4.4 overlap other chapters—such as the discussion of drivers (chapter 1, chapter 5, 6, and 7) and the discussion of social decision making (chapter 2). | Taken into account in the revision (shortening). But theory and reference to chap3 and concepts prior to AR4 are needed for this framing chapter.<br><br>Coordination with other chapters under way. |
| 18457 | 4 | 0 | | | | Clearly, the authors of this chapter have done a very thorough professional job of presenting the current knowledge base about many aspects of sustainable development and its connections with equity issues. The authors really know their stuff. | Noted (thank you). |
| 18458 | 4 | 0 | | | | Clearly, the authors of this chapter have done a very thorough professional job of presenting the current knowledge base about many aspects of sustainable development and its connections with equity issues. The authors really know their stuff. The general question is whether, at this stage in the evolution of IPCC reports, it makes sense any longer to conceive of an IPCC chapter as an encyclopedic coverage of diverse literatures – given the expanding knowledge base and the explosion of published literatures. Many observers think that, instead, chapters should be moving toward assessments of the literatures and the main points to be drawn from those foundations for the WG report. In other words, rather than saying "here is the knowledge base," a chapter should be saying "here is what the knowledge base tells us." In this case, it seems to me that the chapter covers so much territory that it loses any thread of main arguments and points. It is too long and too detailed, following an Executive Summary that comes across as dense and academic. It would be highly useful to (a) extract from the content of the chapter a limited number of key takeaway messages, (b) organize the ES around those messages, maybe in bulleted form, and (c) then use that structure to rethink what to say in the body of the chapter (and how to shorten it). For example, after p. 15 the chapter does not really return to a discussion of equity issues until p. 59, essentially allocating only about 20 of the 81 pages to equity. My suggestion would be that the discussions of sustainable development – sections 4.3, 4.4, 4.5, and 4.6 – be substantially condensed, in a number of cases recognizing significant overlaps with other chapters (e.g., regarding development pathway transitions with Chapter 6). This part of the chapter might have twice the impact if it were half as long. | These remarks will help us shorten and clarify. |
| 6091 | 4 | 0 | | | | It may be better to add a paragraph describing that climate change is one of the very important factors of sustainable development and, therefore, how to allocate scarce resources among various issues including poverty, health care, climate change etc. is one of the key issues in pursuing SD (Refer to 1st paragraph of the Executive Summary of Chapter 6). Also, though there are frequent citation of Rio Declaration in 1992, I found very few description on RIO + 20. What is important here is that, after 20 years, SD is becoming more and more urgent issues. This kind of description should be welcomed if readers find them in executive summary. | CC as important factor of SD is main point made in second para of key message (see p.10). This will improve in the new section 4.2.<br><br>Will discuss Rio+20. |

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| 4026 | 4 | 0 | 0 | 0 | 0 | The current draft represents a good and comprehensive overview of the topic. However I fully agree with the TSU that the text needs to be shortened. On the other hand, I would not suggest leaving out any (sub)section of the chapter completely. They are all important. The authors will likely need to find the way to shorten almost each and every section of the report. For example, the historical perspective might be shortened while the focus on recent developments, which are directly relevant to the climate change politics, needs to be preserved. This actually brings me to say that the chapter might as well need to be streamlined. All in all this is the climate assessment but it is yet to be clarified what is driving what? Is sustainable development driving the climate change policies or it is the other way round – the climate change policies is now a main driver of decision-making for sustainable development? For example, FAQ4.1 does not provide a consistent response. Otherwise, I do not have particular comments. Thank you. | Taken into account. Will shorten as part of overall shortening. The relation SD-climate policy will be specified further (inducing a revision of FAQ 4.1) (Marc, Sivan) |
| 10433 | 4 | 0 | 0 | | | There is no flow between paragraphs in this chapter | Accepted, will try to improve. |
| 5461 | 4 | 1 | | 7 | | The executive summary of this chapter does not discuss a key element of sustainable development- the potential for common pathways to this goal. The chapter summary seems focused more on the concept of SD rather than the implementation or tools to reach this goal. As authors note pn pg 6 oine 7 studies indicate a path forward- yet they seem to contradict themselves in a following paragraph- pg 6 line 15- the paragraph starting on line 18 seems to be the key to this discussion and the focus on ilucidating solutions should be more pronounced- the discussion on most of pg 7 seems superfluous and not likely to reach consensus | Focus on "how do we get there" could provide helpful way to tighten narrative. |
| 5492 | 4 | 1 | | 82 | | This chapter reads as though the authors were overwhelmed by the quantity of potentially pertinent information and unclear as to how to best synthesize it. Sustainability is not a clear concept and can have varying meanings based on the frame of reference used. Because of this, much of the chapter is devoted to review of concepts of sustainability, that while potentially related, are less critical than a more focused and narrow discussion with limited mention of the related topics. Personal happiness is one example of this. Perhaps the authors could more clearly couch their discussion in the Millenium Development Goals- and by doing so more clearly relate sustainability to GHG emissions | Discussion of MDGs may be useful as one small (and intermediate) step toward SD. |
| 3375 | 4 | 1 | | | | I have difficulties figuring out what the punchline of this chapter is. Could the chapter summarize relevant sustainable development dimensions at the end, providing a guide for the sectoral chapters when it is their turn to discuss SD issues? | 4.8 does this and will substantiate more (new table) |
| 16677 | 4 | 1 | | | | This chapter needs to lose 25 pages. The first 4 sections could certainly be shortened. While the equity discussion should remain it should be shortened and back reerence the previous chapter. Part of the problems is that equity as it is used in this chapter is rather different than the notions of ethics and justice used in the previous chapter. | Noted. |
| 15217 | 4 | 1 | | | | There are some repeated topics and descriptions. It needs to be restructure the chapter. | Will shorten and tighten narrative focus. |

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| 13995 | 4 | 1 | | 1 | | Chapter 4 covers an important theme in a WGIII context, as it links sustainability and responses to climate change. In terms of responses such as adaptation, transformation and linkages to equity and sustainable development, these are also broadly discussed in WGII. What is clear from reviewing both drafts is that WGIII approaches the concepts and relationships with a narrower lens that is very much informed by economic perspectives. Other perspectives and literatures are not well represented and assessed. Clearly, to understand how change comes about (particularly at the magnitude and scale being discussed here) calls for an assessment of knowledge on the personal, cultural, institutional and systems changes that are needed to foster more resilient and sustainable development paths. This also involves questioning business-as-usual and asking what role culture and cognition (translated into economic and social policies, legal and legislative frameworks, resource management practices, educational systems, and power relationships) play in facilitating change. One specific example is the lack of reference to behavioral psychology in the discussion about consumption. Some may be covered 4.3.3, but a more holistic discussion on what drives and limits responses would include these perspectives throughout the chapter. Literature to consider: David Manuel-Navarrete (2010) Power, realism, and the ideal of human emancipation in a climate of change. WIREs Clim Change 2010, 1, pp. 781-785; David Manuel-Navarrete, Mark Pelling, Michael Redclift (2011) Critical adaptation to hurricanes in the Mexican Caribbean: Development visions, governance structures, and coping strategies, Global Environmental Change 21, 249-258; O'Brien, K. 2011. Global Environmental Change (2): From Adaptation to Deliberate Transformation. Progress in Human Geography. Published Online 10 November 2011; Brown, L. 2010. PLAN B 4.0. New York: W.W. Norton and Company; Mezirow, J. 2000. Learning as Transformation: Critical Perspectives on a Theory in Progress. NY: Jossey-Bass; Hayward, B. 2008. Let's talk about the weather: Decentering democratic debate on climate change. Hypatia 23: 79-98; Moser, S. C. and J. Ekstrom . 2010) A framework to diagnose barriers to climate change adaptation. PNAS 107: 22026; Newman, P et al. 2009. Resilient Cities. Responding to Peak Oil and Climate Change. Island Press. Washington D.C; Westley, F., Olsson, P. Folke C. et al. 2011. Tipping Towards Sustainability: Emerging Pathways of Transformation. 3rd Nobel Laureate Symposium on Sustainability, Stockholm; Hulme and H. Neufeld (eds.) Making climate change work for us. Cambridge UK: Cambridge University Press; Patt, Anthony, Diana Reckien, Richard J.T. Klein, Detlef van Vuuren, Markus Wrobel, Nico Bauer, Gunnar S. Eskeland and Tom Downing (2010). What can social science tell us about meeting the challenge of climate change: five insights from five years that might make a difference. In M. Hulme and H. Neufeld (eds.) Making climate change work for us. Cambridge UK: Cambridge University Press, pp. 369 – 388; Meadows, D. 1999. Leverage Points: Places to Intervene in a System. Sustainability Institute Papers. Hartland, VT: Sustainability Institute; Geels, F. W., 2002. Technological transitions as evolutionary reconfiguration processes: a multilevel perspective and case study, Research Policy 31(8/9): 1257-1274; Berkhout, F. 2002. Technological regimes, path dependency and the environment. Global Env. Ch., 12(1): 1-4; Barbier, E.D: 2010. A Global Green New Deal: Rethinking the Economic Recovery. Cambridge Univ. Press; Anderson, K. L. and Bows, A. 2008. "Reframing the climate change challenge in light of post-2000 emission trends." Philosophical Transactions of the Royal Society A: Mathematical, Physical & Engineering Sci. 366: 3863-3882. | Helpful references. Will review WGII.<br>Dimensions that need to be added:<br>Questioning BAU:<br>Culture/cognition: 4.3.3 and 4.3.2?<br>Power relationships: Discussion of political economy |
| 13996 | 4 | 1 | | 1 | | The chapter starts out quite clear and structured, but from section 4.6 and onwards the text comes across as unstructured and lacking flow. The author team may consider reorganizing some of the text and also cutting back on sub-headings. In some cases the sub-headings do not match the text that follows. One example is 4.6.1.2. | Noted. |

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| 13997 | 4 | 1 | | 1 | | The chapter aims to discuss responses to climate change, including both mitigation and adaptation, and adaptive capacity and mitigation capacity. The chapter also wants to get at the root causes that climate change shares with other global challenges that both generate risks and push the world into unsustainability. If these deeper root causes had been the backbone for the discussion in chapter 4, it may have been easier to cover both mitigation and adaptation. But as the chapter now reads, it only partly covers both and in some parts it is even stated that the primary focus of the chapter is on mitigation. It would have been good to present the aim of the chapter more clearly upfront. This chapter has a difficult task, and unfortunately it suffers from the rather artificial thematic division between WGII and WGIII in terms of mitigation and adaptation responses. There is little doubt in the literature that ethical and sustainable responses to climate change include both mitigation and adaptation. Some even argue that mitigation is the greatest adaptation that society can do, and as the more newly introduced transformation theme takes form, there will potentially be more literature focused on ways to increase capacities and competencies of individuals, groups and institutions to understand, initiate and facilitate change and responses. | Primary focus is mitigation. Still, point is well taken, Chapter could benefit from focus on root causes (beyond those drivers discussed in 4.3, such as those discussed in Sygna's comment immediately below) |
| 13998 | 4 | 1 | | 1 | | There is a focus on consumption and production in this chapter, and subsequent chapters will focus on sectors. Since this chapter is that overarching one where responses are linked to the wider sustainability debate, there should be more coverage of the role of the financial and trade systems, governance and development paradigms, power and gender relations, knowledge production systems, and values and worldviews. | Accepted. |
| 11567 | 4 | 1 | | 43 | | Very interesting and well discussed passages. | Noted (thank you). |
| 7751 | 4 | 1 | | 115 | | I wanted to preface my comments with a short note to explain: i) I am an LA for WGII and wanted to review something in WGIII to get a sense of what was evolving - to make sure we are linking appropriately with WGIII; ii) I am not an expert in mitigation; iii) I have only reviewed the parts of this chapter on which I feel that I have some expertise - hence there are many sections that I have not read. | Noted. |
| 18302 | 4 | 10 | 1 | | | The point is better made here.... CC underlines the potential for equity and SD. | Accepted. |
| 18303 | 4 | 10 | 10 | 7 | 14 | 'Can help' is an overstatement. If this second claim is to be made, it needs to be referenced.While I do not hold to the line that authoritarian action around climate change can be sustained indefinitely, the effectiveness of very different governance regimes in implementing short term technology-altering change is clear, and the 'inequitable' nature of those regimes may be central to their success. This chapter fails to grapple with this problem. | Noted. Here we do not talk abour political regimees, only about general equity. |
| 14009 | 4 | 10 | 12 | | | Suggest adding "…without QUESTIONING EXISTING DEVELOPMENT PRIORITIES and adopting…" | Accepted. |
| 14377 | 4 | 10 | 15 | | | Sounds like Club of Rome in 1970s | Will delete the "transgressing planetary |
| 14313 | 4 | 10 | 21 | 10 | 24 | Given the chapter focus on both mitigative and adaptive capacity, have/will cross-linkages with WGII chapter 20 on Climate-resilient pathways: adaptation, mitigation, and sustainable development been/be taken more explicitly into consideration in the next draft versions of chapter 4? | Will review latest WGII draft. |
| 18304 | 4 | 10 | 22 | | | Suggest changing 'will' to 'may'. The assertion about the link between SD and equity, and CC responses is discussed above. The assertion here is a value position which may be challenged. For instance, it is arguable that emphasising the SD elements of CDM may (sadly) lead to poorer mitigation outcomes. Also, the term 'climate challenge' is an aggregation that limits consideration. Change to 'the challenges of mitigation and adaptation'. | Accepted. |
| 14010 | 4 | 10 | 23 | | 24 | Since the chapter aims towards discussing both mitigative and adaptive capacity, there needs to be a deeper discussion of why this is important in a sustainable development context, and that means going deeper into the social and human dimensions of responses and change. It should also be discussed whether adaptive capacity in SD context is different from what is talked about in WG II, where it partly is limited to responses to impacts. | Important point. General socioeconomic development (such as educating girls) as part of SD strengthens adaptive capacity but is different from specific adaptation measures |
| 5463 | 4 | 10 | 25 | 10 | 43 | Two paragraphs are great- | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8797 | 4 | 10 | 32 | 10 | 35 | Discussion of the harm to individuals, societies and nature from over consumption and under consumption could include mention of 'Global Virtue Tradition' - in particular moderation or temperance - that stretches back before Aristotle's Nicomachean Ethics, is arguably the ethical starting point of the majority of the global population, includes epistemology most capable of coping with difficulties in predicting the Earth System and includes directly relevant literature such as http://www.earthcharterinaction.org/invent/images/uploads/echarter_english.pdf, Palmer M and Finlay V (2003, n.b. page xi, Faith in conservation: New approaches to religions and the environment, Washington DC: The World Bank, http://go.worldbank.org/3L9IDQNFO0 or http://www.arcworld.org/books_resources.asp. Accessed 9 May 2011); Engel JR & Engel JG (Eds.) (1990) Ethics of environment and development: Global challenge, international response, London: Belhaven; Connelly J (2006) 'The virtue of environmental citizenship' in Dobson A and Bell D (Eds.) Environmental Citizenship, Cambridge, Mass.: MIT press; Sandler R and Cafaro P (Eds.) (2005) Environmental virtue ethics, Lanham, Md.: Rowman indicates something of the connection between consumption, ethics and climate science, with my currently unpublished book manuscript being a much more in depth treatment. | Helpful references (for 4.3.3); Melissa Lane's book is another reference. |
| 18305 | 4 | 10 | 36 | | | The term 'data' is plural…. 'there are more data'... | Accepted. |
| 3215 | 4 | 10 | 48 | 11 | 2 | A just transition to reduced emissions is a nice plan A. Does there exist a plan B and do we need it? | Noted. Interesting question. |
| 18306 | 4 | 10 | 48 | 10 | 48 | A just transition is desirable… but it may not be necessary in the short term… Perhaps 'A just transition is desirable if enduring public support is to be gained….' | Accepted. |
| 2914 | 4 | 10 | 36 | 10 | 43 | proposal is to remove this alinea | To revise. What is meant is lack of access to meeting basic needs. |
| 6891 | 4 | 10 | 4 | 11 | 5 | Please provide more specific references to WGI/WGII AR5. | Accepted. |
| 8491 | 4 | 11 | 10 | | 12 | See comment 20 | See response to comment 20. |
| 5464 | 4 | 11 | 21 | | | Would seem logical to mention valuation of ecosystem services in this section | Rejected. This is dealt with in 4.7. |
| 8798 | 4 | 11 | 26 | 11 | 27 | That the key message understood by Chapter 4 from Chapter 3 is 'notions of well-being and social welfare function' is unsurprising but a sad indictment of the narrow focus of Chapter 3 on undemocratic and irrational utilitarian ethics in the face of an unpredictable Earth System which cannot be adequately understood to be fed in to CBA (Charlesworth and Okereke, 2010). | Taken into account. The notion of well-being is explained to be broader than this reader might think. |
| 3216 | 4 | 11 | 3 | 11 | 4 | What is the empirical basis for stating that this is likely? | Taken into account in the revision, by improving the framing of key concepts. |
| 7761 | 4 | 11 | 33 | 17 | 16 | This section, 4.2, is very theoretical and lacks empirical evidence. I have to admit the text looks much like my introductory lecture to sustainable development that I give to the 3rs year undergrads. A lot of this information provided in this section is straight from text books, it is not cutting edge research with relevance for lcimate change mitigation. I would reduce the entire section in its current form to a couple of paragraphs and use the remaining space to provide up to date and relevant empirical evidence. Specific comments onthis section follow | Taken into account in the revision (shortening, but key concepts must be introduced). Not all readers will have followed your 3rd year lecture. |
| 7762 | 4 | 11 | 39 | 13 | 21 | This section 4.2.1 seems unnecessary, refer to a text book which describes all this, cut to a couple of sentences - what is new in this area? | See previous box. |
| 11731 | 4 | 11 | 4 | 11 | 6 | Those targets and time peaking are not political agreement. Amendant to the apropriate wording is needed. Reffer Decision 1/CP.16 and Decision 1/CP.17. | The term used in this sentence is part of the Executive Summary and so we need to revisit the section that addresses this too. On page 11, It is explicity stated as "politically agreed targets". 2C was politically agreed in the Copenhagen Accord of 2009 but several UNFCCC Parties objected to the non-participatory manner that document was forged so it is in its entirety only formally"noted". 1.5 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10642 | 4 | 11 | 4 | 11 | 6 | Those targets and time peaking are not politically agreed. Amendant to the apropriate wording is needed. Refer Decision 1/CP.16 and Decision 1/CP.17. | See previous box. |
| 9980 | 4 | 11 | 4 | 11 | 6 | This part should be changed from "agreed targets such as 1.5 or 2 ℃" to "noted targets such as 2 ℃". These targets are not agreed but only politically mentioned. In addition, the 1.5 ℃ target is not realistic and even 2℃ target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract).<br><br><Reference><br>[1] Höhne, N., C. Taylor, et al (2011). National GHG emissions reduction pledges and 2℃: comparison of studies. Climate Policy, 1-22, DOI:10.1080/14693062.2011.637818. Available at: http://iopscience.iop.org/1748-9326/5/3/034013/fulltext/<br>[2] Rogelj, J., W. Hare, C. Chen & M. Meinshausen (2011). Discrepancies in historical emissions point to a wider 2020 gap between 2℃ benchmarks and aggregated national mitigation pledges. Environmental Research Letters, 6, 9, DOI:10.1088/1748-9326/6/2/024002. | Accepted. |
| 9813 | 4 | 11 | 44 | 11 | 45 | Especially in this chapter you should add a very important part of the Brundtlanddefinition, that is omitted quite often "and chose their own lifestyle" | Noted. There is a long discussion of lifestyles in the chapter (section 4.4). |
| 18307 | 4 | 11 | 5 | | | Delete 'rather' | Accepted (Yoke Ling). |
| 3217 | 4 | 11 | 7 | 11 | 9 | Are we going to change the way people think within the very years available before GHG emissions must be reduced significantly? And how? | Agree - the UNFCCC/Kyoto Protocol legal regime as well as the Bali Roadmap were all agreements that would have made a difference if they had been implemented fully and |
| 15651 | 4 | 11 | 10 | | 12 | One area where social scientific assessment can inform policy on the issue of equity is through empirical assessment of the strength of particular perceptions among different groups about what is equitable in the context of climate change policy. See e.g. Lange, A., C. Vogt, and A. Ziegler. 2007. On the Importance of Equity in International Climate Policy: An Empirical Analysis. Energy Economics 29:545-62. This area of research could be accorded more prominence in Chapters 4 (as opposed to the more theoretical literature covered in Chapter 3). | Accepted. Useful reference. |
| 10977 | 4 | 11 | 4 | 11 | 6 | Is the target of one point five degrees centigrade really agreed politically? It might be difficult to achieve even two centigrade. | This needs to be clarified. "Politically discussed targets" ? |
| 6892 | 4 | 11 | 4 | 11 | 6 | Such statements on projected climate change need to be based on the WGI AR5 assessment, probably best on WGI AR5 Chapter 12. Reference needs to be added. | Accepted. |
| 13272 | 4 | 11 | 26 | 11 | 26 | It is said: "(…) the hazard confronting future generations"; it should say "(…) the hazard confronting current and future generations" | Accepted. |
| 18308 | 4 | 11 | | | | This section does not really deal with the issue of SD indicators. | Accepted. There was a typo in the title. |
| 14314 | 4 | 11 | 33 | | | The section on approaches and indicators remains quite general and the presentation of key concepts of SD and equity could be tightened up. More generally, the added value of repeating literature findings and discussions that in many cases preceed both AR4 and AR3 can be questioned. It would be interestingand novel if the section could have a more pronounced emphasis on tying up the concepts of SD and equity directly to climate change and to the latest literature and 'real world' trends. It does so at the very end, page 17 line 4 to line 16, but the discussion of low carbon development strategies/economy/society/energy development could be expanded to include e.g. the concept of 'climate compatible development', 'climate resilient development', NAMAs, the issue of mainstreaming climate change into development planning and decision-making processes, and these approaches or concepts could then be discussed in the context of the original and broader definitions and interpretations of SD and equity and their theoretical underpinnings be explored. | Taken into account (Yoke Ling) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4684 | 4 | 11 | 39 | | | This chapter could be appreciated as the first comprehensive review of IPCC reports regarding sustainability and sustainable development. A more detailed explanation of the concept and its definition, along with historical background before publication of the Brundtland report is needed. The Brundtland report was not the first to launch the concept and definition, and these concepts should be understood within their historical context. For example, please see:<br>- Lele (1991), World Development 19(6): 607-621.<br>- Dresner (2008), Earthscan.<br>- Robinson (2004), EcolEcon, 48(4): 369-384. | Rejected. We are asked to streamline and focus on recent ideas/facts. |
| 12683 | 4 | 11 | 40 | 12 | 10 | In addition you may like to mention that the Brundtland Report includes intergenerational justice ("… the ability of future generations to meet…") as well as the need principle ("… in particular the essential needs of the world's poor..."). | Accepted (Yoke Ling). |
| 9814 | 4 | 12 | 1 | 12 | 4 | Besides the concept of needs and limitations you should add the concept of lifestyle, that is actually adressed in other parts of the report. | Accepted (Yoke Ling). |
| 18311 | 4 | 12 | 11 | 12 | 16 | This para is insufficiently clear. The Brundtland Report does not do this unless you are reducing 'development' to mean an increase in' material capacity', which that report does not do.Debate over its definition of SD has recognised that tension exists between its desire for intragenerational equity and intergenerational equity. A development path is 'sustainable if the capacities for development can be preserved etc'. It is unclear in the present sentence what 'benefits' might be and can be read to suggest that material outcomes must endure eternally. The debate referred to later on this page - between supporters of weak SD, who believed that under SD resources and nature can be transformed to/substituted by capital for human benefit, and supporters of strong SD, who are much more limiting - should be introduced here. | Accepted, the paragraph will be deleted. |
| 18313 | 4 | 12 | 17 | 4 | 25 | This para weakly fails to take a position on a central debate about SD. If one accepts a triple-bottom-lone version which gives each element equal priority, then what are the consequences for action around climate change, specifically for biodiversity preservation? This discussion should follow that about weak and strong SD. | To be taken into account (Yoke Ling). |
| 9815 | 4 | 12 | 17 | 12 | 25 | When defining sustainable development you should also include the time perspective. Especially in the current economic system shorttermism is a | Noted. |
| 8256 | 4 | 12 | 26 | 12 | 41 | Two approaches of sustainability, weak sustainability V.S. strong sustainability, are reviewed here. It would be more illuminating to provide some evidences or arguments to shed light on which approach is more relevant or realistic. | Noted. This is an ethical divide, not an empirical issue. |
| 18135 | 4 | 12 | 27 | 12 | 29 | Reference required. | Accepted (Yoke Ling). |
| 5465 | 4 | 12 | 30 | | | Here appropriate valuation of factors in strong sustainability would seem to remove this discrepancy | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8711 | 4 | 12 | 42 | 12 | 45 | One of the most important tools in monitoring and predicting the health of ecosystems is the use of biological parameters, as the composition and abundance of species within ecosystems, research in this direction are able to determine what the characteristics of natural ecosystems are and how this can change over the changes caused by climate change. The effects are shifts in geographical range, promoted by shifts in temperature patterns that delimit species boundaries. Each 1o C of change moves ecological zones on Earth about 160 Km. The methods to monitor this changes include long-term observation and re-surveys of previously sampled sites (Thuiller,W . Climate Change and the ecologist. Nature. Vol 448 / 2 August 2007. ). But only the monitoring of taxonomical composition of ecosystems couldn't be enough to understand how the ecosystem functionality is affected by climate change. A new approach for this is the identification of functions related to each species with the intention to understand the importance of species organization to maintain the ecosystems service, trough this is possible to develop a computational model capable to predict how and when these functions can collapse. A good model for this is called Complex Adaptive Systems (CAS), which is a self-organized system, where the controlling rules define how the system changes in response to changes of the past and present in the environment where they are submitted (LEVIN, S. 1999. Fragile Dominion. Complexity and the Commons. Massachusetts, Perseus Books). In CASs systems, the redundancy of species playing the same function in ecosystem is much more important than the simple number of individuals or species. In this sense, different species can play the same function at different conditions, so the system acquires resilience to face changes like climate changes. The universality of the concept of complex adaptive systems brings out an alternative perspective to the context of ecosystems involving great diversity of organisms and complex trophic interactions. For example, in the case of tropical ecosystems, it's possible to understand not only the role of taxonomic groups, such as is the case of genres or species, but also the role that taxa take when organized into functional groups. Thus we can understand how changes in the scale of observation can influence the perception of the different functional behavior of ecosystems, and from that understand how their integrity is maintained, and most importantly, how and when it can collapse (Gontijo, A.B. 2009 "Estudo e modelagem das dinâmicas estruturais de assembléias de formigas tropicais em diferentes escalas ecológicas" Master's degree dissertation. Federal University of Ouro Preto. Tropical Biomes Ecology Program. http://www.repositorio.ufop.br/handle/123456789/397?mode=full&submit_simple=Apresentar+o+registro+completo). | These useful references are introduced. |
| 14011 | 4 | 12 | 42 | | 45 | There is now a large and well established literature on vulnerability, and the new direction is more on how to adress vulnerabilities and create human security through climate change responses and sustainable development. | OK |
| 15271 | 4 | 12 | 42 | 12 | 45 | In addition to vulnerability, the notion of resilience should be mentioned here as an important concept in discussing sustainability. Sustainability of a system can be understood as a balance between efficiency and resilience (Lietaer, Ulanowicz, and Goerner, 2009). Resilience is dependent upon diversity and connectivity. Diversity refers to the existence of different types of agents acting as "nodes" in the network. Connectivity concerns the number of pathways between agents. A system's resilience is enhanced by more diversity and more connections to fall back on in times of trouble or change. In many cases efficiency tends to increase through streamlining, which usually reduces resilience by decreasing diversity and connectivity.<br>Goerner, Sally J., Bernard Lietaer, and Robert E. Ulanowicz (2009). "Quantifying Economic Sustainability: Implications for Free-Enterprise Theory, Policy and Practice." Ecological Economics, 69, 76-81. | Reference introduced. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18310 | 4 | 12 | 6 | 12 | 8 | This treatment of sustainability seems to ignore a body of writing on this issue. For effective reference, see Dobson in the journal Environmental Politics. Sustainability does not refer to 'the preservation of a certain state of affairs' but rather to the maintenance of the capacity of human and biological systems to evolve over time. Similarly, the definition of 'progress' has been much debated and cannot be simply invoked here. Perhaps better to write "development refers to the improvement of welfare and well being in human societies, and etc...". It would be good to introduce, here, the fact that - definitionally - sustainability (and SD), has temporal and spatial elements, and also encompasses humans and other species. Then these elements can be expounded systematically... with some reference to how climate change affects them. Some of them do come through, but seemingly more haphazardly, later in the chapter. The 'rights of Nature', however, is generally poorly handled and largely overlooked in this rather anthropocentric view of SD. | Taken into account (Yoke Ling). |
| 13273 | 4 | 12 | 16 | 12 | 16 | At the end of the paragraph I suggest to add: "(…). And in this sense, the climate system is a key environment component to consider when addressing Sustainable Development and environmental issues." | This is clarified in the new version, 4.2 is substantially revised. |
| 15108 | 4 | 12 | 20 | 12 | 22 | Add: ¨ Sustainability in the economic sphere has to do with the preservation of a healthy economic and financial system IN BEBEFIT OF THE WHOLE, while sustainability in the social sphere is TO WORK FOR THE BENEFIT OF THE POPULATION INSTEAD OF about avoiding conflicts and social unrest¨. | The sentence has been deleted. |
| 13274 | 4 | 12 | 21 | 12 | 22 | Social conflicts are inherent of social dynamics, so maybe it is better to replace "avoid" with "properly manage" | The sentence has been deleted. |
| 18316 | 4 | 13 | | | | There is no mention of the spatial dimension of sustainability - global, regional, local? | Accepted. |
| 12684 | 4 | 13 | 1 | 13 | 10 | Maybe you like to reconsider whether the statements made, here, are in line with the concept of SD. | Not relevant. |
| 8800 | 4 | 13 | 22 | 17 | 16 | It may be more useful to focus on inequity principally created by market ideology, market fundamentalism or market dogmatism (e.g. Soros G (1998) The Crisis of Global Capitalism) and Stiglitz (http://www.nobelprize.org/nobel_prizes/economics/laureates/2001/stiglitz-autobio.html). That is it is easier to identify inequity and its causes and perhaps address these causes than produce a universally agreed description of equity which can be worked towards. To be even blunter, working against inequity is 'easier' than achieving equity. | There is a tension over the extent of the role of the market and there is interesting analysis in the wake of the recent financial crises and the limits even viability of the carbon market in the absence of ambitious emissions |
| 18317 | 4 | 13 | 22 | | | This tighter discussion of distributional, allocative and procedural elements of equity could have been prefigured in the introduction and the earlier section on 'principles'. | It is indeed in the introduction. |
| 5466 | 4 | 13 | 23 | | | This paragraph can be deleted | Rephrased. |
| 12686 | 4 | 13 | 23 | 13 | 32 | You may like to proof whether "Equity Theory" is the right wording, here, or whether it might make more sense to talk about different dimensions of Equity and ways of operationaliz the concept. You may like to check Adams, J.S. (1965). Inequity in social exchange. In L. Berkowitz (Ed.), Advances in experimental social psychology (Vol. 2, pp. 267-299). New York: Academic Press. | This comment ignores the relevant scholarship. Thomson 2011 is more relevant. |
| 18314 | 4 | 13 | 4 | | | This needs clarification. The first part of this sentence can be true only if the time frame is cut short, and therefore the notion of sustainability becomes purely semantic. The second part can be right, as benefits need not be distributed equitably. | This paragraph has been deleted. |
| 5467 | 4 | 13 | 44 | | | Is it possible to consider equity for a finite period and would that make use of this concept less cumbersome? | This had to be shortened drastically. |
| 8799 | 4 | 13 | 44 | 14 | 3 | It can be argued that the problem is less discounting than it is 'comparing streams of utility over time'. Asking the broader question 'what is the right thing to do or right approach to take' should lead to more satisfying answers, as this can include a range of ethical schemes with virtue typically being more comfortable with taking a longer view than at least utilitarian ethics - this can often be seen by the organisations and individuals who take a long term view rather than maximising short term profit. | Not clear comment. |
| 18315 | 4 | 13 | 6 | | | Counter-intuitive. An example would be useful here. Swidden agriculture - logging forests intermittently with stone axes and then burning them on a long cycle ?? | This paragraph has been deleted. |
| 2915 | 4 | 13 | 11 | 13 | 21 | Suggestion is to start with 'Indeed … sustainable development. One guiding principle is …. | Not relevant. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18136 | 4 | 13 | 3 | 13 | 3 | The concepts here are quite complex and could be simplified .For example, the difference between welfare and well-being needs to be elaborated. The thrust of the paragraph and what it intends to convey is not easily apparent. | Accepted, will clarify. |
| 18309 | 4 | 13 | | | | This section does not deal effectively with equity in climate policy | Rejected. |
| 18312 | 4 | 13 | | | | This section does not deal effectively with equity in climate policy. It should come after section 4.2.3. (which should include the more general discussions that are also part of thissub section) and specifically confine itself to the underlying philosophical considerations of 'common but differentiated responsibility' (CBDR) specifically in relation to issues of historical, distributional and procedural justice... | Chapter 3 deals with the concept and philosophy of historical and distributive justice. |
| 12685 | 4 | 13 | 23 | 13 | 23 | Sustainability might be one form of equity or at least contain a limited number of equity characteristics that match with the sustainability definition (SD). So the SD already contains the relevant equity principles in its notion even it is controversial which equity characteristics are leading the process of sustainabile development. In any case, there are equity concerns definitely not belonging to sustainbility. They can be left aside for climate change discussions. Moreover it is not obvious why sustainability and equity are dealt with in a separate way at several places of the chapter. So if there is a reason for not dealing with equity and sustainability in an integrative way, the difference between the two normative concepts should be outlined at the beginning of the chapter. In the other case for the climate change discussion relevant characteristics of the equity principle could be considered with regard to potential controversies under the headline sustainability principle. | Noted. Sustainability is not the same as equity. |
| 12687 | 4 | 13 | 27 | 13 | 28 | The impact of democracy on sustainability could be explained in more detail. It might be useful to base this question on the sustainability issue of the Brundtland Report definition rather than on the three pillar model (see comment 1, 21). For the temporal dimension of the last mentioned model democracy is not necessarily constitutive. Citizens of democracies have the highest amount of per capita emissions today (especially European states and the USA). Moreover engagement of democracies for sustainability may not be due to the democratic structure of the state but could also be a result of the scarcity of resources or due to high damage potential in the course of climate change. Above that the mentioned motives may not only be found in democratic but non-democratic states, too.<br>In contrast, with regard to the spatial dimension of sustainability, democracy could gain importance, especially if there is proof for the thesis that democratic states might be mor willing to share wealth with each other than with non-democratic states. In this case, e.g., the contraction and convergence approach (see IPCC Draft, Chapter 4, Section 4.7.3.3, p. 70, line 38) might be easier to implement within democratic than non-democrativ structures. In any case it should be laid out at which level democratic structures are helpful: a) at the national level, b) at the international level or c) both. Here, the international level might be the most interesting “democracy” concern. Still only some characteristics of democracy may play a role when dealing with climate protection (e.g. equal representation, transparency and the integration of equity concerns may help to reach an international agreement). | To be taken into account. |
| 18318 | 4 | 14 | 14 | | | I don't understand this sentence. | This has been revised and shortened due to space constraint. |
| 3218 | 4 | 14 | 16 | 14 | 29 | The argument of Asheim et al. (2012) is reliant on the modeling of the future as consisting of an infinite number of generations. If the present is better off than the future, then a uniform addition to future generation's wellbeing at the sacrifice of present wellbeing reduces inequality and increases the sum of utility independently of the degree of inequality aversion (i.e. how wellbeing is mapped into utility). | The new formulation here is actually more general as it is compatible with a finite horizon (the priority for the future is then not absolute but strong). |
| 18319 | 4 | 14 | 33 | | | This sentence seems a little loose. | It has been deleted. |
| 14012 | 4 | 14 | 35 | | 39 | A very important point with reference to preserving the status quo, that in many cases is the source of the problem. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 5468 | 4 | 14 | 4 | 29 | | Could more clearly be illustrated with a figure | Rejected for lack of space (and this is not central to the chapter). |
| 7763 | 4 | 14 | 4 | 14 | 39 | I am not convinced by this argument. I would either think how better to explain these points or delete all this text | This has been revised and shortened due to space constraint. |
| 7764 | 4 | 14 | 40 | 14 | 50 | Nicely argued, BUT there are no references, on what are you basing this? | Accepted. |
| 14378 | 4 | 14 | 41 | | | Basically misguided to contend that the 4 billion have nots cannot aspire to current living standards of the top 1-2 billion because that would be inherently unsustainable. Even with current “production processes,” but that is a red herring because productivity will increase. Don’t forget that the same arguments were made in the 1970s and shown to be wrong: the global economy did not collapse because of the exhaustion of natural resources. | Taken into account, see 4.2.2 and 4.5. |
| 3219 | 4 | 14 | 45 | 14 | 48 | Is the following statement an empirical fact or an ethically based side constraint on climate policies: "Put more bluntly, any attempt to preserve the natural environment by keeping living standards low for a large part of the world population will face strong political resistance, and will almost certainly fail." | This is empirical. |
| 12690 | 4 | 14 | 49 | 14 | 50 | Is it really the question? Or should not rather climate policy fulfil the claims of SD? | The sentence has been deleted. |
| 2916 | 4 | 14 | 1 | 14 | 3 | suggestion: IPCC WG3 consider that the horizon in finite and uncertain. Remove sentence 2 and 3 | Rejected, this is a misunderstanding. |
| 15109 | 4 | 14 | 41 | 14 | 43 | Add: ¨On the one hand, the convergence of developing countries toward the standard of living of the richest populations is admittedly unsustainable if the consumption and production processes of the rich are universally adopted, AND WILL EXCEED THE REGENERATION CAPACITY OF EARTH ¨ . | Accepted. |
| 12688 | 4 | 14 | 16 | 14 | 18 | For sustainability questions equity needs to foucus on contradicting interests between the present and future generations. But it may not imply an unconditional preferential treatment of future generations. Discounting of future generation’s interests is e.g. dealt with in Arrow, Kenneth J., Discounting, Morality and Gaming, in: Portney, Paul R. Weyant, John P. (Eds.), Discounting and International Equity, Washington 1999, pp. 13-22. Discounting is mostly based on attended (technological) efficiency increase and on uncertainties (see e.g. Buchholz W., Schumacher, J. (2008), Discounting and Welfare Analysis Over Time: Choosing the η CESifo Working Paper Series). So the conflict between present and future generations might be resolved best when the discounting rate is well justified and the critic is given with regard to the assumptions of discounting (too optimistic efficiency assumption or a too pessimistic assumption about the uncertain utility of natural resources in future, cf. Buchholz/Schumacher, ibid). You may also like to add the idea of Mansbridge, Jane, Rethinking Representation, in: American Political Science Review 2003, S. 515-527 (515). | Noted. Note that there is a key difference between discounting utility and discounting money (or consumption). |
| 12689 | 4 | 14 | 49 | 14 | 50 | Maybe it makes sense to differentiate between intragenerational and intergenerational equity. Intergenerational equity is according to the Brundtland Report part of sustainability. So the phrase "sustainability can be achieved via equity principles" may be misleading as it suggests that sustainability does not imply intergenerational equity. So it maybe helpful to use the term "intragenerational equity" here. | The sentence has been deleted. |
| 5470 | 4 | 15 | | | | It appears from this discussion that the concept of SD can also be used to describe social goals from a particular perspective ie women's rights. It seems to the reader that these alternative views of SD are tangential to the discussion- could be condensed and summarized by saying as has been said earlier, that SD can have a human focus (soft) or an ecological focus (hard). Subsets of the soft SD include particular perspectives such as income distribution or women's rights- this would allow you to cut a significant portion of the discussion without sacraficing much | OK - to be condensed. |
| 14379 | 4 | 15 | 1 | 15 | 14 | Doesn’t acknowledge the reality that Copenhagen has succeeded Kyoto as more practical given the essential inclusion of China and other major emerging market economies in emissions restraint. | Misinterpretation/mis-understanding of Copenhagen and entire set of climate agreements and decisions. See YL |
| 7765 | 4 | 15 | 1 | 15 | 14 | Delete - unnecessary | See YL response re: 319 and 320 |
| 12693 | 4 | 15 | 19 | 15 | 20 | Is Equity the antonym of unequal? You may like to reconsider the wording. | The wording seems good. |
| 3220 | 4 | 15 | 21 | 15 | 22 | Empirical basis for the statement that the mentioned approach is gaining ground? What is meant by sustainable development being a human right? | The first statement has been deleted. The second is referenced. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3221 | 4 | 15 | 26 | 15 | 30 | Are "principles of gender inequality" a desirable side-constraint on climate policies? Or needed for effective climate policies? If so, why? | The sentence has been deleted. |
| 7766 | 4 | 15 | 26 | 15 | 30 | No reference. Reference needed to verify this. If there is no reference - delete | The sentence has been deleted. |
| 12691 | 4 | 15 | 31 | | 33 | You may also like to look at Kals, E., Maes, J. (Hrsg.), Justice and Conflicts: Theoretical and Empirical Contributions. Springer, Berlin,Heidelberg, ISBN 978-3-642-19034-6, 269-282. | This reference is added. |
| 12279 | 4 | 15 | 42 | 17 | 16 | Please consider to include some of the conclutions from O'Briens study; O'Brien, K., 2011: Global environmental change II: From adaptation to deliberate transformation. Prog Hum Geogr, in section 4.2.3 | This reference is added. |
| 18320 | 4 | 15 | 43 | | | The phrase often used about SD is that it is a 'contested concept', which means that many competing definitions abound, and the vagueness of th Brundtland definition itself spawned many of these competing versions. Again, see article on SD definitions by A Dobson in 'Environmental Politics'. It is vital to have the debate about thecontested meaning of development noted here. Herman Daly. | OK |
| 8801 | 4 | 15 | 47 | 15 | 49 | It should be noted that von Weizsäcker et al. (1998) is critical of contemporary economic structures and the philosophical assumptions that underpin these (ibid, 143-209, 271-299). Further it suggests that efficiency gains will not be enough (ibid, 258, 269, 292-3), particularly given that the advertising industry (and much popular culture) can probably create infinite wants. (ibid, xxvi-xxviii) give examples of how contemporary economic structures unjustly militate against taking action to address environmental issues and have questionable moral and philosophical underpinnings (ibid, 271-299). In particular von Weizsäcker et al. (1998, 139-142) suggest that finance structures tend to favour investment in resource use rather than resource efficiency, which is linked with a tendency to subsidise non-renewable energy production a huge amount, even by so called 'free-market' governments (ibid, 153-4). It is worth noting that von Weizsäcker et al. also suggest that current market economies encourage the 'seven deadly sins' or encourage classical vices (ibid, 1998, 143). | Noted. This part has moved to 4.5. |
| 5469 | 4 | 15 | 5 | 18 | | Some comment on whether this perspective on SD is compatible with emissions reductions or an obstacle to them would be helpful- discussion can also be edited | This refers to a different paragraph. This is a study that needs due attention as it is one of very few from a developing country perspective on equity and |
| 9295 | 4 | 15 | 42 | 17 | 16 | In order to facilitate sustainable development, the cement industry in Japan has integrated climate policy with recycling policy. The reference shows a case study to make an analysis of treatment cost of municipality wastes (MORIMOTO, NGUYEN, CHIHARA, HONDA and YAMAMOTO; Journal of Life Cycle Assessment, Japan, Vol.2 No.4 October 2006 "Proposals for Classification and an Environmental Impact Evaluation Method for Eco-Services: Case study of Municipal Waste Treatment in Cement Production") | Noted. We need to decide how to deal with specific case studies or practices. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12694 | 4 | 15 | 26 | 15 | 29 | As democracy, human rights are important in international politics in general. But in international law human rights are not absolutely binding. For example the human rights covenants are not signed and ratified by every state of the world and so can be considered as binding law for the ratifying states only. The Universal Declaration of Human Rights is a resolution of the UN only which has recommanding but not binding character. Regional agreements on human rights, eg. the European Convention on Human Rights have no universal coverage, too. Human rights within customary law are only viewed as binding when referring to the minimum standard (ius cogens). It is controversial which human rights are ius cogens norms. Zenović mentions the right to live, the right to humane treatment, the prohibition of criminal ex post facto laws, the prohibition of genocide, the prohibition of war crimes, the prohibition of slavery, prohibition of discrimination on the basis of race, color, sex, language, religion, or social origin. On the other hand there are human rights which are not in focus, the prohibition of imprisonment for civil debt and the prohibition of crimes against humanity, the right to legal personhood, freedom of conscience and the right to self-determination. And "negative freedoms" and broad positive obligations of states are no ius cogens norms at all (Zenović, Predrag, Human rights enforcement via peremptory norms – a challenge to state sovereignty, Riga 2012, http://www.google.de/url?sa=t&rct=j&q=&esrc=s&source=web&cd=10&ved=0CH0QFjAJ&url=http%3A%2F%2Fwww.rgsl.edu.lv%2Ffiles%2Fdownload%2F33&ei=3udJUNiXLZCTswaVo4CADQ&usg=AFQjCNHcW1EhKJtL6nO4BPImTyQdArR5tA, pp. 35-36). So it seems problematic to talk of an absolute "legal duty" to cooperate in order to realize human rights. | OK. There is however under the Covenant on Economic, Social and Cultural Rights the obligationof Parties to "take steps... to the maximum of its available resources, with a view to achieving progressively the full realization of the rights recognized in the present Covenant by all appropriate means, including particularly the adoption of legislative measures" |
| 18137 | 4 | 15 | 27 | 15 | 30 | It would be useful to state why this recommendation was made. | The sentence has been deleted. |
| 12695 | 4 | 15 | 29 | 15 | 29 | The inclusion of gender research with regard to the climate change problem should be motivated more clearly (what is the difference if aspects of gender are not included?). | The quoted literature shows the strong potential impact of changing gender |
| 12692 | 4 | 15 | 1 | 15 | 14 | This is a repetition of passage p.13, 11-21 and also outlaid in Chap. 3. So it can be shortened or even deleted. | 1) Shorten to include the reaffirmation of equity and CBDR at Rio+20 with specific reference to climate negotiations 2) Clarify that the UNFCCC and Kyoto Protocol are the current legal regime; |
| 18322 | 4 | 16 | | | | By this stage of the chapter, I was wondering how this material linked to climate change. A tougher and earlier linkage - in the intro? - through the Rio Declaration, the requirements of CBDR and of the UNFCCC might help | Accepted - also Rio+20 outcome |
| 3222 | 4 | 16 | 33 | 16 | 35 | Is social transformation something that the IPCC should be concerned over and beyond the need for reducing the GHG intensity of wellbeing. | Sure, because it may belong to the list of objectives that put demands on policies |
| 12698 | 4 | 16 | 40 | 16 | 47 | What would that mean for climate policy? There is no link presented. | To be developed (CA). |
| 14315 | 4 | 16 | 5 | 16 | 18 | The concept of sustainable economic development is not explained, nor are the arguments of Allaby, Hopwood et al, and Schelling balanced by inclusion of references that could support, or the opposite, their theoretical and empirical validity. | Noted. |
| 7767 | 4 | 16 | 5 | 16 | 39 | I am not clear what point is being made here, or how this sectionis relevant to sustainable development and mitigation? I would delete | Not relevant. |
| 18321 | 4 | 16 | 9 | | | The term 'economic wellbeing' is confusing….and mixes two conceptual languages. | Accepted. Will try "affluence". |
| 2917 | 4 | 16 | 4 | 16 | 4 | Please refer also to more recent literature when available. It is a relevant topic. | Moved to 4.5. |
| 6321 | 4 | 16 | 26 | 16 | 39 | I hope that the authors will not think me to be too presumptuous but I would like to suggest that "alternative paradigms of sustainable development" are the topic of my book: Ingrid Leman Stefanovic, SAFEGUARDING OUR COMMON FUTURE: RETHINKING SUSTAINABLE DEVELOPMENT (Albany: State University of New York Press, 2000.) The argument is made that a condition of achieving sustainability is to augment primarily calculative, reductionist modes of thinking that are common today, with more thoughtful, originative perspectives. | OK |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12696 | 4 | 16 | 7 | 16 | 12 | Arguing for a high growth level as a driver towards sustainability is problematic even if poor countries receive the whole benefits. It might be more plausible if the spatial dimension of sustainability is taken into account as is the case in the sustainability definition of the Brundtland Report (IPCC Draft, Chapter 4, Section 4.2.1., pp. 11-12 and Section 4.2.2, p. 13, lines 25-26). There, the spatial dimension of sustainability tries to ameliorate the situation of poor countries. In contrast, e.g., the contraction and convergence approach (see IPCC Draft, Chapter 4, Section 4.7.3.3, p. 70, line 38) does not necessarily depend on growth but can also be based on redistribution. Consequently economic growth is no synonym of sustainability (Since e.g. redistribution could be a more sustainable path, especially, if material growth depends on scarce ressources which cannot be substituted. And because, in the past, growth accelerated climate change and did not limit it as outlined in this chapter, e.g., p. 32, line 4-5; p. 34, line 14-15). Even if partial respectively limited growth could be useful for introducing sustainable politics, respectively, departing from unsustainable pathes a matierialistic growth policy remains problematic against the background of the three pillar modell (see comment 1). So it might be better to talk about "sustainable growth" or "long durable global wealth", here. | Here we just mention one view among others. |
| 12697 | 4 | 16 | 31 | 16 | 34 | Which inequities are meant in detail? How is environmental justice defined in Hopwood et al. (2005)? The definition and application is an important part to analyze environmental as well as economical impacts (refer to Chap.3). | More detail is provided. |
| 11269 | 4 | 17 | 1 | 17 | 3 | “market-friendly reforms” has been implemented everywhere, especially since the 90s. However, since the electricity crisis in California, reforms have been critically scrutinized and have caused social outcries. This added -more recently in the context of the global crisis-, to concerns related to energy security has pushed reforms into the background. Serious assessments of those reforms in different countries are available: at least they have mixed results. | Accepted. |
| 3224 | 4 | 17 | 12 | 17 | 12 | What is the relevance of a niche market in this context? | Not relevant. |
| 14013 | 4 | 17 | 17 | 31 | 20 | Section 4.3 has a challenging task, as it aims at discussing determinants of sustainable development and equity, and at the same time it aims to say why this is relevant for adaptation and mitigation (or probably the capacity to respond). To some extent the chapter meets the first aim, but not the second. | Accepted. We need to ensure that the determinants of the entire section speak to both SD and equity, and to CC |
| 14014 | 4 | 17 | 26 | 19 | 3 | Is this where the research stands on what drives or hinders sustainable adaptation?At least the section presenting the I=PAT (page 18, line 28-31) seems to be very much outdated and calling it a traditional method seems inappropriate. | Accepted. The debates around the Holdridge identity will be updated, and cross-referencing to chapter 5 (where |
| 7768 | 4 | 17 | 26 | 18 | 44 | This section (4.3.1) focusses on basic population and demography issues, while this provides an interesting background for people with no knowledge about this area it is not about mitigation and sustainable development. There are many clear links bwteen population, demography and sustainable development, this is an area full of interesting issues, e.g. discussion of IPAT and its failings, emissions pathways, cultural practices around emissions...it would be good to see more of this, and less of the current content. I would delete the current text | Accepted. We take not of the reviewer's concerns and we agree that there is a need for updated engagement with the population/climate change literatur.e |
| 12701 | 4 | 17 | 27 | 18 | 27 | This part can be shortened as it is not directly linked with climate change issues. The link is not provided till line 28. | Accepted. The overall SOD, including this section, will strive for further |
| 12700 | 4 | 17 | 32 | | | The relation between SD and Equity is not clear. Which are the reference points for an equitable future and how do age, sex etc. relate to them? | Accepted. The SOD will develop our conceptual framework much better in section 4.2 and such framework will help to structure the argument of subsequent sections. Section on population and |
| 7451 | 4 | 17 | 4 | 17 | 5 | Mention is made here of ‘low carbon economy’ and ‘low carbon society’. All living things depend on carbon for subsistence. | Not relevant. |
| 7452 | 4 | 17 | 4 | 17 | 5 | A distinction should be made between ‘renewable carbon’ and non-renewable’ carbon. Increasing the use of ‘renewable carbon’ should be vigorously pursued. | Accepted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3223 | 4 | 17 | 7 | 17 | 10 | Controlling emissions (by increasing the cost of fossil fuels) will have a negative effect on development. That is the premise for the discussion earlier, on avoiding climate change by keeping people undeveloped. If this premise is not clear to the reader (or some author) at this point, then it should be emphasized earlier. | Accepted. |
| 10859 | 4 | 17 | | | | This has a lot of overlap with Chapter 5 in parts | Accepted. Overlaps with chapter 5 will be addressed in the SOD. |
| 18323 | 4 | 17 | | | | This subsection does not deal with barriers systematically. It could also include mention of the "population rebound effect" - namely the problem that the rapid decline in fertility experienced in certain developing countries is coming at the expense of - and counter-balanced by - a major rise in per capita consumption. | Accepted. We are committed to search in the literature for referencing that proofs the kind of relationship implicit in the comment. 4.3.1. needs to indicate more explicitly what is the relationship |
| 12699 | 4 | 17 | | 19 | | Especially the first part of this section emphasizes the relationship of fertility and the actual population size. So the explanations can be shortened or even deleted, here. | Accepted. This section will be synthesized and better framed in the |
| 18324 | 4 | 18 | 28 | 18 | 33 | The discussion of I+PAT could come earlier and introduce and structure this section. | Noted. |
| 14015 | 4 | 18 | 45 | 19 | 3 | Again, this is not a new insight or research field. The social vulnerability theme has been around for a long time, first in the disaster community and then increasingly in the climate change community in the late 1990s and early 2000s. What would be interesting is to include the implications that this insight has for climate change responses. | Accepted. We will make sure to incorporate references to this literature in the SOD. |
| 14016 | 4 | 18 | 49 | 19 | 3 | The literature on vulnerability shows that there are complex arrays of social, economic, political, cultural and environmental factors that affects vulnerability. And that individual characteristics go beyond age and gender to also include the more subjective dimensions, such as attitudes, beliefs, superstitions, etc. | Noted. |
| 3225 | 4 | 18 | 5 | 18 | 8 | This point was already (indirectly) made in the previous paragraph. Can be written more efficiently. | Noted. |
| 2918 | 4 | 18 | 28 | 18 | 28 | The I=PAD identity is possibly a simplification which has been valueble, which suggestion has the WGIII to optimize this identity? | Accepted. The debates around the Holdridge identity will be updated, and cross-referencing to chapter 5 (where this is fully developed and applied) will be ensured. The way in which this |
| 8802 | 4 | 19 | 19 | 19 | 20 | It would be truer to say that population is ethically and politically sensitive but that consumption is really only politically sensitive to 'liberal democracies' that 'buy' votes by offering ever greater material wealth to the majority of their population. | Noted. |
| 14017 | 4 | 19 | 2 | | | Suggest adding "…a fact that is increasingly considered by impact AND ADAPTATION studies." | Noted. |
| 14018 | 4 | 19 | 26 | 20 | 22 | Can this discussion be made broader to talk about humans as agents of change (thus much broader than agents in production), and where education, learning and leadership are important determinant for thriving development? Literature to consider in this section or in section 4.3.3: On humans as agents of change: Meadows, D. 1999. Leverage Points: Places to Intervene in a System. Sustainability Institute Papers. Hartland, VT: Sustainability Institute. On Learning: Mezirow, J. 2000. Learning as Transformation: Critical Perspectives on a Theory in Progress. NY: Jossey-Bass; Pelling, M., C. High, J. Dearing, and D. Smith. 2008. Shadow spaces for social learning: a relational understanding of adaptive capacity to climate change within organisations. Environment and Planning A 40: 867–884; Tschakert, P., K. Dietrich.2010: Anticipatory learning for CC adaptation and resilience. Ecology & Society 15 (2),11. On leadership: See recent writings by Ina Horlings, Susanne Moser. | Noted. We are going to take into account the comment and literature suggested |
| 3226 | 4 | 19 | 27 | 19 | 29 | Human capital cannot be defined as the capacity to do these things, it must be the results of such efforts. (Not the container, but the content of the container.) In any case, it might be better to define INVESTMENTS in human capital as schooling, training, etc. which result in better skills, higher earning potential, better health, and higher wellbeing. | Accepted. We don't understand the first part of the comment but we agree on the second and we will make sure to address it. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10424 | 4 | 19 | 27 | 20 | 3 | Remove the 1st two paragraphs | Rejected. We don't agree with this comment. We acknowledge the need to be more concise in the starting of this section (as recognized as well for other parts of the chapter) but we advocate for |
| 12703 | 4 | 19 | 27 | 20 | 3 | I cannot see the link to climate change issues. | Noted. This link should be further stressed. See some of our previous |
| 7770 | 4 | 19 | 27 | 20 | 14 | all intersting text but not related to mitigation - delete | Noted. This link should be further stressed. See some of our previous |
| 12702 | 4 | 19 | 4 | 19 | 25 | I cannot see the link to climate change issues. | Accepted. The overall SOD, including this section, will strive for further synthesis and integration, to reflect |
| 17639 | 4 | 19 | 41 | 19 | 41 | The reviewer thinks "human capital, education and knowledge" are associated with social development as well. Why the author mentions these three elements are associated with economic development only? | Accepted. We will make sure that the links of human capital with other human and social considerations are also |
| 18138 | 4 | 19 | 12 | 19 | 16 | References required for these synthesis statements on population and sustainable develoment. | Noted. Updated references will be |
| 12704 | 4 | 19 | 40 | 19 | 40 | See comment 21. | Rejected. We are not sure what comment the reviewer is referring to. |
| 7771 | 4 | 20 | 15 | 20 | 22 | Nice, clear, consise and well referenced paragraph | Noted. |
| 17144 | 4 | 20 | 23 | | | Suggest that this section also includes a discussion of culture, sustainability and indigenous peoples | OK noted |
| 14019 | 4 | 20 | 23 | | 35 | I look forward to reading this section in the SOD. It will be important to get at those deeper human and societal dimensions. Literature to consider: Hulme, M. 2009. Why we Disagree about Climate Change. Cambridge: Cambridge; Leiserowitz, A. A., R. Kates, and T. M. Parris. 2006. Sustainability values, attitudes, and behaviors: A review of multinational and global trends. Annu. Rev. Environ. Resour. 31: 413-44; Moloney, S., Horne, R. E. and Fien, J. 2010. Transitioning to low carbon communities—from behaviour change to systemic change: Lessons from Australia. Energy Policy, 38(12): 7614-7623; Elizabeth Shove 2010 Beyond the ABC: climate change policy and theories of social change. Environment and Planning A, volume 42, pp. 1273-1285; O'Brien, K. and J. Wolf. 2010. A Values-based Approach to Vulnerability and Adaptation to Climate Change. Wiley Interdisciplinary Reviews: Climate Change 1:232-242; | Accepted. We will include the references provided. |
| 18699 | 4 | 20 | 23 | 20 | 35 | Not sure why this section will only be developed in the SOD? It promises to be a very useful section, from the described outline, but also one with ambitious coverage, hopefully it will be given sufficient space. Especially the developmental psychology literature on behaviour change is not being covered in any other chapter that i am aware of. In addition to exploring cognitive barriers to behavior change (including the adoption of individual mitigation and adaptation measures), the section should also address motivational barriers. This discussion can refer back to Chapter 2's Sections 2.2 and 2.4. | Noted. The behaviour section will make reference to the reviewer's points. |
| 10425 | 4 | 20 | 36 | 21 | 10 | Remove the 1st two paragraphs | Rejected. We acknowledge the need to be more concise in the staring of this section (as recognized as well for other parts of the chapter) but we advocate for |
| 12705 | 4 | 20 | 36 | | 42 | For the "rules of the game" you might also like to look at Ittner, H./Ohl, C. (2006), Playing Fair within Climate Protection Policy? – Bringing Together Psychological and Economic Methods, ICFAI Journal for Environmental Law (IJEL), V(1), 34-53. | Noted. |
| 5472 | 4 | 20 | 37 | 21 | 33 | Point of this discussion is that governance is defined in multiple ways - this leads into a discussion of how concepts of sustainability is integrated into governance- which is the primary point. Initial discussion of governance can be shortened and still convey critical point- many types of governance | Accepted. The section will be synthesized in the SOD. |
| 5471 | 4 | 20 | 4 | | | Very helpful and critical two paragraphs- sets up the link clearly and succinctly | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2919 | 4 | 20 | 23 | 20 | 35 | Suggestion is Cultures as a subtitle. Suggestion is to illustrate the revisiting the collapse of Rapa Nui. Possibly it is feasible to refer to the contribution of Jan Boersema (revisiting the collapse of Rapa Nui) during the 8th international conference on easter island and the pasificin 2012? | Accepted. We will take into consideration the reviewer's comment when writing the behavioural section, as |
| 2920 | 4 | 20 | 36 | 22 | 46 | In my opinion this part 4.3.4 could be shortened. | Noted. |
| 17338 | 4 | 20 | 23 | 20 | 35 | Consider linking to the examples of Buen Vivir and Gross National Happiness introduced in Chapter 3. | Noted. |
| 12706 | 4 | 20 | 7 | 20 | 8 | Human capital can provide environment-related technologies but also lead to unsustainable technology path ways. Therefore the following phrasing might be more appropriate (and in line with p. 23, line 11): "Human capital can provide the basis..." | Noted. |
| 18325 | 4 | 20 | | | | This section is very Foucauldian and does not do sufficient, in my view, to address issues of state capacity. See works by Lafferty and Meadowcroft, Janicke. | Accepted. We don't understand the "Foucauldian" reference, but we agree that the role of the State as an agent of |
| 13750 | 4 | 20 | | 22 | | If I understand the context of this section right, the task is to review the current literature with regard to answering the question what determines, drives and hinders sustainable development and climate policies. Therefore, I would propose to strengthen this analytical focus in this particular section: What are these drivers and barriers? This section is in large part accurate and up to date, but mostly descriptive and little focused on the initial question. I would rather suggest to focus this section in the latter part more on individual drivers such as governmental decision making versus other actors. | Accepted. However, we don't agree that this point is relevant only for 4.3.4. In line with the co-chairs' view, we acknwoledge that there is a need to strike a balance between framing and the literature review that highlights the |
| 2337 | 4 | 20 | | | | The decentralization should be more analyzed with process of localization. The decentralization is popular political term, but it has vague conceptualization. Thus, localization has to be discussed in environmental governance. The reason is that localization is an integral part of reduction of energy consumption in the case of sustainable consumption and production. Localizing socioeconomic systems, decentralizing governance lead to advance sustainable lifestyles and livelihoods with new social order of sustainable societies. Furthermore, localism is the focus on emerging across with the principles of devolution, of decentralization and of subsidiarity. The Manifesto on the Future of Food by the International Commission on the Future of Food and Agriculture (2006) argues how the localization will facilitate to the reduction of energy consumption. Under current export-oriented monoculture production and an explosion of the long-distance food trade directly cause to increase use of fossil fuel around the word. Obviously, this fossil fuel consumption for food transport damages the eco system and local agro-economic system. On the other hand, local poor farmers become poorer. Thus, localization of agricultural and consumption system has more advantage rather than having just economic advantage for multinational companies. Reference :- Manifesto on the Future of Food , International Commission on the Future of Food and Agriculture (2006) www.arsia.toscana.it/petizione/documents/cibo/cibo_ing.pdf | Accepted. But we may locate this discussion elsewhere in the chapter. |
| 14380 | 4 | 21 | 1 | | | Here and elsewhere the chapter verges on positions that seem likely to serve as fodder for those who will critique the effort as an attempt to impose global governance | Rejected. We don't understand the comment. |
| 7772 | 4 | 21 | 1 | 21 | 33 | Introductory text book stuff on governance, not related to climate change, reduce to 3 sentences max | Noted. |
| 3227 | 4 | 21 | 34 | 21 | 41 | This statement is not simple to interpret, and it might be something that there is not consensus about. | Noted. We will delete the correspondent |
| 7773 | 4 | 21 | 34 | 21 | 48 | much superfluous text, reduce to 2 sentences summarising key points | Noted. |
| 12709 | 4 | 21 | 44 | 21 | 44 | Maybe it is helpful to use "intragenerational equity" instead of "equity" to avoid misunderstandings (See Comment 14) | Rejected. In text, equity refers to both intra and inter-generational concerns |
| 9123 | 4 | 22 | 0 | | | I think consumption of other goods should be included. Consumption is a sum of many things, but mainly proximity/availability, budget constraints and preferences define the choices. Cities may promote consumption-intensive lifestyles and thus densification may have a parallel negative impact. In addition, if GHG mitigation creates monetary savings, rebound effect takes place (e.g. Turner 2009, see first overall comment for details). | Noted. |
| 8493 | 4 | 22 | 23 | | 24 | What exactly are the trends in global capitalism and political economy that are referred to here - being explicit will assist the validity of the message | Accepted. We agree that there is a need for more clarity in the text message. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3228 | 4 | 22 | 31 | 22 | 33 | Consensus about this? Should not arguments in favor of market-based policy instruments to ration access to the atmosphere as a sink for carbon emissions be mentioned? | Accepted. We acknwledge the need to expand the references and perspectives |
| 7774 | 4 | 22 | 31 | 22 | 37 | Nice use of examples to explain the point, it would be nice to see more of this evidence based synthesis | Noted. |
| 2178 | 4 | 22 | 47 | 25 | 29 | Technology section (4.3.5) seems to downplay if not ignore the role of mobile phone technologies in mainstreaming a wide range of sustainability/climate mitigation/adaptation activities in the developing world, particularly in many African countries. Renewal energy deployment in the developing world is not going to happen in the same way as in the OECD countries for many institutional factors and none of the complexity involved in this key difference is not reflected in this section. | Accepted. We will make sure to address the literature that the reviewer implicitly points towards. |
| 9124 | 4 | 22 | 5 | 22 | 11 | The overall impact of agglomeration economies, accumulation of affluence and proximity may cause a reverse GHG effect, even more if supported by rebound effect due to savings on transport and energy costs. | Accepted. The reviewer touches upon something that we will indeed address in the SOD. However, the point in text may |
| 8904 | 4 | 22 | 13 | 22 | 18 | The role of government in sustainable world is very important as they are responsible of land attribution, utilisation and decision making for their communities or citizens. | Accepted. The role of the State should be further emphasized. |
| 7775 | 4 | 23 | 12 | 23 | 23 | I am not clear why you selected health and energy as the two sectors to look at. It would be helpful to explain why you think these are the sectors of interest re: STI | Accepted. We should make this choice more explicit or otherwise expand with |
| 7453 | 4 | 23 | 16 | 23 | 18 | “2.7 billion people rely on traditionally high-polluting biomass cookstoves for household cooking and heating in 2009 and 1.3 billion do not have access to electricity.” | Noted. |
| 7454 | 4 | 23 | 16 | 23 | 18 | This is a very emotive statement. Cookstoves are not polluting, it is the type of biomass that is used that creates the ‘pollution’. | Noted. |
| 7455 | 4 | 23 | 16 | 23 | 18 | Dry unprocessed biomass and charcoal cause very little pollution. Cooking outside again quickly dissipates the smoke etc. There are simple solutions to reduce indoor air pollution and to improve the end use efficiency of the devices. Again, electricity is not a cooking fuel in developing counties because of cost and reliability. Providing electricity to the 1.3 billion without it is very desirable, but it will not be used for cooking! | Noted. |
| 3229 | 4 | 23 | 17 | 23 | 17 | Highly polluting in what sense? If biomass is not depleted, these are carbon-neutral. | Noted. |
| 5734 | 4 | 23 | 19 | 23 | 20 | The figure regarding undernourished people can be updated | Noted. |
| 8803 | 4 | 23 | 4 | 23 | 7 | Science and technology are regarded as key means to achieve sustainability, particularly if they contribute to maintain economic development whilst using environmental resources more efficiently and enhancing social development.' In a report by the IPCC I would have expect an explicit recognition that resources are unlikely to be the limit on sustainability especially a conventional economics can address these issues adequately albeit typically unfairly - rather stress to the Earth System is the more fundamental issue. von Weizsäcker et al. note that it may be ‘the absorptive capacity of the earth for all the pollutants and wastes’ (1998, 258) that is critical to unsustainable development. Faber Faber M, Proops J & Manstetten R (1998, 42-44, Ecological economics; concepts and methods, Cheltenham: Edward Elgar) also suggest it is waste and pollution problems that are more important than resource issues. | Accepted. We should incorporate this point into the text. |
| 17339 | 4 | 23 | 47 | 23 | 50 | A counter-example to the study by Winkler et al, (2007) may be emerging not with policies to introduce Electric Vehicles. Where for example in Denmark a skilled work force, public awareness and specific tax incentives have not helped a rapid uptake of this new technology. Recent studies already point to this, see Chapter 8. | Accepted. We take note of this comment and we will introduce the correspondent text and literature. |
| 18326 | 4 | 23 | | | | This section could be toughened by making it refer more directly to the competing technological and financial demands of mitigation/adaptation actions. | Noted. |
| 12711 | 4 | 23 | 36 | 23 | 36 | Instead of (respectively in addition to) basing the argument for "supporting the poor" on the recommendation of some scholors it might be better to directly link the argument to politically more relevant documents (e.g., the spatial approach of sustainable development as difined by the Brundtland-Report dealt with on pp. 11-12 or article 3 UNFCCC which allows shifting the comment of Prahalad 2004 to the discussion of common but differentiated responsibilities). | Noted. |
| 17340 | 4 | 24 | 11 | 24 | 15 | Not only economic reasons, in the case of biomass also environmental issues (iLUC) have compromised the adoption of this option. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8747 | 4 | 24 | 14 | 24 | 15 | The development of carbon capture and storage technology is also constrained by scepticism/mistrust along with investment... | Noted. |
| 5473 | 4 | 24 | 18 | | | Comment on CDM technologies not being sustainable- not needed here- you are talking about information transfer and whether the transfer has been successful- not if the information transferred is appropriate | Noted. The text will be re-drafted. |
| 14316 | 4 | 24 | 24 | 24 | 32 | Would be interesting to also include consideration of the implications of climate impacts on the feasibility/sustainability of a massive scale-up of RETs. There is also a growing literature on the potential conflicts (including equity considerations) and competition between alternative uses in various sectors (water, energy, agriculture, tourism) of resources that become increasingly scarce due to the impacts of climate change. | Accepted. Literature on these fronts will be reviewed and commented upon. |
| 11732 | 4 | 24 | 28 | 24 | 30 | This kind of concern should be recognized. | Noted. |
| 9531 | 4 | 24 | 28 | 24 | 30 | A good example | Noted. |
| 17640 | 4 | 24 | 33 | 24 | 37 | For development of RETs, is it sure that it is required to extract fossil fuel and other minerals? The reviewer does not think it is closely linked with these extractions and RETs development. | Accepted. We note the reviewer's point and we will make sure to include updated references on the extraction of |
| 5474 | 4 | 24 | 45 | | | Discussion of RET should more clearly bring in the importance of social factors- education re adoption of decentralized systems- this is indirectly stated in text but needs to be a separate sentence- showing linkages of the range of perspectives for sustainability | Noted. |
| 8749 | 4 | 25 | 15 | 25 | 15 | It has been suggested (by whom?) | Accepted. More referencing is required. |
| 11733 | 4 | 25 | 2 | 25 | 4 | This kind of concern should be recognized. | Noted. |
| 9532 | 4 | 25 | 2 | 25 | 7 | Good comment | Noted. |
| 7776 | 4 | 25 | 35 | 25 | 47 | all intersting text but not related to mitigation - delete | Accepted. We recognize the need for succinctness; however, we sustain the need for concept definition and framing of issues beyond climate change in the |
| 8748 | 4 | 25 | 8 | 25 | 9 | In particular contexts,such as ?? | Accepted. We acknowledge the need to delete "in particular contexts", as these |
| 12713 | 4 | 25 | 29 | 25 | 29 | When talking about technology and efficiency the "Rebound effect" matters, i.e., GHG emission reduction is not taking place because (1) material economic growth (over)compensates the savings of CO2 and/or (2) CO2-activities (e.g. fossill fuel-intensive production) are shifted to countries that do not participate in climate change agreements (Carbon Leakage). E.g., see Eichner, Thomas/Pething, Rüdiger, Carbon Leakage, the Green Paradox, and Perfect Future Markets, in: International Economic Review 2011, S. 767-805 (767). It might be worthwile considering also this aspects when evaluating the potential of technical solutions for the tackeling of climate change. (See also comment 21) | Accepted. The literature on the rebound effect will be carefully addressed. |
| 12712 | 4 | 25 | 11 | 25 | 11 | An additional study which might be interesting, heree: Toft, Schuitema, Thogersen, 2012; Abstract in the IAREP 2012 conference proceedings. | Noted. |
| 18327 | 4 | 25 | | | | The legacy of development argument can be inserted with material on path dependency and 'lock-in'. It seems orphaned here and is disproportionately short given other subsections and the importance of this topic. | Accepted. This section will be moved to either the start of 4.3 or merged earlier into our introduction and conceptual |
| 14317 | 4 | 25 | 30 | | | Perhaps this subsection should be moved. Its current position between Technology and Natural resources does not seem to accommodate the flow of the chapter. | Accepted. This section will be moved to either the start of 4.3 or merged earlier into our introduction and conceptual |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3231 | 4 | 26 | 16 | 26 | 17 | Dematerialization and depopulation should not only be mentioned here. | Accepted. We acknowledge that the term "only" is misplaced here; it would be better to use "key" instead. However, we also recognize the need to improve referencing and re-consider the use of |
| 18328 | 4 | 26 | 24 | 26 | 33 | This para seems to misunderstand the nature of CBDR, which is built on developing countries' insistence that the legacy of (mis)development be recognised and addressed. It seems gestural and adds little of substance. Delete? | Noted. |
| 17088 | 4 | 26 | 24 | | 33 | the quotes are only from developed country authors. I would like to refer you to my peer reviewed papers in 'Climate Policy' and "Climate and Development' which you could also use as references. | Noted. |
| 3232 | 4 | 26 | 26 | 26 | 28 | This point might be important and should not only be mentioned here. | Accepted. we acknowledge that the issue of CBDR should be taken more centrally into consideration by the |
| 5475 | 4 | 26 | 34 | | | Section on natural resources- should be more clearly linked as a potential model for how sustainability considerations could be linked to diverse development models- this discussion shows a range of different outcomes for resource rich economies- likely included as critical to models based on sustainability. Say this directly in a few sentences- potentially include a chart with range of outcomes | Accepted. We recognize the need to provide a more explicit conceptualization between natural resource use, economic development models, and the impacts |
| 3230 | 4 | 26 | 7 | 26 | 11 | Perhaps re-formulate; unclear what this sentence means. | Noted. |
| 8905 | 4 | 26 | 34 | 26 | 50 | Make the use of natural ressource more sustainable. Nature can be one of the solution of sustanability (IUCN, 2009). | Noted. |
| 14318 | 4 | 26 | 34 | | | Some of the key links between natural resources and climate change are not pinpointed in the present draft version. One would e.g. expect to see more of a distinction between exhaustible and non-exhaustible/renewable resources, forestry/REDD/LULUCF issues, conflicts in resource use from a SD and climate perspective and so forth. | Accepted. The next version will try to make this differences more explicit. |
| 8259 | 4 | 26 | 1 | 26 | 3 | Some discussions as to what the development mechanism of China and India had been that helped them grow independently of the MDGs process, while other regions lagged behind. Some remarks on these issues would provide the readers a good understanding of the process of sustainable development. | Noted. |
| 12717 | 4 | 28 | 41 | 28 | 41 | Finance aspects of climate change are dealt with in chapter 16. So the aspects raised in this chapter could be shifted to chapter 16 in order to concentrate of the main charecteristics of sustainability, here. | Rejected. However, we don't agree to take finance out of this chapter. Rather we prefer to emphasize its role as a determinant for SD and equity (both a barrier or driver) and exclude a detailed |
| 12196 | 4 | 29 | 41ff | | | The sentence "UNFCCC parties have established…" is not correct as the Adaptation Fund was established under the Kyoto Protocol, not the UNFCCC. | Noted. |
| 11993 | 4 | 30 | 3 | 30 | 8 | It is wrong that the fact that lowest hanging fruits are developed first suggest that the CDM cannot support improved energy access for poorest people or to achieve widespread sustainability. This is a question of demand i.e. The moment there is a demand for CERs from specific methodologies such as the water purification and cookstove methodologies in certain countries, the CDM is exactly the prime instrument to give these people access. It has proven that time and again. Please keep to the evidence and look at the wide research done under the High Level Policy Panel: The research is available on their dedicated webpage cdmpolicydialogue.org. | Accepted. We agree on the need to disentangle two points: 1) the fact that the CDM has so far targeted low hanging fruits; and b) the ability (or inability?) of the CDM to support other forms of technology. |
| 13687 | 4 | 30 | 38 | 31 | 8 | Update data and figures as per the latest UNEP Riso data by the time of finalization of AR 5. Byrne's data will be obsolete then. | Noted. |
| 11055 | 4 | 30 | 38 | 30 | 38 | Regarding the CDM success, the discripsion include contradiction comaparing chap.16 | Accepted. We will ensure that there is coherence with Chapter 13 discussion. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7365 | 4 | 30 | 38 | 31 | 8 | I would question the inclusion of the CDM under the "finance" heading. The CDM serves as a means of supplementing developed countries' mitigation actions in order to meet their commitments. It would be inappropriate to "double count" the CDM as 'finance' as well as mitigation action from developed countries. Of relevance here may be the "share of proceeds" element of the CDM, rather than the CDM projects themselves. | Accepted. We agree with the reviewer's comment and we accept the need to re-consider how the CDM is treated in the overall chapter and particularly in section 4.3.8. |
| 18329 | 4 | 30 | 40 | | | The term 'significant bias' is ambiguous. 'Emphasis' may be a better term. The CDM embodies the contradictory impulses of SD and mitigation - where the expenditure on the emerging economies probably delivers greater mitigation outcomes and better results for future generations as a whole than if these resources were directed to LDCs. Moreover, the 'bias' is possibly appropriate given the preponderance of global population in these countries. This tension could be used as a powerful example in this chapter. | Noted. We need to consider phrasing carefully. |
| 13686 | 4 | 30 | 41 | 30 | 41 | Insert after "... Centre on Energy 2011": "The CDM has generated revenues of several billion Euro for project developers (see Michaelowa and Buen 2012 for a discussions of the strengths and weaknesses of the mechanism)." Reference: Michaelowa, A.; Buen, J. (2012): The CDM gold rush, in: Michaelowa, A. (ed): Carbon markets or climate finance?, Routledge, Abingdon, p. 1-38. | Noted. References will be introduced. |
| 12197 | 4 | 30 | 9 | 30 | 10 | “Meanwhile…” The formulation of this sentence is not clear. What means “unevenness”? Does this refer e.g. to the financial amounts or financing procedures? The term meanwhile suggests an implicit criticism and comparison of the two institutions. I suggest to describe the facts and leave the interpretation to the political debate. If you intend to provide the basis for a comparison, the number of projects funded under the AF is lacking and the adaptation related projects under the SCCF needed to be spelled out, for example. | Accepted. There is a need for greater clarity. |
| 16937 | 4 | 31 | 1 | | 6 | I think this is correct but should not be surprising: another way of putting it is that a "Second Domain" instrument like the CDM, founded upon assumptions of optimising market instruments for price-led investments, cannot be expected to address "First Domain" phenomena (see chapters 2 and 7 of Grubb, Hourcade and Neuhoff op.cit). Earlier empirical data relating to CDM performance, and analysis of sectoral performance, was pubslihed as M.Grubb and T. Laing, "Global carbon mechanisms: lessons and implications." Climatic Change, 2010. | Noted. |
| 13032 | 4 | 31 | 3 | 31 | 6 | The sentence beginning with "This suggests…" is a non-sequitur. Just because a technology is mature, does not mean that all people have access to it. The fact that CDM might favor more mature technologies does not mean that CDM cannot contribute to energy access, industrialization or sustainability. On the contrary, when more mature RE technologies are rolled out in more markets this actually increases the opportunity for increased energy access, industrialization and sustainable development. | To be taken into account. |
| 8804 | 4 | 31 | 39 | 34 | 13 | Good to see questioning of consumerism including 'The spread of consumerism or consumption-based lifestyles is arguably a “mega driver” of global environmental degradation – including global warming.' | Accepted. |
| 14319 | 4 | 31 | 41 | 31 | 43 | Perhaps relevant to include a range of estimates from various sources here? | I assume the commnent refers to consequences of choice of scale and other boundary conditions of sustainability , and if so, I agree it would be useful to add some illustrative |
| 10860 | 4 | 31 | 41 | | | I presume that "global consumption" means GDP here? I would at least state as much, and what is the source of the GDP data? | Accepted. Will check the source and add the information. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13688 | 4 | 31 | 6 | 31 | 8 | Replace "For a .. Jover 2012" by "The contributions of CDM to sustainable development have been assessed by Sutter and Parreno (2007), Olsen (2007), Policy and Operations Evaluation Board (2008), and Corbera and Jover (2012)". References: Olsen, K. (2007): The clean development mechanism's contribution to sustainable development: a review of the literature, in: Climatic Change, 84, p. 59-73. Policy and Operations Evaluation Board, Ministry of Foreign Affairs (2008): Clean and sustainable? An evaluation of the contribution of the Clean Development Mechanism to sustainable development in host countries, IOB evaluations no. 310, The Hague; Sutter, C.; Parreño, J.C. (2007): Does the current Clean Development Mechanism (CDM) deliver its sustainable development claim? An analysis of officially registered CDM projects. In: Climatic Change, Vol. 84, pages 75-90. Reason: Corbera and Jover assess a minuscule project sample and are not representative of the rich literature on CDM and sustainable development. | To be taken into account. |
| 13275 | 4 | 31 | 1 | 31 | 2 | I suggest to add: "(…) tend to be the most attractive and the most profitable -in terms of CO2 equivalent reductions-, (…)" | Noted. |
| 13276 | 4 | 31 | 14 | 31 | 18 | I suggest to add: High transaction cost, very high requirements for additionality demonstration, | Noted. |
| 16263 | 4 | 31 | 3 | 31 | 5 | "This suggests that it is unlikely that the CDM can contribute meaningfully to development goals such as improving energy access amongst the world's poorest people and industrialization in the poorer countries, or to achieving widespread sustainability in the developing world." This statement seems to ignore the latest development in programmatic CDM with 372 progammes submitted for validation up to August 2012 (UNEP Risø CDM Pipeline). Particularly EE demand side, waste and solar projects are better represented in the programmatic approach and Africa gets a higher share of the PoAs (30%) compared to ordinary CDM projects (2,9%). The CMP-7 in Durban decided to highlight the SD co-benefits of CDM projects and activities and at its 69th meeting the CDM EB considered a tool to voluntarily declare the SD benefits and negative impacts of CDM projects and activities. Also, the suppressed demand methodology recently approved and made available to project develoeprs makes it attractive to pursue e.g. rural electrification projects in the poorest countries (LDCs). So, I do not find the above statement to be well grounded. Statements about the future of the CDM should take into consideration the research done by the CDM Policy Dialogue, which has just published its report in September 2012 including recommendations to be considered for COP-18 in Doha. | Accepted. We will make sure to include the latest literature on the CDM, drawing on chapter 13. |
| 12718 | 4 | 31 | 5 | 31 | 5 | Article 12 No. 2 of the Kyoto Protocol (KP) mentions explicitely the purpose of the Clean Development Mechanism (CDM). "The purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under article 3." Within the wording of article 12 KP, the assistance of developing countries is explicitely subordinate to emission reductions. Thus the industrialization of poorer countries would only call for emission reductions if this would be sustainable. However industrialization might not always lead to sustainable progress (see comments 21, 38). Therfore, the industrialization of poorer countries can not be assumed to be sustainable per se be and so, it cannot be seen as a binding aim of article 12 KP. | Rejected. We do not consider emission reductions subordinate to sustainable development in the CDM context. In any case, we provide insights on the CDM effects on host countries' sustainable development, and in forthcoming SOD we will provide cross-referencing to Chapter 13, where this question is further explored. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18330 | 4 | 31 | | | | This is a great section - but the issue of waste is not really addressed. Perhaps drop from title? Also, it does not really pay much attention to the 'dematerialisation thesis' and its associated problems. | Accepted. Waste generation and - management will be specificially discussed, in relation to both 'sustainable production' and 'sustainable consumption'. The 'Dematerialisation thesis or myth, and its problems, will be discussed in Section 4.4.4 on 'sustainable production' specifically in the context of industrial symbiosis. Relevant references using the term dematerialisation include (Hond, 2000; Trainer, 2001; Rodrigues et al., 2005; Lawn, 2006; Tapio et al., 2007; |
| 15110 | 4 | 31 | 21 | 31 | 21 | In the section 4.4 Production, trade, consumption and waste patterns, not are developed enough the aspects of trade and waste patterns that are very important for sustainable aspects. | Accepted. A sub-section will be written on sustainable production. Waste generation and - management will be specificially discussed, in relation to both |
| 14321 | 4 | 31 | 21 | | | Would it be relevant to link this section's discussion to section 4.5.2 and its discussion of the relationships between growth/income levels and emission levels of various GHG's? (e.g. the environmental Kuznets curve, etc) | Accepted. Will make links with section 4.5.2. "Differences between pathways with regard to emissions, where relevant. |
| 10789 | 4 | 31 | 41 | 32 | 12 | Please insert photos of consumpion patterns of middle classes in different countries and cultures. The photographer Peter Menzel has published some startling photos of how families across the world purchase things. Source: Peter Menzel, photographer. http://www.menzelphoto.com | Will make an attempt, but photos are usually not allowed in the report. The suggested website does not function. |
| 9022 | 4 | 32 | | 33 | | It is important to highlight that inequality among countries is the bigger driver of inequality than inequality within states. This is implied in the discussion in these pages but could be more explicitly stated in the interest of a comprehensive and accurate treatment of the subject. | Partly accepted. There are large income inequlities in very large countries such as the US, Brazil, and China, and within-country inequality in these and a range |
| 10864 | 4 | 32 | 1 | | | This paper may have some useful indicators, such as emissions embodied in trade Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908. | Accepted. The discussion of emissions embodied in trade is taken in section 4.4.6.1, and the references fits best |
| 10862 | 4 | 32 | 13 | 32 | 25 | A relevant study here is Hertwich, E.G., Peters, G.P., 2009. Carbon Footprint of Nations: A Global, Trade-Linked Analysis. Environmental Science and Technology 43, 6414-6420. | I assume the comment refers to the paragraph starting on line 19 - 31. If so, the suggested reference is used later in the 4.4.5.2 where the focus is on GHG emission impacts, while on page 32 the discussion refers to environmental |
| 8260 | 4 | 32 | 26 | 32 | 40 | The paragraph should include examples to illustrate how, generally speaking, luxury goods are more emission intensive than subsistence goods. | Accepted. The point is made by several reviewers and will be dealt with. |
| 12719 | 4 | 32 | 26 | 32 | 40 | You may like to consider that luxury consumption may not be THG-intensive in any case. | Comment somewhat incomplete, references would have been helpful. |
| 10863 | 4 | 32 | 26 | 32 | 40 | It is not really started here that what is "subsistence" and what is "luxury" will change. If you use the definions based on elasicities greater than 1 being luxuries, then you will find that a car is a "necessity" in developed countries but a "luxury" in developing countries. I am not sure of a good reference (other than my unpublished work), but at least raising the issue is important here. It is easy for a developed country to drive their cars and not let developing countries have luxury products! | Accepted. Will deal with it. |
| 3234 | 4 | 32 | 27 | 32 | 29 | There are also luxury goods that are not materially intensive, e.g. consumption of culture (if not dependent on travel). | Accepted. The point is made by several reviewers and will be dealt with. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9816 | 4 | 32 | 28 | | | The concept of "considerate design" argues that luxury goods are more expensive and thus can be a trigger for sustainable development: people buy high quality for a high price and use the goods for a longer period of time. | Accepted. Would be helpful with some references. |
| 3235 | 4 | 32 | 38 | 32 | 38 | Whose priority is this, and how can it be implemented? | Accepted. Rephrase last part of sentence and elaborate point. |
| 10861 | 4 | 32 | 4 | 32 | 12 | I would be a little careful with this paragraph as it is a very western view of consumption. While all levels of incomes will suffer some degree of "consumerism" it is not really correct to imply that consumerism covers those in poverty. | Accepted. It was not intended to imply that, we will make that clear. |
| 8261 | 4 | 32 | 43 | 33 | 2 | It seems unclear what is the difference between inequality among countries and between-country inequality in terms of metrics used to compare inequalities - both seem to be using average per capita income. | Accepted. Will check how the difference can be made easier to understand. |
| 12280 | 4 | 32 | 5 | 32 | 5 | Please consider to replace the term "global warming" with "climate change". Rationale: Global warming is so linked to temperature, while changes happening affect many other parameters such as precipitation and the frequency and intensity of some extremes. | Accepted. Will change terminology from global warming to climate change, and throughout the Chapter. |
| 2921 | 4 | 32 | 30 | 32 | 34 | Please include references to support the judgement. Deserve this remark a more prominent position in this report? | Accepted. Will do with assistance of Contributing authors Tim Jackson and |
| 8906 | 4 | 32 | 27 | 32 | 29 | It's the issue of feed the world in a sustainable way. | I don't understand what is wrong with it. Will check it. Comment not very clear. |
| 14320 | 4 | 32 | 41 | | | Given the title of this section, consider to reorganise the subsections to introduce the relationship between income inequality and consumption inequality before going into the income inequality. It could also be considered to include 'income' in the title | Accepted. Will include income in the title and consider reorganisation of the section. |
| 4349 | 4 | 33 | 26 | 33 | 28 | Cultural and economical conditions may also influences. | Unclear what the comment refers to. |
| 14381 | 4 | 33 | 5 | | | Need to show relationship to causes of global warming. Otherwise too broad | Accepted. Will demonstrate that link more clearly, in a general way. |
| 17145 | 4 | 33 | 5 | | | Suggest inclusion of discussion on indigenous peoples as within country inequality - particularly as their consumption patterns differ greatly from dominant societies and thus their contribution to climate change differs greatly too. | Accepted. Given space limitations. |
| 5476 | 4 | 33 | 7 | | | Please define Gini coefficient | Accepted. Could be included in the |
| 12721 | 4 | 33 | 39 | 33 | 40 | Why trends of cunsumption may not follow trends of income is not clearly stated. Give reason since it may have high relevance for matching life styles with sustainability pathes. | Accepted. Similar comments and reasons were given ealier. Agree to |
| 4350 | 4 | 34 | | | | An arrow from materials to energy is important if we think harvest wood products. We can use waste material woods as energy source. | Unclear what the comment refers to. Seems misplaced. |
| 5477 | 4 | 34 | 14 | | | Major points of this section are that a minimum level of income is required for happiness and beyond that income inequality is responsible for unhappiness- this can be conveyed with much less discussion | Wil consider this as part of overall strategy to shorten the Chapter. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8805 | 4 | 34 | 14 | 35 | 31 | The discussion of happiness and consumption here tends to make utilitarian ethical assumptions and misses a more profound category of literature. In philosophy virtue speaks more directly to happiness than its utilitarian complement or competitor. Aristotle argues that happiness comes through virtue including moderate (i.e. not too much or too little) consumption. Sandler R and Cafaro P (Eds. (2005) Environmental virtue ethics, Lanham, Md.: Rowman) relate virtue directly to consumption, happiness and environmental issues. Palmer M and Finaly V (2003, n.b. page xi, Faith in conservation: New approaches to religions and the environment, Washington DC: The World Bank, http://go.worldbank.org/3L9IDQNFO0 or http://www.arcworld.org/books_resources.asp. Accessed 9 May 2011); Engel JR & Engel JG (Eds. (1990) Ethics of environment and development: Global challenge, international response, London: Belhaven) suggests that more people in the world would start their ethical deliberations with virtue than with utility. Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) indicates that virtue is a more rational response to the limitations of climate science than consequential utilitarian approaches. My currently unpublished book manuscript is a more direct and in depth treatment of virtue, climate and happiness. | Accepted. We will briefly discuss virtue ethics, but we reject the idea that there are utilitarian assumptions in what we wrote - quite the contrary, in fact. |
| 12281 | 4 | 34 | 15 | 34 | 16 | Please consider to replace the term "global warming" with "climate change". Rationale: Global warming is so linked to temperature, while changes happening affect many other parameters such as precipitation and the frequency and intensity of some extremes. | Accepted. Will change terminology from global warming to climate change, and throughout the Chapter. |
| 14382 | 4 | 34 | 17 | | | 17 “Reducing the level of material consumption for affluent populations” – Very strange indeed that this could seemingly be endorsed by WGIII. Surely the objective is to change the composition of the inputs away from carbon while spreading more widely the high consumption standards of higher-income countries. | Accepted. We need to clairify and qualify several issues here. We need to distingusih between 'consumption' and 'material consumption' and think about what constitutes 'high consumption'. It also tocuhes on the idea of |
| 8750 | 4 | 34 | 17 | 34 | 17 | … for affluent populations- why only them? This should perhaps read .."for populations in both industralised countries and emerging economies" | There are affluent populations in all countries, perhaps we should refer to 'affluent groups' rather than 'affluent populations' as the latter suggests the |
| 18700 | 4 | 34 | 5 | 35 | 13 | Are the two studies cited the only ones on the topic? Not sure i understand what "consuming less for status seeking or upgrading" means. And not sure the Bradbury study on intrahousehold income inequality is particularly relevant to the topic of the section. But if kept, then it would be useful to find out what precisely the "significant impact on expenditure" was (at least indicate direction of effect). | Accepted. Will bring in more literature and improve clarity of text. |
| 9254 | 4 | 34 | | 35 | | There might be scope here to comment on the organic role of social media (recent but mushrooming technology) in altering perceptions on both consumption and well-being, and political influence once communities start to really fear the effects of climate change (eg due to increased extreme weather events). | Ok, but we also need to simplify and shorten the text. How actual/experienced climate change will change consumption and perceptions of well-being is an |
| 10426 | 4 | 34 | 15 | 35 | 31 | This section is not related climate change or vulnerability to climate change and has to be removed | We will explain better the relevance to climate change, but will not agree to |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12723 | 4 | 35 | 22 | 35 | 23 | Decoupling growth and well-being is not the main issue. What about GHG-emissions? The assumed relation between growth and emissions should be made transparent. | Whether decoupling growth and well-being is an issue depends on the extent to which it is possible to decouple growth and material consumption - i.e. the dematerialisation discussion or myth. So far we have not been able to do so, so what are the indications that it will be possible in the future. The chapter addresses sustainability at large, and not only GHG emissions. Regading the link |
| 12724 | 4 | 35 | 24 | 35 | 31 | I miss the link to climate change issues. | Accepted. The relevance to climate change will be explained better in |
| 16938 | 4 | 35 | 3 | | 16 | It might be interesting to try and link the "satiation" effects to the apparent disappearance of any systemsatic link between per-capita income and energy/emissions, which seems to occur at lower levels ($10-15,000: see my comments on Chapters 5 and 14, Figure 14-2). However perhaps this is beyond scope of IPCC. | Noted, but it seems over complicated to make this discussion. |
| 8806 | 4 | 35 | 32 | 38 | 34 | It is good to see discussion of sustainable consumption. Lack of concrete progress on sustainable consumption over the last 20 years is in part related to the factors discussed; however, a factor almost completely ignored in the literature - presumably rooted in ideologically assumptions of funding decisions is discussion of reducing or moderating consumption. Nearly all the literature focuses on technological changes to make products with a lower impact or on encouraging consumers to choose products claiming to have lower impacts. This is despite programs to address reduced excessive consumption being mandated in Agenda 21 (1992, 4.5). The previous comment outlines the logic of the consuming enough but not too much bringing happiness and indicates literature that suggests that this is better for societies and the Earth System. Consideration of obesity and anorexia should be sufficient to indicate the logic and that appropriate consumption has psychological and wisdom components. Chapman R (2002, 'The stag-goat and the sphinx: The place of the virtues in environmental ethics', Environmental Values, 11(2), 129-44) and IUCN/UNEP/WWF (1991, Caring for the Earth: A strategy for sustainable living, Gland: The World Conservation Union, United Nations Environment Programme, World Wide Fund For Nature, http://coombs.anu.edu.au/%7Evern/caring/caring.html. Accessed 19 May 2011) are also relevant in specific discussion of temperance. Jackson T (2002, 'Consumer Culture as a Failure in Theodicy', in Consumption, Christianity and Creation - Proceedings from an Academic Seminar held on 5th July 2002, Sheffield: Centre for Sustainable Consumption) is far from irrelevant. | Response: Accepted. This comment related to the comment in line 77 on 'voluntary simplicity' and we will take up the discussion as far as space limitations allow. Suggested peer-reviewed literature has been located (I could not access the Chapman study), or more recent and formally published versions located: (Chapman, 2002; Jackson, 2005).(Kjellberg, 2008) |
| 8746 | 4 | 36 | | 44 | | As a suggestion for reducing the size, the session<br>4.4.3 Sustainable consumption and lifestyle (from page<br>36 to page 44) could be consolidated, and hence save space. | Will consider the suggestion in the overall strategy to shorten the Chapter. |
| 5478 | 4 | 36 | 20 | 37 | 38 | Are there instances where sustainabilty based consumption has preempted the consumer culture? This discussion is compromised as the authors are trying to evaluate the success of sustainability based consumption within a framework of consumer based consumption | Accepted. There are several instances of such changes in pre-industrial societies, e.g. the 'cargo culture', but I am not sure a discussion of these instances will be |
| 18701 | 4 | 36 | 39 | | | Useful to spell out what the three pillars of SD are | Ok, but briefly as they are alreadt explained in start of Chapter 4. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18702 | 4 | 36 | 41 | 36 | 46 | It may be useful in this section to refer back to relevant sections in Chapters 2 (e.g., Section 2.2) and 3 that distinguish between classical economic assumptions of rationality in expectations and preferences as guiding consumption and other decisions, in contrast to the assumption of behavioural economics and behavioural decision research that expectations can be biased and self-serving and that preferences are often constructed (rather than preexisting) and thus open to contextual factors (see, e.g., Weber, E. U. & Johnson, E. J. (2009). Mindful judgment and decision making. Annual Review of Psychology, 60, 53-86). The research on sustainable consumption summarized here seems to support the latter set of assumptions. | Response. Accepted. The suggested study has been located and added to Zotero. |
| 12726 | 4 | 36 | 11 | 36 | 12 | A mere increase of the demand for sustainable goods and production technologies is not sufficient (see comment 38 referring to the problemd of carbon leakage and comment 21 referring to material growth limits). Sustainable goods must rather replace unsustainable goods. This could be stated more clearly even if the European Commission seems to include the positve aspects of "green growth" only, especially because without a substitution of fossil technologies and of material growth pathes depenmding on scarce resources the effect for sustainablity respectively for climate protection may only be marginal. | Accepted. |
| 13277 | 4 | 36 | 41 | 37 | 9 | Something must be said in this paragraph about marketing and consumption. Not in vain, big companies uses enormous amount of money to convince consumer about the convenience of buying their products. A reference is given in the next page (37, 21) about marketing and prices, but this reference does not capture the complexity of marketing that involves sociological, psicological and even neuro physiological aspects of human behavior. | Accepted. Ther e is a a huge literature on marketing and its consumption impacts, and we need to be selective due to space limitations. One reference is Kjellberg 2008. |
| 18703 | 4 | 37 | 1 | 37 | 14 | Competing goals and selective accessibility of different and oftentimes competing goals as a function of individual and group differences as well as situational context , which can influence the outcomes of decisions (if conceptualized as a multiattribute tradeoff) is one of the implicit themes in this section, which it might be useful to spell out more explicitly. The Weber & Johnson (2009) review article in Comment 4 has a discussion of multiple competing goals and the effects of goal accessibility. | Suggested article added to Zotero. Included in section 4.4.3.1 [JT] |
| 10427 | 4 | 37 | 16 | 37 | 32 | Remove this paragraph | Not accepted. No reason is given for |
| 14383 | 4 | 37 | 32 | | | Where is the role of tax signals in all of this? Affect consumption profiles by taxes that impose a cost on emissions. | Taxes and other policy instruments related to SC will be breifly discussed in Section 4.4.3.2, while avoiding overlap with policy chapters (13 and 15). The section was condensed. This point |
| 12728 | 4 | 37 | 27 | 37 | 27 | You may like to add that individual decisions are not always rational (refer to Chap.3). | Accepted. To be elaborated by John. The section was condensed [JT] |
| 17341 | 4 | 37 | 33 | 37 | 38 | unsustainable lifestyles are reproduced also by the media, which perpetuates the carbon intensive lifestyles of a middle class family in western nations with glamour and great attractiveness. The widespread availability of these images in the media can be consider at minimum here as having a powerful persuasive influence on consumer's attitudes, to say the least. The power of commertialization of the most intimate aspects of the life-style of the rich and middle class is important to consumption patterns globally. This needs be highlighted here. | Accepted. To be elaborated by John. Media influences mentioned in section 4.4.3.2 instead [JT] |
| 14020 | 4 | 38 | 27 | | 34 | Important to stress the importance of social and material contexts, so that consumption is not reduced to individual behaviors and efficient technologies. Literature to consider: the work by Elizabeth Shove and others, including Shove, E. (2005) Changing human behaviour and lifestyle: a challenge for sustainable consumption? In: Consumption - Perspectives from ecological economics. Elgar, Cheltenham, pp. 111-132; | Accepted. Reference is difficult to locate, and somewhat dated. Can we find a more recent reference? |
| 17342 | 4 | 38 | 4 | 38 | 26 | How information influences behavior is explained in Chapter 2 (System 1 and System 2 type of reaction) please make a cross-reference here. | Accepted. Done [JT] |
| 18704 | 4 | 38 | 4 | | | Weber, E.U. & Johnson, E.J. (2012). Psychology and Behavioral Economics Lessons for the Design of a Green Growth Strategy. White Paper for Green Growth Knowledge Platform (OECD, UNEP, World Bank). | Accepted. Reference stored in Zotero. Peer reviewed literature is preferrred. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18705 | 4 | 38 | 4 | | | Here and below it may be useful to make the point that metrics like the carbon footprint of products help to create new goals (e.g, to reduce CO2 emissions) and to attract and keep attention on those goals, in the competition between goals that i mentioned in comment 5. The reference in Comment 6 discusses this point on its p. 10. | Accepted. Will make that point and use the reference (but which one, the comments are not numbered). Done [JT] |
| 18706 | 4 | 38 | 4 | 38 | 26 | This discussion is useful, but also very developed-world focused. It may be useful to address what these topics mean in a developing world context, including the ideas of a hierarchy of needs (e.g., Maslow, 1954), where concerns with product carbon footprints might be seen as a luxury concern that only developed countries can afford. This is especially true in light of the fact that this chapter also covers equity as a topic. | Accepted. I agree, but exporters in developing countries are nevertheless often compelled to document and reduce the carbon footprint of their |
| 12729 | 4 | 38 | 4 | 38 | 26 | Sundarakani, Balan; Souza, Robert de; Goh, Mark; Wagner, Stephan M.; Manikandan, Sushmera (2010): Modeling Carbon Footprints across the Supply Chain. In: International Journal of Production Economics 128 (1), p. 43–50; p.43) provide further information on the Carbon Foot Print within the supply chain. | Accepted. Although this comment and refernece seems to refer to Section 4.4.4. The suggested study has been |
| 16246 | 4 | 39 | 1 | 39 | 3 | I would not call "industrial symbiosis" a sub-discipline, but a concept explored in industrial ecology. So is design for environment. LCA is not a field as an alternative to industrial ecology, but a tool within the field of industrial ecology. Relevant tools within industrial ecology not mentioned here are Material Flow Analysis (MFA) and environmentally-extended input-output analysis (EE-IO). | Accepted. To be elaborated by Michael |
| 5479 | 4 | 39 | 11 | | | this is being attempted by the state of Oregon - http://www.deq.state.or.us/lq/sw/materialsmgmtplan.htm | Ok. Find studies reporting on this |
| 17642 | 4 | 39 | 26 | 39 | 38 | Such as systematic concept is better approache for monitoring and evaluation, it is important to define "unit" and "boundary" with representativeness heuristic for regionals and countries, etc. | The comment is difficult to understand. |
| 10865 | 4 | 39 | 26 | | | Define "CO2 equivalents". I am sure you use GWP100, but this should be stated. This choice is not unique, and should point to the relevant section of WGI Ch8. In the case of food, using CO2-eq based on GTP will give a quite different result. | Accepted. Will make a note to that effect. What is GTP? |
| 5480 | 4 | 39 | 39 | 40 | 29 | Here the authors go from very big picture- changing basic assumptions on how LCA can be used to estimate GHG emissions to very small picture of different levels of accounting for this- It would be helpful to add additional information on how the broader perspective changes overall understanding of emissions- one or two examples could be used and to limit discussion on the smaller accounting issues | Accepted. Wil have to give this comment more thought, it is not crystal clear what she wants us to do. |
| 10866 | 4 | 39 | 42 | | | For the first point, appropriate references here include Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908. and the model comparison, Figure 1 (and references), in Peters, G.P., Davis, S.J., Andrew, R., 2012. A synthesis of carbon in international trade. Biogeosciences 9, 3247-3276. | Accepted. Comment refers to 'choice of accounting method', item 1 about reduction in emissions by nations. The suggested references (Glen P. Peters et al., 2011b; G. P. Peters et al., 2012) |
| 5229 | 4 | 39 | 45 | | | The inclusion of new references will add some information. 1. Soimakallio, S., Kiviluoma, J., Saikku, L. 2011. The complexity and challenges of determining GHG emissions from grid electricity consumption and conservation in LCA - A methodological review. Energy 36, 6705–6713. 2. PINGOUD, K., EKHOLM, T., SAVOLAINEN, I. Global Warming Potential (GWP) factors and warming payback time as climate indicators of forest biomass use". Mitigation and Adaptation of Strategies for Global Change (3 November 2011), pp. 1-18. DOI 10.1007/s11027-011-9331-9. 3. Helin, T., Sokka, L., Soimakallio, S., Pingoud, K., Pajula, T. 2012. Approaches for inclusion of forest carbon cycle in life cycle assessment – A review. GCB Bioenergy (in press). | Accepted. The suggested references (Pingoud et al., 2011; Soimakallio et al., 2011; Helin et al., 2012) have been located and added to Zotero and will be considered, given space limitations. |
| 2922 | 4 | 39 | 34 | 39 | 34 | attempts' - does it suggest the definition is not useful? | Accepted. No, I think I was using the author's own wording. "Attempt to" |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12731 | 4 | 39 | 9 | 39 | 10 | Labour rights might be important in international politics as democracy and human rights in general (comment 12, 19). But it is no conditio sine qua non for sustainable development. Sustainable production in the sense of the Brundtland Definition of sustainability (pp. 11-12) rather depends on durablity (temporary level of sustainability) and the potential to spread a production pattern worldwide (spatial level of sustainability). Even if low labour standards are morally controversial the durability of the use of ressources would not depend on its amerlioration. In this context also see the inclusion of labour rights within the spatial context of sustainability as included in the contraction and convergence principle (p. 70, line 38). | Accepted. We will qualify the statement. It depends on your conception of SD, i.e. whether the social aspects of sustainabiliyt is considered and deemed important. See early part of Chapter. |
| 16939 | 4 | 39 | | | | If this is the place where AR5 addresses consumption vs production accounting, it might be interesting to try and produce a graphic correlating to Figure 14-2 but showing how it would change on a consumption basis? Or this may be a task for Chapter 5. | Will consider this. |
| 8807 | 4 | 39 | 11 | 43 | 28 | Carbon accounting is largely based on assumptions falsified by Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) and section 4.4.5 would be a good candidate to be trimmed leaving the references by indicating the literature but less of the detail, in my opinion. | We will adopt a more critical perspective on carbon accounting and LCA in general, using Charlesworth & Okereke (2010) among other references. Carbon accounting, irrespective of its problems, is a strong trend in both private companies, NGOs and governments, so it is important to discuss it thoroughly |
| 10273 | 4 | 39 | | 39 | | T. Homma et al., "Quantitative evaluation of time-series GHG emissions by sector and region using consumption-based accounting", Energy Policy (forthcoming) will also provide consumption emissions by region including non-CO2 GHG, and additional information on the consumption CO2 emission pattern. | Accepted. The reference (Homma et al., 2012) has been located in added to Zotero. More detailed discussion of |
| 7843 | 4 | 4 | 1 | 7 | 44 | This executive summary of chapter 5 is an example how an executive summary should not be written. It is too lon, it does not include references to the underlying subchapters and it does not include information on the level of uncertainty of the findings. All this indicates that this executive summary does njot really reflect the findings of the assessment of the literature but has more the nature of an introduction. | Will take into account. |
| 3277 | 4 | 40 | 13 | 40 | 13 | Multi-regional input-output models are not a class of hybrid LCA-EIO methods. Multi-regional input-output models are a type of EIO model in which the imports to a region are modelled using the technology of the region of origin, whereas simpler EIO models generally assume that imports are produced using the domestic technology of the destination (consumimg) region. | Accepted. Will make the text more accurate/precise. |
| 10867 | 4 | 40 | 14 | | | Accounting systems are a human construct is a better way to put this, Caldeira, K., Davis, S.J., 2011. Accounting for carbon dioxide emissions: A matter of time. Proceedings of the National Academy of Sciences 108, 8533-8534. | Accepted. Will consider the suggested reference (Caldeira and Steven J. Davis, 2011) which has been added to Zotero. |
| 7303 | 4 | 40 | 30 | 43 | 28 | Propose to merge sections on various carbon footprints in one, to reduce the entire length of the chapter. | Will consider this as part of the overall strategy to trim Chapter 4. |
| 5735 | 4 | 40 | 40 | 40 | 40 | What is the source? However this is consistent with FAO's rough calculation of 22% (+ around 15% due to land use): http://www.fao.org/docrep/014/i2454e/i2454e00.pdf | The source is given in the beginning of the sentence - Hertwich and Peters |
| 4570 | 4 | 40 | 15 | 40 | 17 | Add: Rajamani, Lavanya. 2012. “The Changing Fortunes of Differential Treatment in the Evolution of International Environmental Law.” International Affairs 88 (3): 605-623. | Noted. |
| 7332 | 4 | 41 | 25 | 41 | 28 | Uncertainty of consumption-based emissions is dicussed in Lenzen et al (2010). DOI: 10.1080/09535311003661226 | Response: Accepted. Will consider the suggested reference (Lenzen et al., |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10869 | 4 | 41 | 25 | 41 | 26 | What is the relevance of the "complexities and uncertainties". There are complexities and uncertainties in current emission accounting, but they are still used. And the complexities and uncertainties are only relevant in some cases. If my policy is a nudge, then the complexity and uncertainty may be irralevent, however, if my policy is a BTA, then it is a different situation. | It is probably a fair point, but it needs clarification; it is important to be very explicit about uncertainty regardless of the type of accounting adopted, and we should probably make a stronger point about this, including the observation by another reviewer that accounting systems are human constructs (negotiated, influenced by political and |
| 16905 | 4 | 41 | 31 | 41 | 33 | How to combine production-based and consumption-based approaches? Would like to see more elaboration and references. | Accepted. Will make an attempt, depending on availability of literature (see references in comment in Line |
| 13691 | 4 | 41 | 31 | 41 | 31 | Add after "… source)": "Furthermore, countries exporting goods benefit from export revenues, with costs related to greenhouse gas emissions as well as any other negative impacts of production of those goods priced in (Steckel et al. 2010, p. 781)". Reference: Steckel, J.; Kalkuhl, M.; Marschinski, R. (2010): Should carbon-exporting countries strive for consumption-based accounting in a global cap-and-trade regime?, in: Climatic Change, 100, p. 779-786 | Accepted. Will consider the argument made and the suggested reference (Steckel et al., 2010) for inclusion. |
| 10870 | 4 | 41 | 32 | | | There are lots of references for this point, eg, Lenzen, M., Murray, J., Sack, F., Wiedmann, T., 2007. Shared producer and consumer responsibility - Theory and practice. Ecological Economics 61, 27-42.; Andrew, R., Forgie, V., 2008. A three-perspective view of greenhouse gas emission responsibilities in New Zealand. Ecological Economics 68, 194-204.; Davis, S.J., Peters, G.P., Caldeira, K., 2011. The supply chain of CO2 emissions. Proceedings of the National Academy of Sciences 108, 18554-18559.; etc | Response: Accepted. Will consider the suggested references (Lenzen et al., 2007; Robbie Andrew and Forgie, 2008; Steven J. Davis et al., 2011) for inclusion, in view of space limitations. |
| 7331 | 4 | 41 | 4 | 41 | 33 | Chapter 14 (14.2.4) discussed more technical difference of consumption-based emissions. Peters (2008) and Kanemoto et al. (2012) discuss the difference between territorial and consumption-based emissions. http://dx.doi.org/10.1016/j.ecolecon.2007.10.014 http://dx.doi.org/10.1021/es202239t | Accepted. Will coordinate with the relevant authors of Chapter 14 (14.2.4), and consider the two suggested references (Glen P. Peters, 2008; |
| 10868 | 4 | 41 | 4 | 41 | 24 | There could be a broader list of references on these issues. Davis, S.J., Peters, G.P., Caldeira, K., 2011. The supply chain of CO2 emissions. Proceedings of the National Academy of Sciences 108, 18554-18559.; Davis, S.J., Caldeira, K., 2010. Consumption-based Accounting of CO2 Emissions. Proceedings of the National Academy of Sciences 107, 5687-5692.; Peters, G.P., Hertwich, E.G., 2008. CO2 Embodied in International Trade with Implications for Global Climate Policy. Environmental Science and Technology 42, 1401-1407.; Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908.; etc | Accepted. Will consider the suggested references (Glen P. Peters and Hertwich, 2008; Steven J. Davis and Caldeira, 2010; Glen P. Peters et al., 2011a; Steven J. Davis et al., 2011) for inclusion, while also considering space limitations and the possibility that some of these references address very similar questions and report on very similar model results. Some of the suggested references have been cited elsewhere in |
| 3278 | 4 | 41 | 43 | 41 | 43 | Move the word "average" to earlier in the sentence, as follows 'The growth in average CO2 household emissions was 15% on between 1990 and 2004.....' | Accepted. |
| 3279 | 4 | 41 | 45 | 41 | 56 | Replace<br>"and since 1996, increased household energy use"<br>with<br>"with only slight relative decoupling between expenditures and CO2 emissions occurring since 1996". | Accepted. Check the wording in the cited paper. |
| 4572 | 4 | 41 | 29 | 41 | 33 | Add: Shue, Henry. 2013. “Climate Hope: Implementing the Exit Strategy.” Chicago Journal of International Law 13(2). | Noted. |
| 10871 | 4 | 42 | 1 | | | The following review should at least be mentioned Hertwich, E.G., 2011. THE LIFE CYCLE ENVIRONMENTAL IMPACTS OF CONSUMPTION. Economic Systems Research 23, 27-47. | Accepted. Will consider the suggested reference (Hertwich, 2011) for inclusion, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5481 | 4 | 42 | 3 | | | Graph should include some basic information on characteristics of households for example m2 per household, vehicles per household | Accepted. |
| 4574 | 4 | 42 | 28 | 42 | 28 | The report to President Lyndon Johnson was by Roger Revelle, not the Jasons, and was in 1965. The report by the Jasons was to President Jimmy Carter, and was in 1977. Oreskes, Naomi, and Erik M. Conway. 2010. Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco to Global Warming. Bloomsbury Press, New York. 170-172. | Noted. |
| 10873 | 4 | 43 | 34 | 44 | 15 | There are several articles on the temporal dimensions, Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908.; Peters, G.P., Davis, S.J., Andrew, R., 2012. A synthesis of carbon in international trade. Biogeosciences 9, 3247-3276. | Accepted. Will discuss temporal dimensions also, subject to space limitation, and in this regard consider inclusion of the suggested references (Glen P. Peters et al., 2011b; G. P. |
| 10872 | 4 | 43 | 42 | | | Nothing agains the Carbon Trust report (it was my data), but there are a multitude of peer reviewed articles that can be referenced here. Peters, G.P., Hertwich, E.G., 2008. CO2 Embodied in International Trade with Implications for Global Climate Policy. Environmental Science and Technology 42, 1401-1407.; Davis, S.J., Caldeira, K., 2010. Consumption-based Accounting of CO2 Emissions. Proceedings of the National Academy of Sciences 107, 5687-5692.; Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908.; and many others | Response: Accepted. Will consider inclusion of the suggested references (Glen P. Peters and Hertwich, 2008; Steven J. Davis and Caldeira, 2010; Glen P. Peters et al., 2011) (they are all are mentioned in other comments). |
| 3280 | 4 | 43 | 7 | 43 | 7 | PAS 2050 was updated in 2011. | Accepted. |
| 10428 | 4 | 43 | 31 | 44 | 15 | Remove the section: The spatial divide between consumption and production, very little value-add to the chapter | The comment is not well substantiated. The section will be improved upon, cf response to other review comments. We maintain that the increasing dislocation of production and consumption activities have significant implications for |
| 17343 | 4 | 43 | 34 | 43 | 45 | Please consider coordinating here in this session with Chapter 8 and Chapter 12 at least cross-referencing and reading their take on this spatial aspects. | Accepted. Will do that. |
| 17344 | 4 | 44 | 16 | 44 | 23 | again seek to coordinate with Chapter 8 please for content and cross-referencing | Link with Ch.8 to be explored |
| 2561 | 4 | 44 | 22 | 44 | 22 | Not only biofuels. All fuels. See SRREN Ch9 | ok |
| 11568 | 4 | 44 | | 52 | | The relevance of the section should be made clearer. Maybe the section can be shortened. | Noted |
| 8808 | 4 | 44 | 24 | 53 | 33 | Including a development pathway where widespread moderation of consumption by the global middle class and those with higher wealth still would appear a useful addition. | Accepted, provided there is literature |
| 3290 | 4 | 44 | 35 | 47 | 33 | This portion of the section should be deleted - or at least significantly shortnened - because of overlap and there should be a reference to chapter 6, Assessing Transformation Pathways. | Section useful in Ch.4 flow but overlap w/Ch.6 (and 5) to be addressed. Section will have to be shortened anyway. |
| 15111 | 4 | 44 | 16 | 44 | 22 | I propose to delete this paragraph because don´t exist consensus neither their definition nor their clear application and results | We do not understand what the consensus is about. Page 44 lines 16 to |
| 4571 | 4 | 44 | 6 | 44 | 8 | Add: Shue, Henry. 2011. Human Rights, Climate Change, and the Trillionth Ton. In: The Ethics of Global Climate Change, ed. Denis G. Arnold. Oxford University Press, United Kingdom. 292-314. | Noted. |
| 2923 | 4 | 44 | 26 | 46 | 22 | Possibility to be shortened | Accepted |
| 5482 | 4 | 46 | 16 | 46 | 22 | More information on green growth would be helpful | Noted, provided there is space |
| 17345 | 4 | 46 | 26 | 46 | 35 | Make a crossreference to chapter 8 here. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 6322 | 4 | 46 | 16 | 46 | 22 | A recent collection of articles arose from two international conferences on "The Natural City," where Robert F. Kennedy Jr., Dr. Jane Goodall and former Vice-President Al Gore were keynote speakers. The book may be useful to be referenced here. Co-edited by Ingrid Leman Stefanovic and Stephen Scharper, THE NATURAL CITY: RE-ENVISIONING THE BUILT ENVIRONMENT (Canada: University of Toronto Press, 2012.) It is a collection of chapters that summarize and address many "green growth" concepts. | Noted, will review reference |
| 12732 | 4 | 46 | 19 | 46 | 20 | See comment 1. | Unclear |
| 12734 | 4 | 46 | | 48 | | This section should refer more to climate change and the general explanations could be shortened. | Accepted |
| 14322 | 4 | 46 | 24 | | | This section would benefit from the inclusion of more references. In the present version, the level of detail in which Page (2006) is discussed is very high and there are relatively few additional references. | Accepted |
| 12733 | 4 | 46 | 25 | 47 | 16 | The sentence in p. 46, line 16f. makes point so the passages before can be shortened. | Unclear |
| 10429 | 4 | 46 | 2 | 46 | 22 | The forward looking development paths have to be clearly specified. The section as such does not specify it properly. Applications related to growth, poverty in developing countries are necessary | Accepted. Box 4.1 to be revised |
| 8262 | 4 | 47 | 11 | 47 | 11 | There probably need more explanation to the statement, “the level (and type) of consumption is almost completely driven by cultural norm”, are these the consumptions referred to as luxury consumption? | In fact, refers to Section 4.4 and not 4.5 |
| 18331 | 4 | 47 | 16 | | | This sentence is opaque to most readers… simplify? | Noted, will review sentence |
| 3291 | 4 | 47 | 34 | 50 | 9 | Keep this portion of the section because it is nicely focused on key issues. | Thank you |
| 17346 | 4 | 48 | 13 | 48 | 15 | Make a crossreference to chapter 8 here. | Accepted |
| 3613 | 4 | 48 | 24 | 48 | 24 | Please add as citation for the Environmental Kuznets Curve itself "(Grossman and Krueger, 1991; Grossman and Krueger, 1995)". Please cite as Grossmann, G.; Krueger, A.: (1991). Environmental Impacts of a North American Free Trade Arrangement. Discussion Papers in Economics, No. 158. Woodrow Wilson School of Public and International Affairs, Princeton. Grossmann, G.; Krueger, A.: (1995). Economic growth and the Environment. Quarterly Journal of Economics 110 (2), 352-377. | Reference to be reviewed |
| 3614 | 4 | 48 | 27 | 48 | 27 | Please make the references to the econometric work here. | Noted, but some econometric work |
| 18332 | 4 | 48 | 28 | 48 | 37 | This is a critical para. It would be even more powerful if it were integrated with the argument about population growth and changes in wealth and demographics. | Noted, will see overlaps with Ch.5 |
| 10874 | 4 | 48 | 3 | | | The following should at least be referenced in this section , Steinberger, J.K., Timmons Roberts, J., Peters, G.P., Baiocchi, G., 2012. Pathways of human development and carbon emissions embodied in trade. Nature Clim. Change 2, 81-85. | Noted, reference to be reviewed |
| 5483 | 4 | 48 | 4 | 48 | 21 | How does infrastructure relate here? It would seem that infrastructure choices re multiple variables including transport, waste management, energy are critical to this but are not mentioned directly | Accepted. Will include discussion on infrastructure. |
| 12735 | 4 | 48 | 1 | 48 | 1 | "providing more information" in the brackets might be better replaced by a reference. | Accepted |
| 12736 | 4 | 48 | 22 | 48 | 27 | Different result in Tucker, Michael (1995): Carbon Dioxide Emissions and Global GDP. In: Ecological Economics 15 (3), S. 215–223: positive relationship between CO2 emissions and GDP; it should be mentioned that there are different findings. | Noted, reference to be reviewed |
| 15112 | 4 | 48 | 4 | 48 | 4 | I propose to delete this paragraph or pass to another Chapter because not is directed related with sustainable development | Rejected. Link to sustainable development development to be added. |
| 3615 | 4 | 49 | 17 | 49 | 17 | Please add "For China, Li and Oberheitmann (2008) found that the country is still on the left hand rising part of the Environmental Kuznets Curve. The four year period of negative income elasticities of emissions between 1997 and 2000 which temporarily that lead to an Environmental Kuznets Curve like shape with a decreasing right hand part of the inverted U-type shape was only a structural break." Please cite as: Li, Y. and Oberheitmann, A. (2008). Main factors of decoupling China’s energy related emissions from its economic growth – Where is China on the Environmental Kuznets Curve? ASIEN, 106, 7-23. | Noted, reference to be reviewed |
| 12737 | 4 | 49 | | 49 | | A figure of an environmental cuznets curve might have more explanatory power than this figure. Furthermore, Canada, US, Germany can not be distinguished, also World is probblematic to identify. | Noted, Figure to be revised |
| 14311 | 4 | 5 | 1 | 7 | 44 | The executive summary would benefit | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8794 | 4 | 5 | 11 | 5 | 14 | The 'definitions' of sustainability all make more consumerist and utilitarian ethical assumptions than does Brundtland or the Rio Declaration. Literature such as Dobson and Jacobs would help broaden and crystalize the authors understanding of sustainable development and sustainability. | Rejected. There is no consumerist or utilitarian assumption in the text. |
| 3943 | 4 | 5 | 11 | 5 | 11 | Who determines what conception will prevail, and what is the fate of those who disagree? | Collective discussions of objectives are the essence of democracy. |
| 6092 | 4 | 5 | 11 | 5 | 15 | Is this the definition by Chapter 4 members or citation from other literature? Please make it clear. | OK. |
| 4752 | 4 | 5 | 14 | 5 | 15 | I don't agree with the sentence "ensuring sustainable development is less ambitious but more consensual than seeking a socially optimal pathway". Could you please explain are argue how you have reached this statement? | Noted. Will clarify. |
| 3942 | 4 | 5 | 15 | 5 | 15 | Who determines what is the socially optimal pathway and what is the fate of those who disagree? | Collective discussions of objectives are the essence of democracy. |
| 4753 | 4 | 5 | 16 | 5 | 23 | "First" is mentioned but there is no "second", "third", etc. Change the sentence. | Not relevant. |
| 4751 | 4 | 5 | 2 | 5 | 10 | Please provide an IPCC definition of the "sustainable development" | Will check IPCC Glossary (Yoke Ling) |
| 2248 | 4 | 5 | 2 | 82 | 8 | Sustainable development is impossible. There are only two directions, forward and backward. The climate and everything in it evolves, and we should try to take advantage of its course. To try and stop it leads to disaster. Futire generations will not be grateful if we make decisions on their behalf. They will make their own decisions and they are certain to be different and even diametrically opposite from what we want to wish on them. We should have greater concern for the state of our own affairs.. The future generations are going to have to cope with the mess we are making and the likelihood is that they will hate us for it. Currently we are imposing mass unemployment on the next generation. Since ther is no evidence that greenhouse gases are harming the climate the Chapter as a whole is irrelevant | Will shorten chapter. |
| 3205 | 4 | 5 | 20 | 5 | 20 | "it appears" How? | Not relevant. |
| 2935 | 4 | 5 | 22 | 5 | 23 | This line refers to "the need for an ..operational ..meaning of equity", but without any reference to p7 lines 17-27 , which would appear to point towards an answer to this question. | Noted. |
| 3944 | 4 | 5 | 24 | 5 | 24 | Who determines which approach to SD and equity will prevail, and what is the fate of those who disagree? | Collective discussions of objectives are the essence of democracy. |
| 14004 | 4 | 5 | 33 | | 34 | The IPAT model is a narrow and outdated explanation of environmental impacts. The social sciences has shown that it is about much more, including access to resources, power relations, social vulnerability, etc. | Agree. This is quantitative decomposition with no explanatory |
| 7752 | 4 | 5 | 33 | 5 | 35 | I was a little concerned to see the use and support of the IPAT explaination of transition to SD in the Exec Summary. There is a significant critique of IPAT, and this should be cited. Many authors disregard IPAT as it is only useful in limited contexts. E.g. empirical tests show different types of impacts (e.g. CO2 or SO2) relate differently to changes in population, affluence and technology, i.e. the relationship does not always hold. Further the simple multiplicative relationship among the main factors generally does not hold, e.g. doubling population does not necessarily lead to a doubling of impact. This critique must be recognised. | Agree. This is quantitative decomposition with no explanatory value. Must discuss (4.3.1) |
| 3945 | 4 | 5 | 33 | 5 | 3 | Who considers these to be the key factors and who disagrees? ( Niall Ferguson's Reith Lecture series this year is saying that institutional quality is a key factor in the advancement of nations.) | Choice of drivers needs further discussion (4.3) |
| 3946 | 4 | 5 | 33 | 5 | 35 | Is this saying that there is high agreement that greater prosperity makes a cleaner environment more affordable, or is this saying the opposite? | The opposite. |
| 10856 | 4 | 5 | 36 | 5 | 41 | Wouldnt governance also be quite important in shaping these issues? | Sure,this is just said in the following |
| 18296 | 4 | 5 | 37 | | | The word 'income' is too narrow, and could be replaced by 'well being and material standards of living'. | Accepted. |
| 13999 | 4 | 5 | 37 | | | What about humans as agents of change? Limiting this discussion to human capital and the role humans have in production will leave out the discussion about how humans can foster change and the individual and systems level. | Accepted. |
| 3204 | 4 | 5 | 4 | 5 | 4 | Is the existence of co-benefits of climate action for SD and equity an empirical fact, so that its place at the beginning of the executive summary is warranted? | To be clarified (Sivan). |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4518 | 4 | 5 | 46 | 6 | 6 | Increases in global affluence which is described in this paragraph as “consumption of goods and services” has also driven vast improvements in public health, human environments, and in many cases natural environments (improvement of criteria air pollutants). The one-sided description of the ills of affluence is not balanced by the obvious benefits or the aspirations to seek affluence. Suggest that this paragraph include descriptions of improved conditions (e.g. life expectancy) over the past few decades. | Will take into account. |
| 10857 | 4 | 5 | 46 | | | If you are talking about "global consumption" then it is the same as "global production", and thus your argument is equally applicable to consumption and production | Agreed. |
| 14000 | 4 | 5 | 47 | | | Suggest "…and is a key driver of environmental CHANGE AND degradation, | Rejected. |
| 3947 | 4 | 5 | 47 | 5 | 47 | Who is the authority for this statement and is there a good reason for not acknowledging alternative views - eg see the literature reviewed by Lomborg, the Skeptical Environmentalist, chapter 1? | See comment 149 |
| 12277 | 4 | 5 | 1 | | | Please ensure that the executive summary focus on the key findings in the chapter in line with the current practise of IPCC reports. A lot of the text in the FOD of the Summary is of a descriptive nature, hence the summary can be shortened by omitting this. You might consider to move parts of the descriptive text from the summary and use it instead of the too long text in the body of the chapter, where appropriate. The executive summary in the FOD is in my opinion too long, and should be reduced by at least one page. | Accepted. |
| 15099 | 4 | 5 | 17 | 5 | 17 | To include: ¨Development RIGHT, the elimination of poverty, …..¨ | Rejected. |
| 15100 | 4 | 5 | 46 | 5 | 47 | To include: ¨The global consumption of goods and services has increased dramatically over the last decades, in both absolute and per capita terms, JUST AS UNSUSTAINABLE CONSUMPTION AND PRODUCTION PATTERNS, ARE key driverS of environmental degradation, including global warming ¨ | Rejected. |
| 2909 | 4 | 5 | 46 | 5 | 46 | proposal is to remove 'dramaticly', in stead for instance enormously? | Accepted. |
| 12676 | 4 | 5 | 12 | 5 | 13 | An equal development of the three pillars might be impossible insofar that they limit each other (in this context also see e.g. Norman, Wayne/MacDonald, Chris, Getting to the Bottom of "Triple Bottom Line", in: Business Ethics Quarterly 2004, pp. 243-262). Another argument to refuse an equal importance of each pillar is provided by the limited possibility of substitution of natural ressources (cf. IPCC Draft, Chapter 4, Section 4.2.1, p. 12, line 28; see also Constanza, Robert et al., The value of the world’s ecosystem services and natural, in: Nature 1997, p. 253-260). A reasonable exception (where socio-economic concerns prevail) might be the subsistence level respectively a very low level of "welfare" that might be intouchable when weighing the interests between todays and future generations (Constanza et al., p. 257). Hence, with regard to avoiding contradictions the Brundtland definition of SD seems superior to the "Triple Bottom Line" (IPCC Draft, Chapter 4, Section 4.2.1., pp. 11-12 and Section 4.2.2, p. 13, lines 25-26; see also infra comment 21). | Helpful points (for 4.2.1) |
| 12677 | 4 | 5 | 36 | 5 | 40 | The increase of income and economic returns, the acquisation of skills and the accumulation of knowledge are no aims within sustainable development per se only if they are in line with a durable development path (cf. comment 1). | Noted. |
| 3292 | 4 | 50 | 10 | 53 | 33 | Delete these materials, including Fig. 4.2, in view of the need to shorten the chapter because they are a bit general. | Rejected, see response to comment 5484 |
| 10430 | 4 | 50 | 28 | 50 | 29 | Remove this line | Noted, line to be made clearer |
| 5484 | 4 | 50 | | | | Section 4.5.3.1- this discussion is carried out too much in a vacuum. The authors are trying to apply pre existing models to a structure or range of structures that are at present very poorly defined. As the authors have stated in previous sections- use of a sustainable model likely involves a transition from the existing consumerist model. The value of the Solow growth model may be limited with a new mindset. For me, the most valuable portion of this section lines 38-46 on sequential decision making and inertia- this seems the most applicable and helpful | Noted, 4.5.3.1 provides framing for the tools to analyze transitions. To be revised (see also response to comment 18333) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18333 | 4 | 50 | | | | Good discussion - but ity needs a comment that this economic transition modelling fails to account for social and political institutional factors which can offer either profound unanticipated barriers to - or catalysts for - change. As a consequence, the projections are often weakly predictive. An example relates to section 4.5.3.2. The failure of social acceptance of nuclear power led to its economic unviability in most Western countries. Cars were initially also rejected - and if the toll of injury and death associated with them were more forcefully recognised and considered, the successful acceptance and use of the car as a form of mass transport may have taken another path (at leat in terms of design). This element is considered where this chapter talks about' actors losing faith in the regime'... this is almost the only point in this chapter where social institutions are given prominence. | Noted, 4.5.3.1 to include a broader review of model limitations. |
| 16940 | 4 | 51 | 3 | | 12 | This is potentially a crucially important paragraph that in my view misses the fundamental point. Rigidities of all sorts characterise short-term options and constraints, and this para correctly implies that this is about far more than just capital stock, but has a lot to do with behaviour, expectations, habits etc; classic First Domain characteristics. Keynes' General theory can be interpreted as illustrating what these rigidities of "First Domain" characteristics do to classical economic expectations; in that sense Solow's acknowledgement was spot on. However, concluding that neoclassical assumptions are appropriate to "very long times scales" misses the equivalent phenomena at the other end of timescales. Neoclassical (Second Domain) assumptions assuming constant supplly and demand curves ie. constant (or exogenously defined trends in) technology, prefrences, infrastructure etc. For timescales beyond a decade or two, evolutionary effects, path-dependence, endogenous change etc, start to dominate. This paragraph really needs to expand from the Two to the Three domains to make the core points, that different decision and economic processes dominate at different ttimescales, and neoclassical is a reasonable approximation to the middle domain. for details see Chapter 2 in Grubb, Hourcade and Neuhoff, Planetary Economics. | Noted, very important comment, to be included in revision of section 4.5.3.1 |
| 10432 | 4 | 51 | 42 | 51 | 42 | Please look up Gillig, McCarl and Sands 'Integrating agricultural and forestry GHG mitigation responses to general economic frameworks' MITI 9 (3) (2004) 241-259 | Noted, reference to be reviewed |
| 5485 | 4 | 52 | | | | Section 4.5.3.2- is there any information or literature on alterations of the socio-technical landscape in light of the rapid information transfer through social media or innovations that don't require extensive infrastructure? | Noted, will review literature |
| 12738 | 4 | 52 | | 52 | | To which institutional theory does the figure refer to? Should not there be arrows from 2., 3., 4. point to 1.? The arrows could also be displayed in a different colour in order to improve the visualisation of the "evolution". Please note "shits" in the brackets under 3. | Noted, will improve figure |
| 12740 | 4 | 52 | 23 | | | A reference should be made why new technologies are often less efficient. Is not it a question of time? | Noted, will clarify |
| 14022 | 4 | 52 | 7 | 53 | 33 | On technological transitions literature that is highly relevant includes: Berkhout, F. 2002. Technological regimes, path dependency and the environment. Global Env. Ch., 12(1): 1-4; Berkhout, F., Marcotullio, P. and Hanaoka, T. Understanding energy transitions. Sustainability Science [Special Issue: Socio-technical transitions towards sustainable energy and climate stabilization F. Berkhout, P. Marcotullio and T. Hanaoka (eds)] vol 7(2) 2012: 109-111; Adrian Smith, Andy Stirling, Frans Berkhout, 2005. The governance of sustainable socio-technical transitions. Research Policy 34, pp. 1491-1510; Rohracher, H. 2008. Energy systems in transition: contributions from social sciences. International Journal of Environmental Technology and Management, 9 (2-3), 144-161; Rohracher, H. 2008. Energy systems in transition: contributions from social sciences. International Journal of Environmental Technology and Management, 9 (2-3), 144-161. | Noted, reference to be reviewed |
| 7777 | 4 | 53 | | 55 | | There is some confusion thorughout this section beteen mitigation and mitigative capacity, and adaptation vs adaptive capacity, While these concepts are really clearly laid out in the second para of this section, these definitions are then not used in section 4.6.1.2 'differences between mitigative and adaptive capacities' | now clarified in 4.6.1.2 |
| 14021 | 4 | 53 | 34 | 57 | 23 | The discussion about mitigative capacity and mitigation, and link to adaptive capacity and adaptation is somwhat misplaced also in section 4.5. It is an important section as it has the potential to bridge the gap between adaptation and mitigation, and argue why these two needs to be considered together in a sustainablity context. | this section is being moved into 4.5. It is unclear what gap between mitigative and adaptive capacities needs to be bridged. Reference? |

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| 3293 | 4 | 53 | 34 | 56 | 21 | This proposed section is ok, except Box 4.2, which should not be included because it is too cryptic and confusing. | Agreed |
| 15113 | 4 | 53 | 44 | 53 | 44 | This subsection¨ Mitigative capacity, adaptive capacity and response capacity¨ would be deleted or pass to another Chapter because it isn´t written in analysis with sustainable development. | This section will be moved to 4.5. A new sentence in intro makes the connection |
| 12200 | 4 | 54 | 3ff | | | You write about the 'abilities of a society' and 'factors that contribute to adaptive and mitigataive capacity' – what are these? | True, we mention broad characteristics rather than specific institutions, and so this section can be made a little more |
| 14023 | 4 | 54 | 1 | | 5 | Are these common factors (shaping both adaptive and mitigative capacity) also described up front? It would be useful, as it very much forms the basis for discussing adaptation and mitigation in one chapter. | not sure what "up front" means, perhaps we can bring this out in intro to chapter |
| 14025 | 4 | 54 | 11 | | 24 | Why there is a gap between response capacity and actual actions, has been widely studied and it would probably include not only literature that points to lack of policial will, but also literature pointing at social practices (see work by Elizabeth Shove, John Urry, Hal Wilhite, etc.) | Social practices is now included. |
| 7780 | 4 | 54 | 13 | 54 | 14 | delete sentence starting 'Some have thus viewed..' as it repeats previous sentence | The best of these two wil be combined |
| 7781 | 4 | 54 | 18 | 54 | 18 | delete 'Caring enhances political willingness', there are many cases where this is not the case, e.g. UK love of animals and hatred of animal testing, yet we still have animal testing | This will be handled in a more nuanced way. |
| 14026 | 4 | 54 | 28 | | 40 | Start out with presenting the multiple factors, processes and structures that affect response capacity (as opposed to starting out with a narrow focus on economic and technological resources), including education, health, institutions, knowledge and technology, social factors such as human capital and governance structures, social capital, socia networks, values, perceptions, customs, traditions and levels of cognition, inequality in the distribution of income, and high access to information. | Not clear why starting point is important. Many of these factors are highly correlated.List will be made more complete to reflect a more cultural perspective. |
| 12201 | 4 | 54 | 29-30 | | | You write that there is a strong correlation between the capacity to develop sustainably and climate response capacity. What is "climate response capacity"? Is there a common definition in the scientific literature? Does this include the field of adaptive capacities? What about the trade-offs between mitigation and adaptation policies? In chapter 15.10.2 the authors write that "mitigative and adaptive capacities are fundamentally disjoint" - how does this logically fit together? | Definnitions of mitigative and adaptive capacity are all pretty vague, as are the definitions of the capacity to develop sustainably. As authors become more specific, the directions of their |
| 8263 | 4 | 54 | 3 | 54 | 3 | A specific definition of mitigative capacity can be inserted here. | We have blended multiple sources here |
| 7778 | 4 | 54 | 3 | 54 | 3 | Make reference to adaptive capacity section in WGII | Agree, and will be done. |
| 7782 | 4 | 54 | 34 | 54 | 40 | Many references to response capacity, start with IPCC (2001), Tompkins and Adger (2005) and then more…it would be interesting to track the trajectory of this idea. | It would indeed, especially since some scholars oppose combininb them, but it would be a longer story. Thompkins and Adger will be cited earlier, the trajectory |
| 14027 | 4 | 54 | 39 | | | Suggest adding: "...effective, EQUITABLE AND SUSTAINABLE responses." | OK |
| 7779 | 4 | 54 | 6 | 54 | 6 | Apologies for referencing my own work, but these ideas about response capacity have been around for some time e.g. see: Tompkins EL, and Adger WN. 2005. Defining response capacity to enhance climate change policy. Environmental Science and Policy 8(6):562-571, this paper has been cited about 40 times, and several of these papers also build on this conceptualisation of repsonse capacity. | We cite Yohe, 2001 who first made the argument but we can include Thompkins and Adger, 2005 |
| 14024 | 4 | 54 | 8 | | 10 | First of all, the effects of mitigation and adaptating are different because they aim towards different goals; one to reduce emissions and the other to reduce vulnerability and enhance resilience. Unclear how the statement that mitigation is a public good informs the discussion on capacity. Furthermore, it maintains a narrow view of what adaptation is about. Also there are moral obligations related to both mitigation and adaptation. | First, this section is about both capacity and ithe use of capacity. Adaptation surely entails moral responsibilities too, and this will be included. |
| 12203 | 4 | 55 | 12 | | | I doubt that adaptation only benefits the "adapters" (does this word exist?). If climate change impacts can lead to migration or a climate-related disaster in a country, for example, does any external intervention then only benefit the recipient country or community? What about avoided effects on neighbouring countries for example? | again, the word "tend" is in the text to cover this. |
| 13693 | 4 | 55 | 12 | 55 | 12 | Replace "While…adapters" by "While some forms of adaptation only generate benefits for those that finance them," Reasons: see comment on p. 55, line 2 | see above comment and response |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14029 | 4 | 55 | 19 | | 22 | Would be good to consult WG I and WGII on the geographical scale issue, both that mitigation only truly is a global concern (what about black carbon? (Report to Congress on Black Carbon, EPA, 2012)), and that adaptation only has a local dimension (this conclusion probably comes with framing adaptation as purely a technical issue). See also comment #35. | we used the term "largely" to modify a global concern here, not "only" |
| 13692 | 4 | 55 | 2 | 55 | 4 | Replace "A fundamental … private good" by: "Whereas mitigation is generally a global public good, some forms of adaptation are club goods (e.g. a dike protecting a certain region) or even pure private goods (strengthening of one's house to withstand stronger storms). Aakre and Rübbelke (2010) describe the public good properties of many adaptation measures." Reference: Aakre, S.; Rübbelke, D. (2010): Objectives of public economic policy and the adaptation to climate change, in:Journal of Environmental Planning and Management, 53, p. 767-791 | The term "private god" is not in FOD. We already specify that the benefits of mitigation are "essentially" a public good and that the benefits of adaptation "tend" to accrue to the individual, local, or natinoal actor undertaking the action". This wording encompasses the fact that some adaptation goes to groups without burdening the reader with the jargon of "club good". Similarly, roads are built |
| 14028 | 4 | 55 | 2 | | 11 | As commented upon before, this framing is too narrow, also wondering how this informs the difference in mitigative and adaptive capacity. There cannot be many adaptation measures that do not have wider societal consequences. As stressed in various chapters in WGII, adverse impacts from climate change are likely to set back development, hinder sustainable development, threathen human security, etc. . This also holds for impacts experienced by individuals and communities. So arguing that adaptation is not something that has wider societal implications is to narrow. Within sectors one can say the same: take adaptation in the road building sector for example. This adaptation is initiated to reduce costs associated with adverse climate change and it will benefit the sector, but a well adapted road sector will benefit other sectors and society at large. | See response to the same comment above. Not sure these reviewers are looking at FOD. |
| 7783 | 4 | 55 | 2 | 22 | 18 | this section confuses adaptation with adaptive capacity, and mitigation with mitigative capacity, They are not the same (as exlpained earlier in this chapter, yet they appear to be used synonymously in this section. The starting point for this chpater woudl be Yohe 2001 | Text will be modified to note that capacities are developed and maintained for different reasons, not that the capacities themselves are different. This relates to the issue of whether |
| 7784 | 4 | 55 | 27 | 55 | 36 | The previous literatyure on response capacity argues that this capacity is about: availability of technolgy and ability and willingness of society to act. The aspect of willingness is missing from this section | This is a definitional issue. There is a literature on willingness that we are trying to bring out here. Clearly we could |
| 9533 | 4 | 55 | 45 | | | Please, delete however due to duplication. | OK |
| 12741 | 4 | 55 | | 55 | | Mitigation may be a means to reach sustainability so that there could be a positive relationship between mitigation and sustainability. In contrast, the conection between adaptation and sustainability is not so obvious. | Once in the Anthropocene, and it will be a long time before the greenhouse effect of existing green house species go |
| 6893 | 4 | 55 | 23 | 55 | 24 | Please consider revising the sentence "This is true, say, for sea level rise, in which case a few meters difference in elevation can make a major difference". "A few meters difference in elevation" could easily be misinterpreted as "a few meters in SLR", i.e., an elevation in Sea Level of a few meters. Suggest to clarify that you are referring to an elevation above sea level of a specific location here. | Will clarify |
| 3294 | 4 | 56 | 56 | | | Do not include this box. See above comments on section 4.6. | Noted. |
| 14323 | 4 | 56 | 1 | | | This could be expanded to include other issues of costs and financing issues, technical and institutional capacities, short-term and longer term considerations, etc. | Noted. |
| 12742 | 4 | 56 | 23 | 56 | 40 | You may like to mention that there is a discussion about the definition of adaptation and mitigation as complements or substiutes (Ingham, Alan/Ma, Jie/Ulph, Alstair M, Can adaptation and mitigation be complements?, Tyndall Centre for Climate Change Research Working Paper 79, 2005, http://www.tyndall.ac.uk/sites/default/files/wp79.pdf (13.09.2012). | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14324 | 4 | 57 | | | | This figure does not immediately seem to provide an interesting illustration of the relationship between socio-economic adaptation and mitigation challenges. | figure illustrates alternative pathways, not challenges |
| 3295 | 4 | 57 | 1 | 57 | 23 | Delete figure and the associated discussion. They are too general. | Will consider when shortening. |
| 12743 | 4 | 57 | 19 | 57 | 21 | Maybe you like to add some more details, here. | Noted. |
| 17095 | 4 | 57 | 25 | 59 | 10 | You need to make a reference to ICSU along with the reference to Weizsacker.<br>According to recent scientific consensus arising from an international consultative process the social and biophysical sub-systems are intertwined such that the system's conditions and responses to external forcing are based on the synergy of the two sub-systems. Consequently, the full global system has to be studied rather than its independent components, as none of the challenges can be fully addressed without addressing the other challenges (ICSU, 2010). The key scientific insight is that in actions for achieving global sustainability environmental change and social transformations are tightly intertwined, impacting on our understanding of trends and drivers of global change.....ICSU, 2010, Earth System Science for Global Sustainability: The Grand Challenges, International Social Sciences Council, Paris, Oct 2010 | Yes, but we are writing one section in one chapter of one volume of a three volume report, so "whole system" thinking, though clearly correct, calls out to communication limits. |
| 8264 | 4 | 57 | 3 | 57 | 3 | To edit: "Figure Error! No text of specified style in document" | Noted. |
| 14325 | 4 | 57 | 24 | | | It is unclear why at least parts of this section is not integrated into the previous sections on the same topics (equity, indicators, consumption-based emissions, and so forth). As it presently stands, the (interesting) section seems to re-introduce and discuss the same topics covered in earlier sections of the chapter. | Agreed, but this was an imposed structure (bullet points-sections) |
| 2926 | 4 | 57 | 25 | 77 | 7 | Is it feasible to shorten this part? | Accepted. |
| 8809 | 4 | 58 | 1 | 58 | 11 | Both CBA and cost-effectiveness approaches are called into question by Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) with forms of precaution being the most widely recognised option that remains logically viable. | This paper will be quoted in another part of the chapter. |
| 12744 | 4 | 58 | 37 | 59 | 10 | A concretization of risks and examples should be added: irreversible damage, tipping points (see also comment 9). Furthermore, the incidence rate and the amount of damage should consequently structure this risk section. There might be a difference in the perception of risks of individuals concerning this two aspects, especially if they are not acting rationally. For some cases, the incidence rate, for others the amount of damage might be decisive (See infra, comment 23). | Noted. See also Ch 2. |
| 15114 | 4 | 59 | | 81 | | The subsections 4.7.1.3, 4.7.2, 4.7.3, and 4.8 have many similarities and repetitions in relation with subsection 4.2, I propose to revise and shorten, the Chapter will reduce a lot of contents. | Accepted. |
| 8810 | 4 | 59 | 22 | 59 | 29 | Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) suggests that predictions of regional climate changes are sufficiently problematic that any complacency about climate impacts by any group are 'misplaced' to say the least. | Noted. |
| 12745 | 4 | 59 | 22 | 59 | 36 | The statements seem a bit suggestive to me (e.g. call for less information in order to…). You may also like to consider that the fairness motive could also counterbalance the risk effects (as is e.g. suggested in line 48) | Agreed. Revise. |
| 8811 | 4 | 59 | 37 | 62 | 6 | Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) calls into question all consequential approaches to policy including refinements of conventional utilitarian economic approaches as consequences cannot be robustly be predicted in any meaningful way. These refinements may be useful to move policy in the right direction where economics is typically imposed; however as well as being irrational they are arguable undemocratic as discussed above so a better approach may be to challenge the use of consequential approaches to policy. | This is a very extreme viewpoint which does not seem very constructive. What should be done if consequences cannot be assessed? |
| 4573 | 4 | 59 | 9 | 59 | 10 | Order of authors is reversed. Correct is: Oreskes, Naomi, and Erik. M. Conway | This probably refers to another chapter. |
| 12278 | 4 | 6 | 1 | 6 | 1 | Please consider to replace the term "global warming" with "climate change". Rationale: Global warming is so linked to temperature, while changes happening affect many other parameters such as precipitation and the frequency and intensity of some extremes. | Accepted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17082 | 4 | 6 | 15 | | | (and other such references), why use the term “development”? The correct term would be “economic growth” as it applies to both developed and developing countries and also better captures the activities leading to concentration of GHG’s | To be clarified. |
| 14001 | 4 | 6 | 15 | | 17 | The wording chosen for this part leaves one with the impression that yes, development paths chosen will impact emissions, but that it is ambiguous. Could you elaborate on the reasons for the ambiguity? (Is it because we are not sure if it has an impact, or because we don't know the direction of the impacts?). Consider changing the wording to get across that there is a complex relationship that is not yet fully understood. | Will clarify |
| 17083 | 4 | 6 | 18 | | 20 | (and other such references), why use the term “development”? The correct term would be “economic growth” as it applies to both developed and developing countries and also better captures the activities leading to concentration of GHG’s | See 166. |
| 17084 | 4 | 6 | 21 | | | the words “path dependence” need to be clarified, and includes both technology and lifestyles. Must be spelled out! | Accepted. |
| 17085 | 4 | 6 | 25 | | | “technology transitions” refers only to production patterns, and a section on “lifestyles” should be added with reference to consumption patterns. | See 4.4.3 |
| 17086 | 4 | 6 | 25 | | | the words “a number of determinants can be considered drivers or barriers” is not clear. The entire section 4.3 titled “Determinants, drivers and barriers” needs to be reviewed, because, as page 5 line 33 states “population, affluence and technology” are key, and these three elements should be considered in this section, along with a section on ‘patterns of natural resource use, under these titles. References to human capital, education, behaviors, values, culture, governance, legacy of development – what is this – natural resources, finance are not based on scientific evidence of these elements as significant and not included in the other four elements. | See 4.3: Will add clarification about the choice of drivers to focus on. Will make consistent with Exec Sum. |
| 3949 | 4 | 6 | 25 | 6 | 30 | Why the adjective 'scientific'? To understand why governments take the decisions they take requires a positive theory of the state, as distinct from a normative theory. If the policy adviser does not have a positive theory of the state, how can he or she hope to understand why governments behave in the way they do behave? The idea that a model can scientifically predict how state power will be used or abused in the future is a novel one. | Will clarify use of term model, and its role in providing "understanding". |
| 4754 | 4 | 6 | 31 | 6 | 38 | It is also important to match financial and social requirements | Noted. |
| 7753 | 4 | 6 | 31 | 6 | 31 | Check for consistency in the use of 'adaptation' vs 'adaption' throughout | Accepted. |
| 3950 | 4 | 6 | 32 | 6 | 33 | Is the idea that the state would 'guide individual action' an elitist conception of democracy? If so, what fate is envisaged for those who refuse to be so guided? | It is in part a coordination problem, in part a prisoner's dilemma. Both situations can be improved by collective |
| 14005 | 4 | 6 | 33 | | | "Response capacity, the ability to forsee, PREPARE FOR, effectivley respond to…" | Accepted. |
| 3206 | 4 | 6 | 35 | 6 | 38 | What about economic challenges? To give incentives that internalize the external effects that underlie the climate change problem. | Agreed. |
| 18297 | 4 | 6 | 36 | | | It would be preferable to use 'social' or 'socio-political' rather than 'political', as the latter is usually regarded as referring narrowly to formal political institutions and activity and therefore fails to include legal and other social institutional elements. | Will take into account. |
| 17078 | 4 | 6 | 37 | | | replace “project” with policies and strategies, as projects are not being considered here, and the concern is with policy | Accepted. |
| 3207 | 4 | 6 | 39 | 6 | 40 | I do not understand this sentence. | Will clarify. |
| 17079 | 4 | 6 | 39 | | 43 | is a key statement and must be retained | Accepted. |
| 14002 | 4 | 6 | 39 | | 40 | There is a link between SD and climate change, even without anthropogenic climate change, due to social and biophysical vulnerability; adverse weather and climate change can have negative effects on societies, which can influence sustainability. | Accepted. |
| 6093 | 4 | 6 | 39 | 6 | 43 | It may be better to make it clear that there exist trade offs and synergies between pursuing SD and climate change (Ref. Page 5 lines 23-25 of Chapter 6) | Will clarify. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16936 | 4 | 6 | 4 | | 6 | I find this surprising. In terms of major energy end-use categories, industry is around 30% of energy and 40% of global fossil fuel CO2 emissions (including process emissions). I appreciate that industry is mostly producing products for other end-uses so in their some of this could be assigned downstream, but it hard to see how this can all be assigned to mobility or housing (let alone agriculture). I would also question the use of trying such a total downstream "ultimate use" allocation; surely industrial energy consumption, as the biggest end-use emissions sector, should at least be in the list? The structuring and breakdown, along with both energy and CO2 data, that I have found most useful is set out in Grubb, Hourcade and Neuhoff, Planetary Economics: the three domains of sustainable devleopment, Taylor and Francis forthcoming : Chapter 3, "Energy systems and technologies". | Will check (Simon) |
| 3208 | 4 | 6 | 42 | 6 | 43 | As long as sustainability has not been defined, it is hard to agree or disagree with this statement. | Not relevant. |
| 7754 | 4 | 6 | 42 | 6 | 43 | I am not convinced by the argument in the exec sum, or the chapter, that making development pathways more sustainable can go a long way to mitigation, adaptation, and adaptive/mitigative capacity. I do not think this argument is made in this chapter. I woudl reconsider including this conclusion here. | Important point. We must caveat, unpacking out relationship betw SD and CC. |
| 17080 | 4 | 6 | 45 | 7 | 2 | the paragraph is not clear and should be deleted | Will clarify. |
| 3951 | 4 | 6 | 47 | 6 | 47 | What evidence is there that pessimism is receding and why would it be important if it was when no one has been able to put forward a social welfare function capable of commanding universal support? Once again the question posed for anyone to wanting to exercise the coercive powers of the state is 'what will be the fate of those who disagree with the proposed interpersonal utility comparisons'? | The social welfare function is not a dictatorial machine, just a tool for democratic discussion of policy consequences (different people can refer |
| 17081 | 4 | 6 | 8 | | | why mix production and consumption patterns? The impacts are different and occur at different stages of development and in different countries | Noted. |
| 3948 | 4 | 6 | 9 | 6 | 10 | Is this positing that there is a trade-off between economic growth and sustainable development? If so, should not views to the contrary be acknowledged and discussed - the famous Simon–Ehrlich wager illustrates the debate. | Either engage this comment directly, or present weaker statement that posits this decoupling as "a way to reduce |
| 13271 | 4 | 6 | 39 | 6 | 43 | SD and climate change are also linked in the way climate change is currently affecting people's wellbeing (for instance, how different climate patterns make sustainable or unsustainable important human activities). A paragraph about this relationship could be included just after line 43. (in fact, stated in 4.1.2, pag 10 of the chapter) | Will bring into ES. |
| 15103 | 4 | 6 | 1 | 6 | 3 | Add: ¨This trend involves the spread of high-consumption life-styles in some countries and sub-regions, in many cases INFLUENCED BY PROPAGANDA FOR CONSUMPTION, while in other parts of the world MAINLY IN DEVELOPING COUNTRIES, large populations continue to live in poverty. | Rejected. |
| 15101 | 4 | 6 | 2 | 6 | 3 | Add: ¨ while in other parts of the world; MAINLY IN DEVELOPING COUNTRIES, large populations continue to live in poverty. ¨ | Accepted. |
| 2911 | 4 | 6 | 20 | 6 | 30 | proposal is to have less detailed information in executive summary, for instance remove 'of particular … well being'. | Accepted. |
| 15104 | 4 | 6 | 31 | 6 | 31 | Change adaption by ADAPTATION | Accepted. |
| 15105 | 4 | 6 | 37 | 6 | 38 | Add: and financial (who should pay for projects with diverse effects) challenges, AS FINANCIAL ASSISTANCE FOR DEVELOPING COUNTRIES . | Accepted. |
| 2910 | 4 | 6 | 4 | 6 | 4 | insert probably ('are probably responsible'), remove medium agreement, medium evidence (general remark) | Not relevant. |
| 15102 | 4 | 6 | 5 | 6 | 6 | Mobility,PRODUCTION OF food IN EXCESS WHERE ONE PART FINALIZE CONVERTED IN GARBAGE, and housing are responsible for about three-quarters of consumption-related environmental impacts in industrialized countries | Rejected. |
| 12678 | 4 | 6 | 10 | 6 | 10 | It seems reasonable to enlarge this remark: "from unsustainable economic growth" because growth does not per se menace the climate change even if in many cases it does (see infra, comment 21). | Accepted. |
| 3236 | 4 | 60 | 12 | 60 | 12 | Biodiversity can also be included in an anthropocentric analysis, by taking into account the future effects of lack of biodiversity. In addition, biodiversity cannot maintained without protecting insentient beings. | Yes, this is written in the previous sentence. |
| 12749 | 4 | 60 | 12 | | | It should be made clear who delivers the values. | Anybody is free to put ideas on the table. We should not be afraid of democratic |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12747 | 4 | 60 | 3 | 60 | 7 | On p. 58 reference is made to a second best world (cost-effectiveness). So it should be made clear in which sense a social welfare function matters, here. | Good point. Change the wording and specify the articulation. |
| 3956 | 4 | 60 | 43 | 60 | 43 | Is there any authority that can be cited in support of the assertion that Arrows theorem does not point to a radical impossibility? Similarly can any authority be cited that rebuts Hayek's arguments that centralised determinations whose efficacy depends on being able to harness widely dispersed information of a specific and detailed nature will fail to work well if they contain no mechanism for allowing that information to be harnessed at a lower enough cost? See http://www.econlib.org/library/Essays/hykKnw1.html | Yes, cite Sen 1999 and Fleurbaey-Maniquet 2011. |
| 12746 | 4 | 60 | 11 | 60 | 12 | Not to hurt sentinent beings is not exactly the same as the (broader) biodiversity question. The anthropocentric approach dominates the social sciences. If the IPCC integrates an ecocentric point of view in its consideration this should be explained and marked as a contrast to the elsewhere anthropcentric point of view. Anyway, the surrogate representation of sentinent beings might be a rather difficult task for humans because they only are able to represent their own perspective. Hence, if the sentinent beings should be integrated into a utility function, a non-human perspective would be hard do quantify. Thus, it seems more reasonable that humans are only able to represent their own interests. Anyway, biodiversity can be an indirect human interest or right because it can be a material prerequisite to human existence and human utiliy, too. Biodiversity or a stable climate are part of environmental stability and balance. They are constiutive for human life. So from the human point of view there is a big protection interest already. Sentinent beings can be protected as (positivistic) preferences of humans or even as humans' aesthetic interests (see IPCC Draft, Chapter 4, Section 4.8.3.1, p. 80, line 43). | We simply think it is worth mentioning the nonanthropocentric view as it exists and is not so marginal. |
| 5486 | 4 | 60 | 13 | | | Section 4.7.2.2- if you want to edit text- much discussion on well being which is difficult to define and difficult to build metrics around. Instead could you substitute metrics like access to fresh water and sanitation, sufficient food and education. Previous discussion has indicated a relationship between these and happiness- these are easier to quantify | Capabilities cover these aspects. Don't interpret well-being in a narrow sense. |
| 12748 | 4 | 60 | 40 | 60 | 40 | There should be at least one reference when refering to "many practioners". | OK, like Stern and Nordhaus. |
| 12751 | 4 | 60 | 47 | 61 | 5 | The monitization of policies could be explained in more detail. If sustainablility questions should be examined by measures of monetarization at least some concepts should be mentioned respectively cross reference be made. Above that the question of how to cope with uncertainties could also be raised in this context. Especially because of uncertain natural science-based causalities (tipping points, irreversible damage, substitutability of natural resources) the quantification of costs and benefits may be too vague. So uncertainity should be made transparent and some ideas given how to cope with (e.g. by a qualitative balancing process that includes uncertainity in a transparent way or by normative borders as e.g. given by the precautionary principle when high risks are at issue). | This is already explained in quite some detail but will be taken into account. |
| 3237 | 4 | 61 | 1 | 61 | 2 | Are the implicit distributional preferences shared by the actual decision-makers? What should be done if not? | This comment misses the problem which is: What methods are available to decision-makers? Obviously they cannot |
| 12752 | 4 | 61 | 23 | 61 | 25 | Would not this also hold in case of a "piecemeal" approach? | Not clear. |
| 5487 | 4 | 61 | 37 | | | Don't participatory strategies require a certain level of education and if so, is it possible to differentiate the benefits associated with education and the benefits associated with a paticipatory strategy? | Participation does not "require" education but it does work better when education is there. Education without participation would not make sense in |
| 12753 | 4 | 61 | 24 | 61 | 25 | See comment 72. | Not trackable. |
| 16908 | 4 | 62 | | 73 | | Overall, section 4.7.3 gives a fairly good overview of the context and various framework regarding equity and burden sharing. | Thank you |
| 3238 | 4 | 62 | 17 | 62 | 20 | It is justified by the benefits of reduced climate change when also the benefits for everyone else is taken into account! | The point here is that it is the benefits OF OTHERS' MITIGATION to |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8812 | 4 | 62 | 7 | 63 | 15 | Unquestioned utilitarian assumptions limit the imagination of this discussion of 'commons'. | Clarify, make clear that "rational" is only limited positive descriptive value. Exceptions arise. However, see |
| 8089 | 4 | 62 | 37 | 63 | 15 | Please note the following, which repeats for chapter 4 a comment made on chapter 13:<br>This reviewer wishes to suggest that what is mentioned in these two lines be more explicitly connected with what is said in lines 37-40 and 45-47 of p. 62 of chapter 4: the transfers discussed here (in chapter 13) do have a fundamental role in making the Paretian approach (discussed in chapter 4) a feasible one in terms of voluntary agreements.<br>Astonishingly, both here in chapter 13, and there (throughout chapter 4), the inescapable necessity of a voluntary character of any international agreement is pretty much ignored, the authors seeming to be dominated by the quest for equity. But on this subject, undermining the voluntary dimension is a severe lack of realism.<br>NB : in referring to p. 62 of chapter 4, I ignore lines 41-44, because they are an extreme, and actually, as stated, incorrect implication of paretianism. There are better things to say on Pareto improvements in international affairs. | Will address this. Is voluntary nature undermined by equity? |
| 3240 | 4 | 63 | 17 | 63 | 27 | Does this facilitate the avoidance of climate change? | Remains to be seen. |
| 15652 | 4 | 63 | 17 | | 27 | There is some overlap between this paragraph and Box 3.3 - suggest cross-referencing and either shortening here or removing box 3.3. | Accepted, linkage improved. |
| 3239 | 4 | 63 | 3 | 63 | 5 | Adding fairness may increase the cost of some parties to participate, and therefore increase the risk of defection. | Discuss with paretianism discussion. |
| 17087 | 4 | 63 | 3 | | | should read 'Right to Sustainable development' based on the UNFCCC and the Cancun decision | Will ensure consistency with references |
| 15653 | 4 | 63 | 30 | | 37 | Could condense reference to Rio Declaration by simply highlighting that Principle 7 links CBDR to sustainable development more broadly. | Will shorten while overall shortening. |
| 12754 | 4 | 63 | 3 | 63 | 5 | This statement is not evident for different perceptions of fairness. | Reference |
| 12755 | 4 | 63 | 38 | 63 | 47 | It should be made transparent if the reference is the need principle, here. | Not clear. |
| 3241 | 4 | 64 | 1 | 64 | 3 | See: Lange, Andreas, Andreas Löschel, Carsten Vogt and Andreas Ziegler, "On the Self-Serving Use of Equity Principles in International Climate Negotiations", European Economic Review 54, 2010, 359-375. | Helpful reference. |
| 12756 | 4 | 64 | 1 | 64 | 15 | The considerations, here, are convincing but I expected to find these issues in Chap.3. | Noted, this has been coordinated with |
| 15654 | 4 | 64 | 1 | | 3 | Sentence re self-serving interpretations could refer to Lange, A., A. Löschel, C. Vogt, and A. Ziegler. 2010. On the Self-Interested Use of Equity in International Climate Negotiations. European Economic Review 54 (3):359-75. | Helpful reference. |
| 12757 | 4 | 64 | 25 | | | In the documents referred to there is nothing said about "equality". So, where is the link and how does "equality" fit with e.g. CBDR? | See p. 67 |
| 5488 | 4 | 64 | 28 | 65 | 36 | this has been discussed elsewhere- can mostly be edited out with only summary points retained to take it to the current topic | Noted. Text has been revised. |
| 2566 | 4 | 64 | 31 | 64 | 40 | Extremely important item, poorly referenced. The principle of common but differentiated responsibilities should not be used as it is by diplomats, evading commitments and overlooking the closing opportunities to stabilize global temperatures at safe levels, ie the ultimate goal of the UNFCCC. A reference: http://jed.sagepub.com/content/19/3/335.abstract | Add references |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15656 | 4 | 64 | 36 | | 37 | The distinction could usefully be drawn here between _retrospective_ understandings of responsibility (i.e. for contributing to a problem) as opposed to _prospective_ understandings of responsibility (i.e. for fixing a problem). These have been elaborated extensively in the philosophical literature. See for example Miller, D. 2001. Distributing Responsibilities. Journal of Political Philosophy 9 (4):453-71. This distinction is best elaborated further in Chapter 3 in the discussion on historical responsibility. | Agreed. Helpful reference |
| 15657 | 4 | 64 | 44 | | 46 | The existence of a "no-harm rule" in international law is contested. See for example Birnie et al (2009) who argue that existing rules of customary international law do not prohibit transboundary harm per se, and that therefore 'it is erroneous to refer to a “no harm” rule in this context' (Birnie, P., A. Boyle, and C. Redgwell. 2009. International Law and the Environment. 3rd ed. Oxford: Oxford University Press, p.137. | Will elaborate. |
| 15655 | 4 | 64 | | | | There is considerable overlap between this section and section 3.7.3. The latter section contains some important material, but it seems best to integrate it into chapter 4 (in the more applied chapter) rather than in chapter 3. | Noted, this has been coordinated with Chapter 3. |
| 11569 | 4 | 64 | | 68 | | The section may belong to chapter 3. | Noted, this has been coordinated with |
| 12758 | 4 | 65 | 17 | 65 | 21 | You may like to emphasize that this implies a double burden for the current generation. | Taken into account, this will be clarified. |
| 16907 | 4 | 65 | 22 | 65 | 36 | it should also be pointed out that projections of future emissions should not be used as an excuse to negate historical emissions and the consequent responsibility. | not in this discussion. |
| 11056 | 4 | 65 | 28 | 65 | 28 | In the context of supporting these studies , we analyzed accumulative CO2 and found developing countries would match the 1990 level of developed country in 2013 using Nordhaus(1994) CO2 absorption formula and CDIAC and SRES scenario data (estimated by AIM) .<br>Miki YANAGI, Yosuke MUNESUE, Shuzo NISHIOKA (1999) “An Equity Evaluation for Burden Sharing in the Mitigation Process of Climate Change,” Paper presented at annual conference of Society for Environmental Economics and Policy Studies, 1999. | Helpful reference. |
| 11570 | 4 | 65 | 37 | 66 | 14 | Some of this is covered elsewhere. | Noted. |
| 16906 | 4 | 65 | 4 | 65 | 5 | Some more recent references and calculations regarding historical emissions should be added here, for example, http://www.pnas.org/content/109/32/12911 | Helpful reference. |
| 10953 | 4 | 65 | 3 | 65 | 36 | Confer: Rive, Torvanger, Fuglestvedt (2006), Climate agreements based on responsibility for global warming: Periodic updating, policy choices, and regional costs, Global Environmental Change, 16, 182-194. (See comment 1.) | Helpful reference. |
| 6894 | 4 | 65 | 6 | 65 | 8 | Please revise to be more precise. One of the major factors controlling CC is certainly the atmospheric GHG concentration, but CC is also influenced by orbital parameters, aerosols, volcanic eruptions etc. | Taken into account, this will be clarified. |
| 8497 | 4 | 66 | | 67 | | Capacity - note there is a large literature that deals with this concept, but it tends to view it in a limited way (as is the case here) At a minimum, one could focus on two dimensions of community capacity (decisionmaking and implementation) but must also consider the generally undisputed assumption that increasing capacity will result in improved outcomes. We are increasingly aware that there are often exogenous factors which limit or intervene with this assumption | See "Response Capacity". |
| 15658 | 4 | 66 | 19 | 66 | 32 | It would also be useful to mention as a possible starting date 1990, being the date of publication of the first IPCC report. This date has been proposed by several theorists, including Steve Vanderheiden (2008). Atmospheric Justice: A Political Theory of Climate Change. | Not neceessary to make point. |
| 6895 | 4 | 66 | 34 | 66 | 39 | WGI AR5 should not serve as a reference for "Some would argue that..." -- please adjust sentence; Please be more specific in citing WGI AR5 Chapter 6 here. | Add reference. (Note IPCC WGI is ref to ocean acidification.) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12759 | 4 | 66 | 45 | 66 | 48 | The definition of declining marginal utility of income is confusing, here. You may consider: The more income a person has the smaller is the additional utility which he or she gains from more income. And then mention that poorer people lose accordingly more utility when their income decreases, thus they have a greater level of sacrifice. | Taken into account, this will be clarified. |
| 12760 | 4 | 67 | 29 | 67 | 35 | See Comment 6. | Cannot access. |
| 12761 | 4 | 68 | 18 | 68 | 18 | It may be worthwile to consider addings, whether within a contraction and convergence approach (see p. 70, line 38), developing countries might continue a developing path based on fossil fuels etc. This would mean to exclude developing countries from binding reduction targets until they reach a certain wealth level. Only when achieving a wealth level comparable to developed countries they shoul have to reduce green house gases. Another approach would try to integrate developing countries into the climate regime as early as possible, at least through negative reduction aims as we know it from the European "bubble sytem" (article 4 of the Kyoto Protocol). This second approach changes the path of unsustainable development early and therfore could minimize transaction costs for the developing countries in comparison to a later turn (see Section 4.5). As developing countries did not cause the existing climate change problem financial transfers should be integrated into this second mitigation concept (cf. Chapter 16). | See CDC.<br><br>Perhaps this is talked about as distinction between "delayed participation" meaning no mitigation, versusus meaning mitigation with support. |
| 5489 | 4 | 68 | 22 | 68 | 28 | Important points and paragraph- could be expanded | Noted. Will elaborate. |
| 6323 | 4 | 68 | 3 | 68 | 28 | It may be useful to note here that there are difficulties that have arisen in the field of environmental ethics in attempting to use traditional rights-based language when dealing with issues of sustainable development. For instance, regarding future generations, it is difficult to accord rights to non-existent people. Similarly, it becomes awkward to talk about the "rights" of ecosystems or plants (and perhaps even animals), so the rights-based approach, while appropriate in some areas, is difficult to apply generally to all discussions of sustainability. This point is raised in chapter 3 of the IPCC draft report. | Noted. Will elaborate. |
| 7304 | 4 | 69 | | | | Please, feel the Table 4.1, otherwise exclude it from the Chapter 4. | Will fill. |
| 6896 | 4 | 69 | 10 | 69 | 12 | This sentence is mixing GHG sink capacity with global carbon budget, both of which can't be aimed at with ethical principles directly... | Taken into account, this will be clarified. |
| 5490 | 4 | 69 | 4 | | | Section 4.7.3.3- this list is likely included as it provides a potential framework or basis for evaluating the sustainability frameworks that are discussed immediately after this. However- it is long, takes up room and could likely be replaced by a table that summarizes the different accounting methods with only a few described in detail in the text | Agreed. Will present in synthesis. |
| 13660 | 4 | 69 | 4 | 72 | 46 | The categorization of the approaches is according to the framework followed by the approach -i.e. 'effort sharing' or 'resource sharing'. This however may be an incorrect way to categorize the approaches as the resource sharing approach also in effect places a burden on some countries to limit their emissions within a budget specified by agreed climate goals. On the other hand, effort sharing goals are almost always based on 'flows of emissions' as opposed to stocks of emissions. So the categories of flow based vs. stock based approaches may be more suitable. In specifying target emissions in specific years, flow based approaches cannot account for the total cumulative emissions of a country between the target years, which is the parameter that is most important to check climate change, whereas stock based approaches can do so. | Taken into account, this will be clarified. |
| 3953 | 4 | 7 | 11 | 4 | 11 | This sentence is unclear. Does it refer to a voluntary cooperative solution or a solution enforced on all using the coercive powers of the state? The distinction is critical from a moral perspective. | Not relevant. Both are possible. |
| 3209 | 4 | 7 | 12 | 7 | 14 | Equity has been reflected in international agreements that produce statements on how to address climate change in the future. Has there been any effective (in the sense of reducing GHG emissions) international agreement, and are future ones likely to reflect equity? | This is a positive statement about existing agreements. |
| 3954 | 4 | 7 | 15 | 7 | 16 | What needs to be discussed here is the morality of forcing a political minority to bow to the will of a political majority. The entire executive summary seems to be turning a blind eye to the elephant in the room - the propriety of using the power of the state to over-ride dissenting viewpoints. | Dissenting viewpoints must be respected, but for "public good" issues (i.e., one cannot have a different climate policy for different people) some decision |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3210 | 4 | 7 | 17 | 7 | 27 | The structure of this paragraph is unclear. | Taken into account, this will be clarified. |
| 18298 | 4 | 7 | 18 | | | This section on principles and norms is too brief and misses some of the important nuances about and associations between the terms used. It therefore becomes confusing when it mixes rights with principles relating to responsibilities. Perhaps put the 'rights' first, as these are generally regarded as the drivers. It can be argued that sustainable development can be achieved without equity. In other words, there is a slide underway here, which is introducing a specific version of SD (which I support). This slide is made evident by the way that 'equitable development' and 'sustainable development' are offered seprately in the par beginning line 33. 'Capacity' is not a principle but rather a means... Is this 'Beneficiary pays'? There are also other principles of considerable importance here - for instance relating to 'harm avoidance', 'representation and participation' 'preservation of biodiversity - which need to be introduced in relation to 'equity'. | 1. Clarify relationship between equity and SD.<br><br>2. Clarify rights vs principles<br><br>3. Capacity as "ability to pay"<br><br>4. rep and Part: procedural equity<br><br>5. Harm avoidance: link to PPP? |
| 17075 | 4 | 7 | 18 | | | the statement “responsibility for GHG emissions” is not scientifically correct, and it should read “responsibility for concentrations of GHGs”. Climate change is caused by the concentration of GHG’s. | See 4.7.3 on responsibility for emissions |
| 10858 | 4 | 7 | 23 | | | "sinks, as they are common resources"! Not sure many soverign nations would agree with that. Sure, this could be applied to oceans, but certainly not the land sink. If a "sink" is a common resource, then so is the forest that makes the sink and thus everyone would have equal right to harvest the forest? | This is a misunderstanding. A sink is a common resource for all who emits…! Not that they do what they want with the |
| 17076 | 4 | 7 | 24 | | | the statement “equal right to the natural carbon sinks, as they are a common resource, and thus an equal right to emit” is not correct. As an equal right to the carbon sinks does not equal to an equal right to emit, it confuses stocks and flows and is mathematically incorrect. The words “and thus an equal right to emit” should be deleted, and if a clarification is needed, the words “equal right to the global carbon budget” be added | Agreed. |
| 18299 | 4 | 7 | 28 | | | It can be argued - strongly - that in the current context of deepening ecological crisis, sustainability concerns bear on the short term as much as the long term. The dissociation from the present context and the sense that SD embodies ong term goals is, arguably, what is making SD so hard to realise. Discussion of the work on 'overshooting' (Meadows et al) is critical in for injecting a sense of urgency and focus here. Moreover, as the chapter later acknowledges - intragenerational equity is a SD consideration. Perhaps 'bear on both the long and short term'. | Important point. Need to assess ES (and chapter) for "long-term bias". Perhaps even more important for Ch 6 |
| 3955 | 4 | 7 | 28 | 4 | 7 | A key problem for the policy advisers is that politicians have to concentrate on the very short term - winning the next election. What is the use of developing a long-term policy if there is no mechanism for making it in the interests of politicians to adopt it? The executive summary also seems to be ignoring the problem of political incentives. | Discuss in 4.3.4, and political economy section? |
| 14003 | 4 | 7 | 3 | | 7 | Is this not contested? Framing climate change as an externality and a commons problem has large implications on how climate change is dealt with, both practically and politically, and some argues that it is a barrier to social change and transformation. | Not relevant. That it is a commons problem is a fact, not a judgment or a framing strategy. |
| 3211 | 4 | 7 | 31 | 7 | 31 | What about the feasibility of such a direct assessment? | It is always possible to make a forecast. At any rate, standard indicators require at least as much if applied properly. |
| 18300 | 4 | 7 | 33 | 7 | 35 | The growing scientific emphasis on 'the critical decade' for action suggests that the line about 'effective, robust and long term response' - while acknowledging that we will need to respond for centuries, perhaps millenia, fails to consider the importance of rapidityof action for effectiveness - with substantial challenges for political and social legitimacy, and technical capacity. Suggest delete 'long-term', to read: 'effective and robust' | Accepted. |
| 2936 | 4 | 7 | 33 | 7 | 44 | I agree strongly with this key conclusion about the link between adaptation, mitigation and SD. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18301 | 4 | 7 | 35 | 7 | 37 | The comment that both mitigation and adaptation rely to a 'profound extent' (etc...) is an unsubstantiated assertion. Effective global mitigation may occur without equity or SD principles being met in the short or even longer term. This point is made later on (Sect 4.2). The unilateral use of geoengineering is one example. Collusion between the 20 major national emitters is another. Adaptation is quite another matter - and this does depend on equity principles being realised. This chapter unconvincingly overstates the necessary links between CC action and SD. 'Can' dos not equal 'must'. The moral case needs to be made more robustly. | To be taken into account. |
| 3212 | 4 | 7 | 36 | 7 | 36 | On the contrary, one can argue that adaptive capacity is defense against climate change by the strongest, for the strongest, which does not lead to equitable development. | That is not adaptation for all. |
| 3213 | 4 | 7 | 38 | 7 | 44 | Paragraph is unclear. Also, typo: "… measures and measures …" | copy edit |
| 3952 | 4 | 7 | 4 | 7 | 7 | This sentence sets up a straw argument. What we are observing instead is a great deal of spontaneous cooperative action (eg NGOs) that is not based on the posited self-centred individualist thinking. This should surely be acknowledged and its implications considered. | Not relevant. |
| 17637 | 4 | 7 | 40 | 7 | 41 | Regarding of alternative framework for implication of measures, "well-being" is categorized one of "social capitals." Please discuss the classification of this framework | This is a misunderstanding. |
| 17077 | 4 | 7 | 40 | | | the statement “equal right to the natural carbon sinks, as they are a common resource, and thus an equal right to emit” is not correct. As an equal right to the carbon sinks does not equal to an equal right to emit, it confuses stocks and flows and is mathematically incorrect. The words “and thus an equal right to emit” should be deleted, and if a clarification is needed, the words “equal right to the global carbon budget” be added | Accepted. |
| 4756 | 4 | 7 | 41 | 7 | 42 | "As risk is a central aspect of sustainability". Could you please explain this statement? | Accepted. |
| 14007 | 4 | 7 | 42 | | 42 | Suggest adding "…the analysis of mitigation measures and ADAPTATION measures should not…" | Accepted. |
| 14006 | 4 | 7 | 42 | | 44 | Not clear what is meant by "…examine likelihood of potential impacts". Assume that this referes to the consequences of climate change responses and that these has impacts, but what impacts are we talking about beyond those for SD and equity (which would cover consequences across time and space). | Just that indeed (SD and equity). Will rephrase. |
| 7755 | 4 | 7 | 42 | 7 | 44 | This sentence does not read clearly, I am not sure what is meant | See 217. |
| 4755 | 4 | 7 | 9 | 7 | 9 | I think that "inter-generational nature of the problem" is also very important | This was a typo. |
| 12679 | 4 | 7 | 12 | 7 | 13 | The definition of equity mentioned in this line does not include sovereignty. According to the definition of equity as a proportional distribution (see Ringius, Lasse; Torvanger, Asbjorn; Underdal, Arild (2002): Burden Sharing and Fairness Principles in International Climate Policy. In: International Environmental Agreements: Politics, Law and Economics (2), pp. 1–22; p. 6), the sovereignty principle is a special case of equity (see Kverndokk, Snorre; Rose, Adam (2008): Equity and Justice in Global Warming Policy (2), p.149f). | Refer and clarify relationship between equity and sovereignty. |
| 15106 | 4 | 7 | 22 | 7 | 24 | In these lines ¨In one perspective, this moral equality is interpreted to imply an equal right to the natural carbon sinks, as they are a common resource, and thus an equal right to emit. ¨, the ideas are very confusing taking into account the national sovereignty over natural resources in one sense, and the equal right to emit maybe suppose one spiral of increment of GHG emissions, I suggest the convenient clarification. | Taken into account, this will be clarified. |
| 12681 | 4 | 7 | 26 | 7 | 27 | This passage or line only mentions burden-sharing but not benefit sharing. The differentiation between burden sharing and benefit sharing depends on the question whether ther is a right to be protect or a right to pollute. This distinction can also be found in Kverndokk, Snorre; Rose, Adam (2008, Equity and Justice in Global Warming Policy (2), p.150) or in Ringius, Lasse; Torvanger, Asbjorn; Underdal, Arild (2002; Burden Sharing and Fairness Principles in International Climate Policy. In: International Environmental Agreements: Politics, Law and Economics (2), pp. 1–22; p. 5). You may like to check at wich places in the chapter this distinction is important. | Taken into account, this will be clarified and sources assessed. |
| 2912 | 4 | 7 | 33 | 7 | 37 | probably as a first sentence 'Chapter 4 focus on…'.? | copy edit |
| 15107 | 4 | 7 | 38 | 7 | 38 | In: ¨ Likewise, mitigate and adaptation measures can strongly affect broader SD and equity objectives,¨ I propose to change any words as:¨ Likewise, mitigate and adaptation measures can HAVE BROAD INFLUENCES OVER SD and equity objectives,¨ | Accepted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12680 | 4 | 7 | 20 | 7 | 20 | "A right to sustainable development" is not the same as the sustainability principle. To create a right to sustainable development must be discussed in jurisprudential terms. Here, a right is considered to be more concretized than a principle. A right must have a sufficiently concrete consequence while a principle depends on a weighing process in order to find the optimal balance between several rights that the principle includes. Šušnjar describes the difference between rights and principles as follows: "Principles are defined as optimization commands that only make prima facie prescriptions in contrast to rules, which are definite in nature," Šušnjar, Davor, Proportionality, Fundamental Rights, and Balance of Powers, Leiden/Boston 2010, p. 75; see also Alexy, Robert, Constitutional Rights, Balancing and Rationality, in: Ratio Juris 2003, pp. 131-140. The jurisprudential definition leads to the conclusion that the "sustainability principle" is the better word here. | This is not a legal right, it is defended as a moral right. |
| 13690 | 4 | 70 | 37 | 70 | 37 | Better use peer reviewed reference Meyer, A. (2004): Briefing: contraction and convergence, in: Engineering Sustainability, 157, p. 189–192 | Will add references. |
| 3274 | 4 | 71 | | 72 | | Effort sharing approaches picked up here seem not be fully covered. For example, "equal MAC" and "cost per GDP" can be important approahces as discussed den Elzen (2010) and Wada (2012). Furthermore, this section is overlapped with 13.4.1.2. It seems that this issue fits international cooperation, rather sustainable development.<br><br>den Elzen, Höhne, Niklas, Hagemann, Markus, Vliet, Jasper and Vuuren, Detlef, (2010), Sharing developed countries' post-2012 greenhouse gas emission reductions based on comparable efforts, Mitigation and Adaptation Strategies for Global Change, 15, issue 5, p. 433-465<br>Kenichi Wada, Fuminori Sano, Keigo Akimoto, Takashi Homma, Assessment of Copenhagen pledges with long-term implications, Energy Economics, Available online 13 January 2012, ISSN 0140-9883, 10.1016/j.eneco.2012.01.001. | Noted, this has been coordinated with Chapter 13.<br><br>Will also discuss equial MAC and equal % GEP |
| 3616 | 4 | 71 | 21 | 71 | 21 | Please add "Oberheitmann (2010)". Cite: Oberheitmann, A. (2010). A new post-Kyoto climate regime based on per-capita cumulative CO2-emission rights—rationale, architecture and quantitative assessment of the implication for the CO2-emissions from China, India and the Annex-I countries by 2050. Mitigation and Adaptation Strategies for Global Change 15, 137-168. DOI: 10.1007/s11027-009-9207-4 | Will add references. |
| 11571 | 4 | 71 | 41 | | | Discussions of effort sharing should also refer to the literature on collective responsibility. | Will examine literature on collective |
| 13662 | 4 | 71 | 43 | 71 | 44 | Resource sharing approaches can also theoretically take into consideration 'capacity to pay' by weighting the equity parameters with GDP or some other income indicator. It is not a methodological constraint of the resource sharing approaches as implied by the statement | Noted. |
| 13661 | 4 | 71 | 11 | 71 | 19 | One billion high emitters – Also penalizes countries progressively as the number of people with higher incomes within the country increase (penalizes fast developing countries for increasing incomes) | Noted. |
| 15659 | 4 | 71 | 29 | | 31 | Ideas of "carbon debt" and "ecological debt" are not conceptually necessary components of cumulative carbon budget approaches. The risk of implying a direct link between these ideas is that those who find ideas of carbon debt unacceptable will therefore tend to reject the idea of a carbon budget as well. See Pickering, J., and C. Barry. (forthcoming, 2012). On the Concept of Climate Debt: Its Moral and Political Value. Critical Review of International Social and Political Philosophy. Better therefore to say that "some theorists have linked the idea of negative allocation to the concept of "carbon debt" or "climate debt"' etc. | Agreed. |
| 12762 | 4 | 72 | 8 | 72 | 8 | Which principles are meant with "above principles"? | Line immediately above. |
| 15660 | 4 | 72 | 14 | | 18 | The discussion of the Brazilian Proposal could refer to other findings in the literature that suggest that an approach based primarily or solely on historical responsibility (i.e. in the absence of ability to pay) is likely to be inequitable. See Müller, B., N. Höhne, and C. Ellerman. 2009. Differentiating (Historic) Responsibilities for Climate Change. Climate Policy 9 (6):593-611, p.608. | Will add references. |
| 9534 | 4 | 73 | 21 | 73 | 30 | Please, delete here due to duplication of Chapter 3 page 64-65. | Noted. This will be coordinated with |
| 9817 | 4 | 73 | 39 | | | This paragraph should be sounded with the corresponding paragraph in chapter 3. | Noted. This will be coordinated with |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4685 | 4 | 73 | 39 | 75 | 34 | The text is well written within a limited space; however, most of the descriptions point out limitations (weaknesses) of the sustainability indicators. Descriptions of their usefulness should be explained in more detail in the text. For example, please see:<br>- Atkinson, Dietz, & Neumayer (2007) Edward Elgar<br>- Lawn (2006) Edward Elgar | Not fair, the attraction of GS is described, with relevant references. |
| 15124 | 4 | 73 | 26 | 73 | 29 | There is similarity with the Latin American “BuenVivir” or "Vivir bien" approaches that pursues the goal of material,social and spiritual satisfaction among all members of a society, but not at the cost of the other living beings or natural resources. BuenVivir has been adopted in the constitution of Ecuador (2008) and Vivir bien in Bolivia (2009) and Peru (I´m not sure on Peru please check it). | Noted. |
| 5491 | 4 | 73 | | | | Section 4.7.4- 4.8 this is the heart of the chapter- this is the section that provides the clearest discussion of sustainability as well as interactions between sustainable practices and climate change. Different methodologies for measuring sustainability are also described. For this reader- as the above comments indicate, much of the preceeding discussion can be edited and shortened. This section can use expansion and clarification. Some discussion of how LCA or the triple bottom line approach could be integrated into this system or has provided a more manageable approach would be appreciated. Some discussion on how expanding accounting of emissions using a full life assessment could also be applied to sustainabiltiy indicators would be helpful as well | Noted. |
| 12763 | 4 | 73 | 17 | 73 | 30 | This is also part of Chap.3. So you might like to shorten. | Noted. This will be coordinated with |
| 8813 | 4 | 73 | 39 | 77 | 7 | This section although recognising the difficulties associated with indicators does not question whether indictors are an appropriate tool for climate change and sustainable development; the section also tends to make simplistic normative ethical utilitarian assumptions. Charlesworth M & Okereke C (2010, Policy responses to rapid climate change: An epistemological critique of dominant approaches, Global Environ. Change, 20:121-129, doi:10.1016/j.gloenvcha.2009.09.001) calls into question numerical approaches to aiming at, measuring or determining policy - numbers (e.g. ppm CO2e) can inform policy but anything beyond this makes gross unwarranted assumptions. | This again seems to rely on a narrow reading of the approaches described here. |
| 4686 | 4 | 74 | 11 | 74 | 40 | The authors stressed the limitations of Genuine Saving by referring to Fleurbaey (2009) and Pezzey (2004), but do not mention the useful nature of Genuine Savings. Indeed, it could be considered to be the best among the indicators for sustainable development. Its usefulness should be described in more detail by referring to Dasgupta (2001). | A message of this section is that belief in GS is partly based on a lack of understanding of its shortcomings. |
| 3243 | 4 | 74 | 23 | 74 | 26 | Note that this interesting possibility is not compatible with discounted utilitarianism. | Not clear. The marginal utility or productivity of a dwindling stock can |
| 4687 | 4 | 74 | 27 | 74 | 40 | Although the authors described the qualifications of GS, which is regarded as the best indicator of sustainable development, among those belong to the weak sustainability. GS can provide information that consumption and utility cannot. It is useful for improving the methodology to measure GS, which the authors criticize. For example, reductions from Gross Saving to Genuine Saving in 10 world regions up to the year 2100 is indicated by environmental impacts and by resources under an optimal run in SRES-B2 and by using an integrated assessment model that incorporates various mineral resources and environmental impacts (Tokimatsu et al., Env.Dev.Sustain 13(2011)703-725. Such analyses cannot be carried out by using consumption as well as utility. Tokimatsu et al. Env.Dev.Sustain 2012 (in Print) measured the future path of GS using endogenously obtained shadow prices from the model, without using market prices. This attempt can be appreciated as an improved methodology to measure GS, referring from Arrow (2010). The paper provides future paths under the cases of optimal and CO2 constraints in SRES-B2 and B1. | Add references. |
| 3244 | 4 | 74 | 28 | 74 | 30 | The results here hold under DU, not necessarily otherwise. | Taken into account, will be noted. |
| 3242 | 4 | 74 | 3 | 74 | 5 | Comparing the current level of consumption to the evel of adjusted (or green) net national product is identical to the genuine savings indicator. This connection should be pointed out. | This is done as they are in the same paragraph. Note that "is identical" is |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3245 | 4 | 74 | 30 | 74 | 31 | ... nor does it guarantee that it is feasible to do so. | Taken into account, will be noted. |
| 3246 | 4 | 74 | 35 | 74 | 37 | In a perfectly managed economy GS measures the PV of future changes in consumption. But GS does not perfectly indicate sustainability even then, unless sustainability is a goal for the management. | Not so relevant. We have short space and focus on realistic situations. |
| 3247 | 4 | 76 | | 76 | | The statement in footnote 17 is Pezzey's (2004) main result under DU. Asheim et al (2003) show that along efficient paths, which may not be DU optimal, GS can be positive and current wellbeing unsustainable (as an answer to the second question), and GS can be negative and current wellbeing sustainable (as an answer to the second question). | Good, the footnote will be corrected. |
| 12764 | 4 | 76 | | 76 | | The numbers in the figure lack a basis in the text. If it is only illustrative this should be mentioned in the caption. | Noted. |
| 4688 | 4 | 76 | 15 | 76 | 29 | Although the authors propose a method to measure future paths of well-being directly with probability, they do not include a concrete methodology for the measurement. Such proposals are useless for climate policy if the methodology cannot be described clearly. It could be that future paths of Genuine Savings with mitigations for climate change are more useful and practical in policy making for climate change than the authors' proposal, because no one knows how to measure well-being in the present day. | The problem is that GS requires more information, not less (which is often misunderstood). |
| 12766 | 4 | 77 | | 77 | | The figure lacks a basis in the text. | Noted. |
| 3248 | 4 | 77 | 10 | 77 | 12 | This sentence is unclear; what does it really say; what is its content and message? | Taken into account, will be clarified. |
| 12765 | 4 | 77 | 12 | | | It should be made clear in which sense you focus on equity and sustainability, here. | Should be clear from chapter context. |
| 3249 | 4 | 77 | 13 | 77 | 15 | The question posed in this sentenced has not been answered. | Must sharpen (and redefine?) narrative. |
| 3250 | 4 | 77 | 15 | 77 | 17 | This is a claim, which has not been supported empirically or otherwise in this chapter. | Must sharpen (and redefine?) narrative. |
| 3251 | 4 | 77 | 22 | 77 | 24 | Should not the converse be the focus here. The issue is avoiding climate change, and the question is whether aiming for sustainability at the same time is helpful or counterproductive. | Must sharpen (and redefine?) narrative. |
| 9818 | 4 | 77 | 27 | | | As mentionned above time is an important issue and should be considered in this and thus in subsequent chapter. In many of the chapters infrastructure plays an important role, causing lock-in effects and path dependencies. | Noted. Urgency to be discussed further. |
| 14326 | 4 | 77 | 8 | | | This section seems to be more of a summary than in pointing out implications for subsequent chapters. | Noted |
| 10434 | 4 | 77 | 27 | 79 | 13 | I question the relevance of this section | Not relevant |
| 12767 | 4 | 77 | 30 | 78 | 2 | The attention should not only be drawn to biodiversity in the environmental sphere since the review is on climate chage. Maybe it should also be mentioned here that the three pillar model is only one model. If the basis of sustainability would be the Brundtland report (pp. 11-12, see also comment 1, 21) prerequisites of sustainable development would be superior to economic and social concerns. | Discuss in 4.2 relation between 3 pillars and Brundtland? |
| 12768 | 4 | 78 | 1 | 78 | 2 | The focus should not be on biodiversity only, respectively, there should at least be made the link to climate change. | OK, add explicit mention of climate. |
| 16009 | 4 | 78 | 34 | 79 | 13 | The methodology described do not reflect the complexity of sustainability and in addition to follow the three pilar concept is easy but in praxis has problems within implementation. For example is it in real projects very difficult to discuss the "economicaly sustainable solution" against the "ecologiclay sustainable solution" against the "social sustainable solution". To avoid this there is the methodology of the "Integrative Concept of Sustianable Development" developed and used in various projects (Kopfmüller, J.; Barton, J.; Salas, A.<br>How sustainable is Santiago? In: Heinrichs, D.; Krellenberg, K.; Hansjürgens, B.; Martínez, F. (Hrsg.): Risk Habitat Megacity. Heidelberg, Dordrecht, London, New York: Springer 2012, S. 305-326; Kopfmüller, J.<br>The integrative sustainability concept of the Helmholtz Association. The "Risk Habitat Megacity" Project as a case of application. In: Banse, G.; Nelson. G. L.; Parodi, O. (Hrsg.): Sustainable development - The cultural perspective. Concepts - aspects - examples. Berlin: edition sigma 2011, S. 137-149 ). | Thank you for these useful references. |
| 3252 | 4 | 78 | 46 | 79 | 13 | The structure here does not take into account earlier parts of the chapter. Valuing the different kinds of capital depends on their effect on wellbeing (or on other objectives that the evaluator considers important). | Discuss: these are presented as orthogonal approaches (pillars, capacities, well-being) but an alternative is to present as complementary, and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8814 | 4 | 78 | 1 | 78 | 2 | This description of environmental sustainability barely includes climate change which is surprising given the nature of the report. This indicates the paucity of the definition and the tendency of much work on sustainable development to put industrial and economic output ahead of the natural basis of industry and economic growth. This is the flavour of much of section 4.8. | Certainly not the intent. Must clarify. |
| 12769 | 4 | 78 | 25 | 78 | 26 | The utility of non-human beings does not belong to the anthropocentric perspective. If the IPCC wants to depart from the anthropohenic perspective and turn to an ecocentric perspective this should be made explicitely clear at this place. (cf. comment 72) | The IPCC has neither an anthropocentric nor an ecocentric perspective. It can mention the various |
| 17915 | 4 | 78 | 31 | 78 | 33 | In the context of AR5, this assessment of relative priorities could be based on the co-benefit/co-cost discussions in chapters 3, 5-12 and 15. To inform this assessment with the important SD context, please liaise with the relevant chapters in the cross-cutting meeting to determine a viable labor division and synthesis of results with respect to the co-benefits/co-cost assessment across chapters. | OK, refer to cobenefits here. |
| 12770 | 4 | 78 | 33 | 78 | 33 | An overall well-being aim is not equal to the sustainability aim for it may not be bearable in the long-run nor may it be transmittable to all countries worldwide (p. 78, line 41; cf. comments 1, 21). | Misunderstanding? Sustaining well-being over time is SD (in one view of it). |
| 17347 | 4 | 79 | 18 | 79 | 31 | There is a specific take of sustainable development that has evolved for transport in particular. This discussion needs to acknowledge this. It appears to dismiss this possibility. Please coordinate with chapter's definition or use of sustainable development. At least Chapter 8. | Accepted (new table). |
| 12774 | 4 | 79 | 34 | | | Is not well-being referring to all the pillars? I do not understand why well-being and the three pillars are separated, here. | These are different approaches. Well-being is more synthetic, 3 pillars looks at |
| 12773 | 4 | 79 | 8 | | | Where is the climate issue? | Everywhere! The point here is to put it in the broader context of policymakers' |
| 12772 | 4 | 79 | 4 | 79 | 13 | It might be worthwile to consider merging "well being" with the economic performance pillar (at least if the three pillar model should be the guiding model). | This would be a big mistake. The whole point of the well-being perspective is to encompass all dimensions of life that |
| 12771 | 4 | 79 | 4 | 79 | 8 | See comments 1, 21, 96. | Not clear. |
| 9296 | 4 | 79 | 18 | 79 | 22 | Toward sustainable development, the cement sector developed several sustainability indicators (so called key performance indicators) linking to local society. Main areas are alternative fuels, biodiversity, employment safety, water as well as climate. (http://wbcsdcement.org/pdf/csi_progress_report_2005.pdf and http://www.csiprogress2012.org/CSI_ProgressReport_FullReport.pdf) | Discuss: We must decide whether we are supposed to list/discuss/evaluate a set of indicators. See TSU letter. |
| 5462 | 4 | 8 | 8 | | | Sentence 'While FAR… can be deleted- prior sentence '… climate policy, squarely and sxplicitly placing the imminent…' Much of this paragraph can be similarly edited- as can remainder of this discussion Key paragraphs are summary of SRES and SRREN- other paragraphs while describing outcomes of the reports primarily focus on language to differentiate or tie SD from equitable development- | See 219. |
| 2913 | 4 | 8 | 1 | 9 | 43 | to much in detail? - proposal is to start in 2011 and to describe in less detail from 2007 - 1995 report | Will shorten as part of overall shortening. |
| 7302 | 4 | 8 | 1 | 9 | 44 | To reduce the length of Chapter 4, it is proposed to drop Section 4.1, because key messages from the previous reports are well known to scientific community and general public. | See 219. |
| 14312 | 4 | 8 | 2 | | | Good summary of previous IPCC report SD messages | Noted (thank you). |
| 6889 | 4 | 8 | 2 | | | Specific references to WG reports and even Chapters is encouraged; Section leaves out the SREX, which had a dedicated Chapter on Sustainable Development. | Accepted. |
| 15661 | 4 | 80 | 19 | | 20 | Here's a reference for progressivity of an airline levy: see Hepburn, C., and B. Müller. 2010. International Air Travel and Greenhouse Gas Emissions: A Proposal for an Adaptation Levy. World Economy 33 (6):830-49. | Helpful reference. |
| 8934 | 4 | 80 | 26 | 80 | 31 | For a quantitative discussion of this topic see B. J. van Ruijven, J. Schers, D. P. van Vuuren, Model-based scenarios for rural electrification in developing countries. Energy 38, 386 (2012). | Helpful reference. |
| 2562 | 4 | 80 | 32 | 80 | 33 | Needs balance - in special to avoid problems in the Plenary. For instance, unconventional fossil fuels extraction may contaminate water and degrade land (fracking, tar sands, deepwater drilling). Disputes for oil escalate military expenditures | Will not appear in SPM. Also, the purpose is not perfect balance, but selective illustrative examples. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12775 | 4 | 80 | 37 | 80 | 38 | The role of women is unclear. Under which circumstances are women key agents? (see also comment 20) | Not to be elaborated here, but more discussion of gender is needed. |
| 12162 | 4 | 80 | 9 | 80 | 40 | I think that it's not necessary to mantain the section 4.8.3.1. It's not a so relevant information. | Will shorten while overall shortening. |
| 4757 | 4 | 80 | 12 | 80 | 15 | The sentence "Habitat loss induced by hydropower dams" is too restrictive and doesn't address the whole hydropower cases. | It is not intended to. |
| 3253 | 4 | 81 | 16 | 81 | 18 | Where explained? What does the sentence means? ("the speed ... is important to assess ...") | Must clarify. |
| 3254 | 4 | 81 | 24 | 81 | 25 | Should not avoiding climate change be the focus? And then ask whether avoiding climate change is necessary and sufficient for sustainability. | That is indeed the idea. No change seems needed. |
| 3255 | 4 | 81 | 28 | 81 | 28 | Elsewhere in the chapter it is argued that sustainable development is necessary for avoiding climate change, which is equivalent to avoiding climate change is sufficient for sustainable development. | Will sharpen this issue. |
| 3256 | 4 | 81 | 31 | 81 | 31 | "... fits the general outlook." What is meant? | Noted. Will be clarified. |
| 3257 | 4 | 81 | 31 | 81 | 33 | What is the time horizon for such a move? | Noted. Will be clarified. |
| 3258 | 4 | 81 | 34 | 81 | 44 | So what is the answer to the responsibility question and what is the relevance for the topic of this chapter. | Address earlier (4.7.3) and recap here. |
| 12163 | 4 | 81 | 6 | 81 | 19 | I think that it's not necessary to mantain the section 4.8.3.2. It's not a so relevant information. | Not agreed. |
| 17348 | 4 | 81 | 6 | 81 | 19 | Democratic transition. This issue is coming too loosely in the end, it needs to be better tight with the concept of procedural justice for example in chapter 3. With people's lack of acceptance that trade offs are necessary as explained in Chapter 2. When values are incommensurable for example Chapter 3. There are many fundamental reasons presented in previous chapters why democratic engagement needs to be at the center of the transition. So, this session even if short could cross-reference to those key factors and this will make it stronger. | Agreed. Section should be strengthened and more consistenty carried through chapter. |
| 7756 | 4 | 9 | | 31 | | While this section is an intersting read about the history of sustainable development, the legacy of colonialism, and sustainability indicators, it is: i) far too long; ii) not directly relevant to mitigation. I now make various suggestions below how to address issues within this section. | Noted. |
| 7758 | 4 | 9 | | 31 | | 2. the main suggestion is to try to reduce these 24 pages into 9. I assume that this chapter should be 25 pages long (or thereabouts), that leaves about 3 pages per sub section. I think that this can be easily done, and this is the focus of most of my comments below. | Will take into account. |
| 7769 | 4 | 9 | | 31 | | No focus on mitigation in these pages, which I think, significantly weakens this section. Also it results in a lot of superfluous text. Much of this section could be deleted and replaced with many of the comprehensive reviews of sustainable development, or e.g. population change | Will shorten |
| 12682 | 4 | 9 | 26 | | | Please proof "due to higher risk aversion" by literature. | Review and clarify. |
| 7757 | 4 | 9 | 44 | 10 | 24 | 1. start the section with an explanation of what is low carbon climate resilient development and immediately equate this with sustainability, e.g. links with production, consumption, population and demography etcc.. | Noted. |
| 7760 | 4 | 9 | 44 | 10 | 24 | This section has no punch, and could really do with setting out the big points early on, at present you lose the reader, there is no clear focus on the big themese running through this chapter - what are they? There is mention of Rockstrom's work but little else - is this the only big theme? | Define narrative more clearly. |
| 3214 | 4 | 9 | 46 | 9 | 47 | What is the meaning of "It recognizes that climate change is in fact inextricably linked with sustainable development and equity". Does it point to an empirical fact? | Noted. Will be clarified. |
| 17638 | 4 | 9 | 46 | 9 | 47 | "It recognizes that climate change is in fact inextricable linked with sustainable development and equity." - from which perspective this situation is recognized, from scientific perspective, from social science perspective, or other perspectives? | See 230. |
| 7759 | 4 | 9 | 47 | 9 | 49 | Final sentence doesn't say anything - delete | Accepted. |
| 14008 | 4 | 9 | 48 | | | Suggest replacing "…promising responses to climate change." with "…sustainable and equitable responses to climate change." Consider defining what is meant by responses to climate change in this chapter. | Accepted. We should be more precise and also distinguish between mitigation |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17089 | 4 | 9 | 6 | | 9 | factually incorrect on two counts. First, “global emissions peaking by 2020” is the EU position and not a global consensus. The global consensus, as you have acknowledged, is that this goal has to be seen in conjunction with ensuring equitable access to sustainable development, as agreed at Cancun, to which reference must be made.<br><br>Second, how do you say that the “most promising response is “requiring humanity to think like a society of people, and not like a collection of individual states”. This is a reference to a paper written in 1998, and has been overtaken by recent science. The most promising response in the context of this chapter could well be equal rights to the global commons or carbon budget – see my peer reviewed articles in ‘Climate and Development’.<br><br>Recent analyses are now arguing that what really matters is the total greenhouse gas budget we allow ourselves, because of the scientific uncertainty associated with emission rates and concentration targets*, which cannot be accurately inferred from quantities we can observe . The United Kingdom already has legislation establishing a national carbon budget , and the National Academy of Sciences of the United States concludes that the “policy goal must be stated as a quantitative limit on domestic GHG emissions over a specified time period – in other words a GHG emissions budget …… national shares of global emissions need to be agreed at the multilateral level as the basis for developing and assessing domestic strategies” . The scientific analysis notes that its efforts are “based on ‘global least cost’ economic efficiency criteria for allocating global emissions among countries, and using other criteria, different budget numbers could be suggested; for instance, based on global ‘fairness’ concerns, a more aggressive U.S. emission reduction effort is warranted – and this is what equity is all about. | This refers to page 11:6-9 and not page 9. It is a matter of taste what to cite at this very general level. The quote form Victor is indeed a bit old but it is genral . enough that I consider it still valid today We clearly have to make sure we differentialte between the EU goals and the globally agreed goals. |
| 6472 | 4 | 9 | 14 | 9 | 27 | Cosst -benefit analsyses as a prescriptive tool for climate change policy formation not only neglects equity arguments but also often conflicts with rights and deontolically based claima about justice and fairness, including distributive, procedural justice claims and human rights based articulations of duties and responsibilities. This section should be modified to say on line 19. Cost-benfit analyses based policy prescriptions often ignore duties entailed by human rights and deontolobical arguments. | Will take into account, but the comment assumes a narrow understanding of CBA. |
| 6890 | 4 | 9 | 40 | 9 | 42 | IPCC SREX and the Chapter on Sustainable Developments is missing here. | Accepted. |
| 4123 | 5 | | | | | Please review chapter 4 section 4.3. If you feel that this section contains redundant and/or inconsistent duplications of chapter 5 discussions, please advice chapter 4 authors on how to revise their section. | Noted |
| 4126 | 5 | | | | | It would be useful to prioritize more and carve out key insights. Some sections seem almost encyclopedic, some sections are skin, not all pieces of information seem relevant. | Accepted: We are now working on prioritizing and streamlining the texts as well as making them more homogenious among sections and subsections when |
| 4134 | 5 | | | | | Please review chapter 1 section 1.3. If you feel that this section contains redundant and/or inconsistent duplications of chapter 5 discussions, please advice chapter 1 authors on how to revise their section. | Noted |
| 4135 | 5 | | | | | It would be helpful for the reader if you could prioritize your findings. Your chapter contains a wealth of information but it is not always clear how important certain trends and drivers are in relation to others. The Executive Summary (which should be much much shorter) should focus on these most important trends and drivers and provide empirical information on their effects. | Accepted: We recognize the issue raised here and we are working to improve clarity about the relationships and interlinks among factors and drivers |
| 4136 | 5 | | | | | Please review chapter 4 sections 4.3 and 4.4.. If you feel that these sections contain redundant and/or inconsistent duplications of chapter 5 discussions, please advice chapter 4 authors on how to revise their section. | Noted |
| 4143 | 5 | | | | | Under all circumstances, please please respect the page limit (55 pages) for the Second Order Draft of your chapter. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4151 | 5 | | | | | It would be useful to highlight the relation of your chapter to the AR4. What has happened since? How were trends and drivers treated in the AR4 and how do you expand on this assessment? | Accepted: We are trying to refer to AR4 everytime such a reference is needed to assess the evolution of trends and |
| 8427 | 5 | | | | | The assessment of resources is very uncertain, so 4 significant figures are too much. I believe that 2 are enough. | Accepted in principle. After discussions with Chapter 7 authors, table has been removed from Chapter 5 as it is already |
| 8429 | 5 | | | | | The assessment of these emissions is very uncertain, so 6 or 7 significant figures are too much. I believe that 2 are enough. | Accepted. Revised. |
| 5736 | 5 | | | | | This figure is very relevant and quoted very often in the past. It would be good to see an updated version. | Figure shown elsewhere |
| 3526 | 5 | | | | | This figure is not clear. In Y-axis, what does it mean 'Emissions relative to 1895'? The caption of the figure is not clear; what is 'open burning'? What is 'normalized to 1985 values'. Please improve the figure. Improve also consistency between section 5.2.1 and 5.2.2: the analysis covered the period 1970-2008 for section 5.2.1 whereas it covered the period 1970-2010 in section 5.2.2 (see figure 5.2.6). | Point 1: Figure and caption clarified. Unfortunately, conssitent data is not available in the literature for the same periods for GHGs and pollutant |
| 13767 | 5 | | | | | This figure uses a different nomenclature than the text. It cannot be understood without referring to the original reference. Please adopt the language of Raupach or change the figure! | Figure eliminated |
| 12539 | 5 | | | | | The data for conventional oil appears to be incorrect, with reserves at 4 900 - 7 610 and reserves at a lesser range of 4 170 - 6 150 EJ. | Rejected. The ranges are from GEA (2012), which is the most recent, peer-reviewed assessment of reserves and resources. However, we will make sure |
| 16206 | 5 | | | | | legend has lots of jargon/abbreviations that are not defined: F=Pgef=Pgh; these are not the exact same as in the intro to this chapter or the big introductory chapter. Harmonize. | Figure has been elimated |
| 16207 | 5 | | | | | 1895 on Y axis should be 1985 | Typo been corrected |
| 17473 | 5 | | | | | I think this table is still to be completed (?) so I have not included full comments but here are a couple: 1) Will sources supporting each entry be given? 2) what is FE? 3) could be better described as carbon rater than system efficiency? 4) is the entry for CHP is the wrong row? | noted. Table deleted. However, the points are taken. |
| 17466 | 5 | | | | | source needed | Editorial: The data is from standard sources provide by the IPCC TSU and will be fully referenced in the final |
| 17467 | 5 | | | | | source needed | Editorial: The data is from standard sources provide by the IPCC TSU and will be fully referenced in the final |
| 17468 | 5 | | | | | source needed | Editorial: The data is from standard sources provide by the IPCC TSU and will be fully referenced in the final |
| 17469 | 5 | | | | | source needed | Editorial. The sources for the data are being included, but reference for common data sources used in multiple |
| 17470 | 5 | | | | | source needed | Editorial: The data is from standard sources provide by the IPCC TSU and will be fully referenced in the final |
| 17471 | 5 | | | | | source needed | Editorial: The data is from standard sources provide by the IPCC TSU and will be fully referenced in the final |
| 17472 | 5 | | | | | source needed | Editorial: The data is from standard sources provide by the IPCC TSU and will be fully referenced in the final |

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| 17806 | 5 | | | | | In particular - the chapter of Haines et al - and the numbers mentioned in the executive summary or in other summaries would be important. Similar arguments have been brought up again in Lancet 2012 by Haines and Dora. There are also a plentitude of examples in the housing sector (e.g. refer to WHO Euro the burden of disease of housing ) and the transport sector - refer to UNECE/WHO transport co-benefits and green jobs. | noted and text redrafted |
| 10792 | 5 | | | | | Figure is very confusing, therefore meaningless. Either replace it with text or redesign. Avoid pastel collors. | Rejected. Figure 5.6.4 has been reviewed positively in other comments (e.g. see Comment xxxx). However, |
| 18141 | 5 | | | | | a) There is no text relating to this figure.<br>b) Figure 5.2.2 depicts the information for 2000 for 5 sectors (Energy, Industrial Processes, Land use change, Agriculture and Waste) which are the commonly used sectors. Figure 5.2.3 shows time series from 1970-2008 for different sectors (AFOLU, Energy, Transport, Industry and Buildings). For ease of comparison, it would be best to use the sector classifications as per Figure 5.2.2 which is also the more common classification. Additionally, as mentioned previously, the sector Buildings needs definition and the waste sector does not appear to be depicted in Fig 5.2.3 while energy seems to be broken into energy, transport and possibly buildings? Furthermore, it is mentioned in section 5.7.2, pg 50 (lines 14-15) that most GHG emissions from buildings come from electricity use - how is this different from the emissions from the energy sector (which would also include electricity)? Likewise, in section 5.7.3, industry emissions include energy use emissios apart from production process emissions. Again what is the distinction between energy use industry emissions and energy emissions?<br>c) Source of data required for this figure. | Figure eliminated |
| 18142 | 5 | | | | | a) REF, LAM and MAF can be more precisely defined rather than stating where they primarily refer to.<br>b) Source of data required. | See reference |
| 18143 | 5 | | | | | What does Gpi stand for? | Figure has been elimated |
| 18144 | 5 | | | | | Y axis title should be changed to Emissions relative to 1985 (rather than 1895). | Agreed. |
| 18147 | 5 | | | | | Data source missing. | Accepted. Data source provided. |
| 18151 | 5 | | | | | Figure is missing some of the legends and the years in the x-axis are unclear. | replotted |
| 15989 | 5 | | | | | where does the literature (claimed to be around 40 sources) come from? Is that table taken from some source? Remains unclear, please specify | Considered. The table removed. |
| 15986 | 5 | | | | | The AR5 will be published in 2014, that's 14 years ... graph needs an update if it's supposed to be published; also, check whether this graph was not already published in AR4 | Datat being updated |
| 15987 | 5 | | | | | if it's possible by IPCC statutes authors might want to update this figures by Raupach (which should be easily manageable) with most recent data (latest IEA publications cover 2009, that's four additional years!) | Figure being removed |
| 16002 | 5 | | | | | in my opionion illumination might be a little "biased" example, as it is particular energy wasting; on the other hand, it's only a small fraction of total PE; the latter should be mentioned in the text | Accepted and the share of less than 7 percent worldwide will be included in the text. However, there are other similarly “biased” examples that are |
| 5922 | 5 | | | | | Biased and untrue for CHP: In countries with cold climate, building extensive, large-scale CHP systems in cities has replaced traditional house-size or block-size heating systems, using coal, oil or wood. Thus CHP has resulted in dramatically improved air quality ! Today, large CHP plants in Europe mostly have very efficient flue gas cleaning systems, required by EU LCP directive and national legislation. A hypothetical shifting to e.g. smaller-size biomass-based systems as a climate change mitigation measure would significantly damage air quality in these cities. | rejected. The overall mood is positive with CHP and a caveat is put on incease in local emissions. This does not mean that smaller biofuel boilers are better for local air quality. |
| 5918 | 5 | | | | | Are D1, D2,D3 countries defined somewhere in the report ? | Figure eliminated |
| 8937 | 5 | | | | | The figure might be correct, but seems strange to me. What is the source of these data? There must (for many countries) be beter data available. Why is only refrigeration and air conditioning singled out? And it's share seems very small (maybe due to the lumping of residential and "other" sectors? | source added in replotted figure |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10388 | 5 | | | | | it is not clear what the word '2' at the end of the caption means | Editorial. The table has been removed |
| 10389 | 5 | | | | | it is not clear what the word '2A' at the end of the caption means | Editorial. The table has been removed |
| 10381 | 5 | | | | | the caption of this figure is missing | Editorial: Caption has been added |
| 10382 | 5 | | | | | This figure needs to redraw since it miss some information. Still it contains some unnecessary information as emissions from refrigeration and air conditioning while the caption of this figure is emission from transport | Figure REDrawn |
| 15982 | 5 | | | | | I do not totally understand the split between global and regional trends that have been announced before ... are regional trends supposed to be discussed here, in this case I'm missing a couple of studies wrt CO2 and e.g. China | Regional trends are discussed here but in more detail in Chapter 6 (for future) |
| 15994 | 5 | | | | | could be shortened | Noted |
| 14457 | 5 | | | | | This chapter will need quite a bot of redrafting. It is confusing and does not represent a clear scientific storyline. The chapter does not follow a sound scientific reasoning.<br><br>It took me much more time to comment on than I expected. This also limited my ability to review other chapters. I feel that, if indeed this chapter is considerably improved, this will also lead to adaptations in the chapters following it.<br><br>My comments below will hopefully underpin this general comment. | Noted |
| 4127 | 5 | | | | | It would be useful for the reader to understand how your chapter relates to chapter 6. | Taken into account - connection to Ch6 |
| 3510 | 5 | | | | | Please avoid to personalize the text by using terms such as "we assess", "we present", "our chapter", "the section tells us". This comment is applicable to the whole chapter. | Editorial. Proceeded as suggested |
| 3511 | 5 | | | | | This chapter is about "Drivers, Trends and Mitigation of GHG emissions and removals". In the current version of the introduction, there is no history to read. The text in the introduction should address questions like: why do we need to know drivers, trends of emissions/removals, what are the causes of changes in emissions/ trends, why mitigation? etc. and build and history in a logical order around these concepts. I don't think the first sentence in the introduction is necessary. Please justify the use of 40 years (1970 - 2010) for the analyses. | Taken into account - Section 5.1 rewritten. |
| 3512 | 5 | | | | | For inventory compilers, the equation in the introduction section is never used to estimate CO2 emissions; the eq. would be applicable only to energy sector and not to AFOLU (for exemple) which generates also CO2 emissions. The statement by the authors that "One cannot conclude from the equation that population growth as such increases emissions, nor does income growth necessarily lead to higher emission levels", weakens the approach (i.e. the equation). Please include a robust approach, otherwise delete the equation. The introduction can be better drafted without using this "Kaya identity". I would suggest that when building the history in the introduction section, that the authors add the sectors covered and the drivers assessed. I agree to describe the structure of the chapter at the end of this section, but this should be brief. | Taken into account - Section 5.1 (and Fig 5.1) now better explains the conceptual set up of the chapter, while Section 5.3 explains the use of the decomposition. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14458 | 5 | | | | | I have some conceptual difficulty with the way the story line in this chapter is constructed.<br><br>I can understand that for the applications in scenarios and projections the Kaya "identity" (see also my comment on lines 13 -16 on this page) might be helpful: if changes over historic times in the per capita gross production, the per gross production energy use and the CO2 emission per energy use are better understood, this understanding could be used in projecting emissions for future years in alternative scenarios with various possible measures, using the Kaya approach.<br><br>Following this the Kaya approach is used for the application of the results of this chapter. It does not necessarily need to be the framework of the analyses herein. I would expect that the chapter would try to derive the dependence of the three different parameters (see my comment on lines 13 - 15 below) on historic variables that could be projected towards future years or as a minimum a proxy for that. This chapter then would need to search for correlations (whether or not these are reflecting causality) with other parameters and variable that would explain the relations between respectively population and gross world production, between gross world production and energy requirement and between energy requirement and CO2 emissions.<br><br>As it is now, the search for such relations and explanations and its application in the Kaya approach is too much mixed up and interlinked. Itis rather confusing!<br><br>I do acknowledge that the Kaya "identity" has been used before by IPCC. Nevertheless, I feel that this use is quite confusing for many scientific disciplines outside the climate science community and might contribute to some of the scepticisms towards the IPCC assessments. To increase the impact and profile of the IPCC assessments it could therefore be a good idea to apply a bit more rigorous formalism from the mathematical point of view, avoiding "identities", since in mathematics (and in physics) these identities do not mean anything, simply because they are identities. When the formalism is given in a slightly different way, applying "parameters" that might be time dependent, the identity disappears and the mathematics becomes understandable for people from other disciplines. At the same time the distinction between identifying (cor)relations from historic information and applying them in projections will help to make the assessment more clear and transparent. (see also my comment on page 19, line 23) | Taken into account - the chapter is revised and the overview presented in the introduction makes clearer what the contributions are of each section to understanding the emission trends. |
| 15996 | 5 | | | | | Even though it can be somehow interpreted from the graph i suggest to also include EI explicitly | Rejected. Comment not understood |
| 4125 | 5 | | | | | Please discuss your definition of 'co-benefit' with chapter 3 authors who are responsible for framing this important concept for the WGIII report. | Accepted: A definition of co-benefits was discussed and agreed for all chapters in WGIII. We will use this definition in |
| 3091 | 5 | | | | | no mention in text (only briefly in table) of the link between energy efficiency and affordability - this is becoming increasingly important with even developed countries having large numbers of households in fuel poverty (e.g. UK around 20%). With rising fuel prices, energy efficiency measures can help reduce fuel poverty. Also relevant for transport as with rising petrol/diesel prices, sales of efficient cars have increased to maintain transport affordability. | taken into account: covered in ch. 4 on equity & poverty issues. Also this is more complicated: such poverty alleviation impact would mean rebound effect: higher efficiency, more |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17917 | 5 | | | | | The literature and details covered in this section are very interesting, but might or should be covered in the respective sector chapters. In my eyes, the role of chapter 5 in the context of the co-benefits/co-cost discussion should synthesize the individual sector chapter assessments (possibly building on Table 5.10.1 and other ways to synthesize quantitative results) and provide an overview of methodological challenges rather than duplicating the detailed examples provided in this section now. Please liaise with the relevant chapters in the cross-cutting meeting to determine a viable labor division and synthesis of results with respect to the co-benefits/co-cost assessment across chapters. | Accepted: A definition of co-benefits was discussed and agreed for all chapters in WGIII. We will use this definition in Chapter 5. |
| 8900 | 5 | | | | | There is more literature on co-benefits that should be referenced here. Also reductions in surface ozone are worth mentioning here and the impacts on plants and their productivity. Some of the health benefits are listed in 5.10.1.2. | partially accepted. More literature is added. Owever, on surface ozone, no literature is provided and no such |
| 12541 | 5 | | | | | Suggest adding a short discussion of health spillover benefits from building energy efficiency. An important recent study is Lucy Telfar Barnard, Nick Preval, Philippa Howden-Chapman, Richard Arnold, Chris Young, Arthur Grimes, Tim Denne, 2011. The impact of retrofitted insulation and new heaters on health services utilisation and costs, pharmaceutical costs and mortality: Evaluation of Warm Up New Zealand: Heat Smart, report for<br>the Ministry of Economic Development. http://www.healthyhousing.org.nz/wp-content/uploads/2012/03/NZIF_Health_report-Final.pdf | noted. Very relevant and valuable information though it is a grey literature. As this is more sector specific, the buildings chapter is a better place to make an assessment. |
| 8901 | 5 | | | | | this section does not include any economic co-benefits | rejected. The discussion of this entire section is about co-benefit and everything is with economic implications. Health, social like employment etc are all economically measurable but quantitative numbers |
| 17918 | 5 | | | | | The use of the term trade-off (to describe adverse side-effects) is inconsistent with the agreements made in Wellington (p.35) whereby the term 'trade-off' might convey the impression "that a balancing of positive and negative side-effects of mitigation measures is being carried out... Such decision-making aspects" should be left to the policy chapters. Please liaise with the other chapters during the cross-cutting meeting to ensure consistent usage of the relevant terms across chapters. Since the term also shows up in the first-level heading, a potential change to achieve consistency across chapters needs to be discussed with the TSU.<br>Please see my comment on Section 5.10.1 that also applies to Section 5.10.2. | noted. Communication with the TSU and other chapters will be made with regard to the use of the terms. However, change has been made using the TUS guidance in the revised text as risk tradeoff as compared with the earlier single term tradeoff. |
| 3627 | 5 | | | | | Delete the summary to save space. | Taken into account - we substantially shortened the ES, introduction and final |
| 3514 | 5 | | | | | Greenhouse gases' and 'GHG' are used interchangeably. Please write 'greenhouse gases (GHG)' for the first time and 'GHG' in subsequent text. | Okay |
| 16250 | 5 | | | | | The title of this section suggests a discussion of stocks and flows of GHG emissions…, however, the section only covers flows. | Title will be revised accordingly |
| 3523 | 5 | | | | | You state at the beginning of this section 'We begin by focusing on the trends in GHG emissions from 1970 through 2008'; but nowhere in the section, nothing is said on the situation after 2008? Please add a text describing the situation after 2008 to improve the completeness of the section. If this has not been assessed, explain why and make reference to section on drivers and explain how the situation is likely to be after 2008. In this section 5.2.1, clarify what is non-CO2 GHG and make reference to section 5.2.2 for the other non-CO2 gases. Please improve the cohesion between sections by making reference between them. | The data base has been extended through 2010. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14470 | 5 | | | | | I believe this section can be considerably condensed, if it were built on the understanding that the time series of emissions (aggregated using GWP) is based on a set of data giving emissions per GHG, per source category, per region and per year. Figures 5.2.1, 5.2.3 and5.2.4 are different aggregations of this same data set (by GHG, by source and by region respectively). Between each couple of these three and for any year in the time series a graph like 5.2.2 could be produced. However, such figures do not add too much understanding, although they look very nice.<br><br>The current text uses 3.5 pages to show the same information in different forms. This could be condensed.<br><br>Figure 5.2.5 is a bit strange here. Does it correspond with a multivariate analysis of the data presented in figures 5.2.1 - 5.2.4, using the Kaya equation as the model under analysis? If not, on what data is this figure 5.2.5 based? Are these consistent with the data presented in the other graphs?<br>The figure does not seem to be used here, so as far as I am concerned it could be deleted. If it is to remain, please consider whether or not it fits in this section and add more explanation on what it means and where it is coming from. | The section has been condensed and two figures have been removed (5.3 and 5.5). However, the writing team agrees that the remaining figures are useful as is. |
| 14477 | 5 | | | | | Is this section needed here? For the purpose of this report it could be sufficient to integrate the analyses of these indirect greenhouse gases together with the direct ones in section 5.2.1 into one section, using the (be it uncertain) effective GWP as derived from the latest versions of the WG I report. | We willl refer to AR% new radiative forcing digram to integrate |
| 18348 | 5 | | | | | The discussion of drivers needs to be coordinated with Chapter 4 (section 4.2) to sharpen chapter-specific focus. | Accepted. 4.2 has been reviewed and no clear overlap found. Further conversation |
| 16208 | 5 | | | | | Again, PPP, GWP100 not defined yet. | Accepted. Removed. |
| 13752 | 5 | | | | | In this section, I miss the role of knowledge as a driver of emissions. It could be important in both ways, either as a driver for more emissions of countries with high-income and high know ledge standards and as a source for reduction strategies e.g. through innovation or efficiency strategies. | Rejected. Not all drivers can be discussed within the limited space. |
| 15999 | 5 | | | | | I disagree with the main message and first sentence here: the causality that is implied here is wrong; see e.g. Jakob and Marschinski, in press Nature Climate Change | Rejected. As it was clearly stated, no causality is implied. |
| 13771 | 5 | | | | | I can see that what is attempted here is worthwhile. However, the present text is rather preliminary and incomplete. No specific results are offered. Please either supplement specific findings or delete this. | Considered. The methodology part has been completely rewritten focusing only |
| 12536 | 5 | | | | | I strongly support the addition of a full consideration of the consumption-based approach within emissions analysis. As the summary shows there have been considerable advances in research since AR4. | Accepted. The text revised accordingly. |
| 14512 | 5 | | | | | Only placeholders here? | Noted. Section has been revised. |
| 13772 | 5 | | | | | This section can be reduced in volume. It does not offer very significant conclusions. | Accepted. Section reduced in volume; conclusions are based on the reviewed |

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| 14513 | 5 | | | | | I wonder whether the authors understand the mathematics of what they are doing. I'll provide a few examples below to show that they don't!<br><br>I feel that this section should be reritten. It does not link at all to the framework of the Kaya approach and copnfuses everything with everything. I do not see any need to show GHG emissions in graphs showing population etc.<br><br>What I would expect is<br><br>1) graphs (global, regional, sectoral, fuel) of Gross Production versus population size to show what happens with (G/P) in the Kaya approach<br><br>2) graphs (global, regional, sectoral, fuel) of gross production versus energy use (E/G) in the Kaya approach<br><br>3) graphs (global, regional, sectoral, fuel) of energy uses versus emissions (CO2/E) in the Kaya approach.<br><br>These curves would be investigated as to the influence on them from a broad range of other parameters that might change over time and of course, if possible, underlying explanatory variables and parameters.<br><br>I will not provide further detailed comments on this section, since i believe it needs a major revision in the light of my earlier comments. | Accepted: Population as factor and the related demographic drivers are better explained. |
| 18363 | 5 | | | | | The treatment of trade and embedded emissions is a very sensitive issue and a clear vision of its coverage should be developed in cooperation with Chapters 4, 13 and 14. | Noted. Coordination has started. |
| 13775 | 5 | | | | | There is an overlap with Ch. 7. Think about how to avoid this by coordinating it. Also, harmonize analysis. | Accepted. The overlap must be avoided. I will try to make suggestions next week |
| 12538 | 5 | | | | | This section could benefit from discussion of the relationship between energy price stability/volatility on the structure of energy demand and related policy aspects, viz. the provision of consumer energy subsidies. | Accepted: Added a mention of the effects of the oil price shocks in 1973, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14518 | 5 | | | | | This section should be rewritten by somebody understanding the first and second laws of thermodynamics.<br><br>What we would need to be looking for here is a relation between Gross Production and preferably physical energy use, if possible by fuel type to be able to decompose the trends in global emissions into a part that is related to energy use.<br><br>The example of the light bulb is a bit overexposing the issue here. Ene4rgy for lighting is only a small fraction of total energy use. And, yes, an incandescent light bulb produces more heat than light. Since light bulbs are in many cases used in winter evenings, this heat is not necessarily a loss, since it will decrease (slightly) heat demand from other energy carriers. LEDs, fluorescent or other high efficiency light sources obviously produce less heat relative to light. The effect on the total energy balance of a building is more complicated. In the case of street lights etc it is more simple.<br><br>Thermal power plants is another issue here: the second law of thermodynamics states that it is impossible to run a thermal power plant without a cooling system. The maximum efficiency of the power plant is determined by the highest (combustion in the boiler) and the lowest temperatures (in the condenser). One could therefor also say that the energy dissipated in the cooling water or cooling tower is basically used to convert high entropy heat into low entropy electric energy. One could try to find a useful application of the even lower entropy (because of lower temperature) "waste" heat, but it can not be avoided. By bringing this into a graph like figure 5.6.2 the reader might think that indeed the major red flow could be avoided. It cannot.<br><br>Also figure 5.6.3 is a bit confusing in energy terms. What does the red and yellow arrows mean? It seems to show that energy never gets lost, but is fully converted into low entropy heat at the end. That is true. Translating this into energy efficiencies however might brake down, not only on the basis of the above entropy reasoning for power plants. Also because for instance because the kinetic energy in transport is basically a loss, since it is fully compensated by the heat energy in the brakes of the vehicle. The energy use in a vehicle is only used to overcome air resistance (road, air, water transport) and rolling resistance (road, trains, etc) or water resistance (navigation). For light my comment above applies. | Noted. Indeed, this has been the intention of the writing team that includes expertize on thermodynamics and will be improved in the next draft. 2. The example of the light bulb will be kept, but better explained including the caveats |
| 3039 | 5 | | | | | Completely agree that energy intensity is a poor measure of energy efficiency. In addition to the considerations mentioned, energy intensity depends on factor price movements (capital, labor, energy, materials), factor substitution elasticities, and factor technology gains. Intensity trends hide a multiplicity of important influencing variables, and depart too far from the concrete engineering efficiency gains that actually underlie intensity trends.<br>Instead defining energy efficiency gains as energy-augmenting technical change [see Stern and Kander 2012 referenced in a comment below; also Saunders 1992 referenced below] gets us much closer to the"bottom-up" language of the engineer and is more consistent with microeconomic theory, at least for the productive side of the energy economy. [for detail on obtaining engineering assessments of energy-augmenting technical change see also H. D. Saunders. "Specifying technology for analyzing rebound" in: Energy efficiency and Sustainable Consumption: Dealing with the rebound effect. Ed. H. Herring and S.Sorrell. Palgrave Macmillan, 2009. link available at: http://works.bepress.com/harry_saunders/12/] | Accepted, further examples of energy intensity factors will be mentioned. Suggestion of including text and references on energy-augmenting technical change is rejected as the text is too long as is. Perhaps, this could be included in sec |
| 4124 | 5 | | | | | Please state at the beginning of this section how the sectoral break down you are using relates to the sectoral break down of chapters 7 to 11. A conceptual visualization might be helpful. | Taken into account: Peter Z addressed this issue |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8428 | 5 | | | | | There is a clear overlapping between this paragraph and the paragraph in the specific Chapters of every sector. As an example Figure 5.7.1 is equivalent to Figure 8.1.2.a. I suggest to leave all the sector specific issue in the detailed chapters and discuss here the broad picture, but not the possibilities to reduce emissions. In this way we can avoid some inconsistencies; as an example in 5.7.1 line 14-27 are proposed some options to reduce emissions, but the importance of behavioural and structural changes are less evident than in the executive summary of Chapter 8 (pag 5, line 14-20). | Noted |
| 8816 | 5 | | | | | The analysis of behavioural change is very shallow, lacking good social science practice of tracing a whole range of causal factors to try to identify the most significant and those that can be effectively addressed. Literature suggested in my previous comment presents a range of factors that should be added to the analysis. | Accepted (added section on factors affecting behaviour change) |
| 3040 | 5 | | | | | The end-use/production distinction is handled better here. But again, globally, only one-third of energy is consumed by households and for personal transportation, while two-thirds is consumed in the productive part of the economy ("embedded" energy), which provides goods and services [ref: ExxonMobil, The outlook for energy: a view to 2030, (2009) available at http://www.exxonmobil.com/Corporate/energy_o_view.aspx. ]. In the U.S., productive energy use is about 60% and end-use 40%. | Noted |
| 3042 | 5 | | | | | Technological change is defined here too narrowly. Technology gains affect other factors of production besides energy (i.e., capital, labor, and materials). Non-energy technology gains have an enormous impact on energy use (increasing it) and also on energy intensity [Saunders H.D. (1992). The Khazzoom-Brookes Postulate and Neoclassical Growth. The Energy 17 Journal 13. (DOI: 10.5547/ISSN0195-6574-EJ-Vol13-No4-7). Available at: 18 http://www.iaee.org/en/publications/ejarticle.aspx?id=1091. (cited in WGIII AR5 FOD report)]. | Reject. Although we don't disagree with the comment, the points made in the comment are already addressed in the FOD text. |
| 3625 | 5 | | | | | Delete or massively reduce as explained in Chapter 3.12. | Accepted, will be coordinated with |
| 6380 | 5 | | | | | This section relies primarily on 10-30 year old literature, despite numerous recent studies (in the last 3 years alone.) Indeed there are only 2 references newer than 12 years old. See several papers by Sorrell et al. (2008, 2009, 2011); David Greene (2007); Winebrake et al. 2012 (good review of recent rebound literature); York 2012 in Nature Climate Change. Rebound effects from production are mentioned, but no examples are given. Several recent economic studies of biofuels discuss rebound effects in global fuel markets resulting from biofuel expansion (Chen and Khanna, 2012, Drabik and De Gorter 2011; Rajagopal et al. 2011; Thompson et al. 2011). An important factor that should be addressed is the difference between rebound in production and consumption: reducing consumption starts produces 0 emissions plus some (10-30%, typically) rebound effect, whereas for production (i.e., fuel switching) net GHG accounting starts with a generally uncertain quantity of GHG emissions (esp. for biofuels), to which a rebound must be added. In the latter case, the potential for backfire is much greater because of the non-zero and uncertain emissions from the alternative fuel/energy system. | Accepted. The rebound effect section has been updated considerably yo take account of developments in the past 5 years. Notably this the section now includes evidence from a substantial review by Sorrell that includes many of the references you mention. Additionally, the figure of 10-30% is also included in relation to direct rebound effects. |
| 2339 | 5 | | | | | It seems that, the ordering of paragraph in the Executive Summary and other sections should be re ordered again. For instance, in the Executive Summary, the factors in the Kaya identity can be summarized. | Accepted: We are rewriting the ES of Chapter 5 following this suggestion, |
| 8902 | 5 | 0 | | | | This chapter represents well the past trends and drivers of GHGs, but the mitigation aspect of the chapter is not properly covered - especially in terms of mitigating future GHG emissions | Rejected - We can not say much about the future in Ch5, but we can say |
| 10747 | 5 | 0 | | | | My impression is that GWP for a 100 year time horizon is used without any indication that the GWP has been subject to critisism and assessment. It could be noted that there are other time horizons than 100 years and that several implicit choices have been made in the application of GWP100 (see WGI Chapter 8 and WGIII chapter 3). It could also be noted that the contributions calulated would look different if a different time horizon was used or if a different metric was used; see figure 8.31 in WGI. | Agreed. The reader will be referred to chapter 3 which deals with this issue in detail. To discuss the issue in detail again would be redundant. |

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| 16941 | 5 | 0 | | | | This is a very data-rich chapter, with rigorous analysis. It might be useful for the authors to step back and try to think about the important "so what" messages.<br>Curiously, amidst all the data, I think the chapter misses out a fundamentally important diagram (and associated set of issues), namely the data captured in a very aggregated form in the FOD Chapter 14 Figure 14-12 on trends in per-capita emissions vs per-capita GDP. I think this format captures several important points, but they are somewhat obscured by the nature and level of aggregation in Chapter 14. The issues are clearer looking at sub-regional breakdowns. One example of both data at this level and interpretation of possible implications is in Grubb, Hourcade and Neuhoff, Planetary Economics: the three domains of sustainable development, Chapter 1 (Figure 1.7). I have sent this chapter to the Secretariat. □ | This is not the section to deal with this issue |
| 9312 | 5 | 0 | | | | The chapter is very well organized, well-written, reader-friendly and takes into account holistic view of drivers, trends and mitigation strategies of greenhouse gas emissions. | Noted |
| 18616 | 5 | 0 | | | | Technological change and individual behaviour become key aspects for future efforts on climate change mitigation. | Noted |
| 18617 | 5 | 0 | | | | "From an economic theory point of view, however, international trade contributes to a more effcient allocation of resources, which may help mitigate GHG emissions." | Rejected: comment not understood |
| 18618 | 5 | 0 | | | | Not handled (from what I can see) –relation between investments and consumption. | Noted. The aim of the section on consumption was to consider the trends in the growth of consumption and its relationship with GHG emissions. With 400 words available it the trend and |
| 18619 | 5 | 0 | | | | Most of the mitigation alternatives (efficiency, RES, CCS and nuclear) build on upfront investments; high CAPEX, substantially lower OPEX. Power systems perhaps a shift from 50/50 to 90/10 in the long run. Savings need to be up (and direct consumption down). Short and long term effects? | Rejected: Outside the scope of Chapter 5 |
| 18620 | 5 | 0 | | | | Parts of the material very theoretical and probably unreadable to a wider audience – share results, not formulas! | Accepted. The part removed. |
| 18623 | 5 | 0 | | | | Also in this chapter the most substantial conclusions are found in the FAQs. To be extended?<br>(As such depressing, the emissions will continue to grow….) | Noted. Partly effectuated |
| 9025 | 5 | 0 | | | | Methdologically, this chapter relies on two approaches which are biased against discussions of historical responsibility and equitable access to development: (1) Reliance on the Kaya identity as a way of decomposing the sources of current emissions, which does not reflect differences in development levels, population, economic structure between developing and developed countries; and (2) Use of standardized comparison of emission flows, which emphasizes recent growth in emissions of developing countries and obscures the role that the stock of the long-lasting emission that had been originated from the developed countries | Taken into account - we try to present our data in various units that provide multiple perspectives, e.g. CO2e/cap as well as total CO2e/yr emissions. |
| 9026 | 5 | 0 | | | | In its data analysis, the Chapter consistently uses 1970 as a starting point, which obscures the role of historical emissions. | Taken into account - we include historic emissions before 1970 in the SOD |
| 9027 | 5 | 0 | | | | The country-by-country comparisons treatment obscures the nature of emissions in production and consumption. Developed country per capita consumption levels are not only much higher than those of developing countries, developed countryper capita production emissions are also much less. However, developed country consumption is dependent on developing country production of goods produced in higher emission production processes. International trade has carbon embedded in it and emissions are unduly associated with developing country economic activity. | Accepted: We are preparing a figure to better show the issue raised. |
| 9028 | 5 | 0 | | | | The Chapter should at a minimum recognizeand state the agreed principles under the Convention. Under the principles of the Convention, developing countries have a right to pursue their development and developed countries have the responsibility to provide the technology and finance to decouple this development from emission increases. | Rejected - Chapter 5 does not assess rights, but trends and drivers. The comment is better suited for the framing chapter. |

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| 16247 | 5 | 0 | | | | This chapter points out well the interdependence of different drivers within different sectors, however, it does not mention the linkages of the sectors themselves through material flows. The sectors are treated as if they were independent from each other. In reality, changes in the building and transport infrastructures are key drivers for industry production, and waste flows are the result of past production activities. A logical consequence of these physical linkages between the different sectors is that mitigation efforts should aim at transforming entire socio-metabolic systems... | Rejected - Chapter 5 does not assess future mitigation options, but past trends and drivers. |
| 13214 | 5 | 0 | | | | This chapter is very factual and highly policy relevant. Its pages number allocation should be increased accordingly. | Noted |
| 12946 | 5 | 0 | | | | For a chapter on mitigation there is strong focus on the engineering/practical needs for technology to achieve the mitigation measures, but not very much at all on the economic conditions needed to make those technological solutions commerically realistic. In particular further discussion of the importance of carbon pricing seems to be lacking. | Accepted - we pay more attention to pricing in the SOD |
| 18523 | 5 | 0 | | | | As agreed in Wellington, Chapter 5 should include some mention of tourism, deliniating the different components, and how those components are addressed across the different AR5 chapters. This has not been included in the FOD. | Accepted: We are working with TSU and CLAs in Chapter 10 on how to deal with the tourist sector. |
| 11285 | 5 | 0 | | | | The entire chapter deals with comparisons, calculations, and various quantification models. It would be interesting (and probably necessary) to reflect also the changes attributable to, or at least within the scope of, the range of existing international covenants, agreements, standards, etc not least of which would be commitments by member states made in Rio at the Rio +20 conference in June 2012. | Taken into account - the issue is touched upon at various occasions in the SOD, but there is not much evidence in the literature, however. |
| 8601 | 5 | 0 | | | | There is not enough information on Fisheries and Aquaculture as to consider the acronym AFOLUFA instead of AFOLU. Evenmore, in the FOD WGIII AR5-IPCC the Fisheries and Aquaculture activities are barely discussed. | Accepted |
| 3144 | 5 | 0 | | | | This chapter is the logical place for all the core discussion of drivers. I suggest that chapter 1 have the figure on Kaya (which already exists—see figure 1.6) and this chapter unpack the drivers in a lot more detail. TSU needs to help steer how other chapters address drivers as this discussion also exists in chapter 4, 6 and 7 among others.<br><br>Depending on what is done with the regional chapter (#14, I think) a lot of the regional discussion might be trimmed back from this chapter.<br><br>it would help if the executive summary were more empirical. Which of the drivers is most important?<br><br>It is possible that some of the more detailed discussion of allocation among industrial sectors (which sets up the later chapters that look sector by sector) belongs here as well. TSU has a note in chapter 10 saying that this kind of introduction is neded. maybe it belongs a bit in chapter 1 and mostly in chapter 5? | Noted |
| 10377 | 5 | 0 | | | | the section 5.6 about the sectoral emission sames irralevent to this chapter, given the excess pages, it may be appropriate to abridge it or move it the according chapters through 7-10. | Taken into account - the section is entirely rewritten. |
| 10379 | 5 | 0 | | | | In discussing the driver of carbon content and the energy substitution, the nuclear security and hence the supersede pertential of nuclear energy should be reconsidered. | Accepted. This point is included in the response to Comment 15978/222. |
| 11527 | 5 | 0 | | | | In my view to much attention is paid to the Kaya formula, while it would we worthwhile to spend more attention to the causal relationships that explain the level of emissions. | Taken into account: Section 5.3 is being rewritten. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11528 | 5 | 0 | | | | It is striking that hardly any reference is made to the impact of energy prices as a driver for trends in emissions. I would expect explicit reference in the executive summary, in paragraph 5.6 and other places. When one analyses long term trends in energy use it is clear that prices hikes have triggered energy consumption to decrease or to grow more slowly. A clear example is the effect of the escalation of oil prices during the last7 to 8 years. | Taken into account - we have included a discussion of major oil price shocks in section 5.6.1. |
| 11415 | 5 | 0 | | | | The chapter looks at historical trends and drivers of stocks and flows of greenhouse gases only from the period 1970 to 2008. Nowhere in the chapter, however, is there any explanation for why only this particular period is selected. In doing so, the chapter presents an incomplete picture of the long-run historical responsibility for GHG emissions. It essentially disregards the fact that the fact that the bulk of historical emissions since the Industrial Revolution (e.g. 1850) or even at least since the start of the 20th century (1900) to the present came from developed countries. In doing so, no adjustment in terms of the attribution of future responsibility therefore needs to be made to reflect the disregagrded historical responsibility. What the chapter tends to highlight as "historical trends", therefore, is that in the 40-year timeframe used, an increasingly larger share of emissions have come from non-OECD countries, thereby creating an implicit conclusion that an increasingly larger share of the mitigation burden will also need to be borne by non-OECD countries. This approach essentially absolves OECD countries of their long-run historical responsibility for anthropogenic emissions and ignores an important element of what should be considered as scientific fact when it comes to correctly attributing long-run responsibilities for historical emissions. It biases the attribution of historical trends in favor of OECD countries and against developing countries but focusing only on the period when most OECD countries had finished their industrialization process (and hence had more or less stabilized their emissions levels) while developing countries by and large were still embarking on the initial stages of their industrialization and development process (and hence would be increasing their emissions). | Taken into account - we have revised Section 5.2 to also include emissions before 1970. We are careful not to suggest that developing countries must take more action vis-a-vis developed countries. |
| 5295 | 5 | 0 | 0 | | | While mentioned in the introduction, the social acceptability factor is sorely missing from the chapter. While less sociology and political science research on enerngy exist, it is an emerging field and some results are available, especially on the rebound effect and experimetns such as the EU wide program Postive energy neighborhoods or families, who, through change in behaviours alone reach an average decrease of -15% in energy consumption in France. My comments attempt to contribute to this point. | Noted/Accepted (Text to be included with inputs from Michael) |
| 3620 | 5 | 0 | 0 | | | Abbreviations should all be explained (esp. in the figures) | Editorial |
| 3621 | 5 | 0 | 0 | | | Is more recent data after 2008 available? Please update. | Taken into account - data are updated |
| 7389 | 5 | 0 | 0 | 0 | 0 | It would be extremely helpful and policy relevant if the chapter could present, for some selected figures, emissions trends and sectoral contributions if GHGs are weighted not by 100-year GWPs but by other metrics discussed in the scientific literature (see section 3.10.3 of this report, and chapter 8 of WGI report). This would help policymakers understand that the relative contributions of sectors to overall emissions depend significantly on their own choice of metric (noting that the IPCC does not recommend using GWPs over any other metric, it simply follows the de-facto use of GWPs by the policy community). At a minimum, you could do this for Figures 5.2.1 and 5.2.3, and show a pie chart of the contributions from different sectors in 2008, using e.g. GWPs with 20, 100 and 500-year time horizons, or using 100-year GWPs and 100-year GTPs. | Accepted: We are working on a figure containing the information suggested |
| 16010 | 5 | 1 | | 89 | | A lot of blanks are missing, a lot of brackets are double | Editorial |
| 13559 | 5 | 1 | | | | In general I would recommend much more robust referencing of particularly figures and tables with regard to data sources, whereas some sections as indicated above could benefit from a somewhat wider use of references as as specific cluster now often used. It is however a reasonable first draft. | Accepted: We prepared a new set of figures based on the adopted databases for WGIII. |
| 5761 | 5 | 1 | 1 | 89 | | I suggest a change of style to shorten the text. You often describe what you want to do next, e. g. page 11, line 22: "We begin by … ". Please avoid such prosaic phrasings. In addition, you use abbreviations quite extensively, so why do you always write "greenhouse gas" instead of "GHG"? | Accepted: The language in the SOD have been change and the whole chapter shorten. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5762 | 5 | 1 | 1 | 89 | | This chapter needs a thorough copy-editing. There are too many articles missing, and, quite too often, blanks between words are also missing. | Editorial |
| 14465 | 5 | 10 | 1 | | 2 | The difference must be international trade: some or many products are produced in different locations and regions than where they are used. This also means that the effects on the regional distributions of emissions will depend on the method of distribution. It does not necessarily add to the understanding of the system. | Taken into account - we now have an explicit accounting of the effect of trade on emissions in Section 5.5.3 and 5.5.4. |
| 12296 | 5 | 10 | 28 | 10 | 28 | Please explain "green paradox literature" | Noted - Section is rewritten. |
| 14467 | 5 | 10 | 37 | | 40 | In line with my remarks, this could probably better be formulated as a search for joint underlying variables and processes that influence more than one of the three parameters in the Kaya approach. | Taken into account - Section rewritten. |
| 14859 | 5 | 10 | 7 | 10 | 9 | As mentioned later in this chapter (page 34, lines 2-3) the Kaya identity is an accounting identity in which all terms are proportional to CO2 emissions. Therefore, the identity does not imply any elasticity as it would be in the context of an econometric analyis. | Noted |
| 14466 | 5 | 10 | 8 | | 8 | This is already excluded by the Kaya identity, isn't it? This identity uses three steps to gert from Population to Emissions: (G/P), (E/G) and (CO2/E). so the sentence is obvious from the previous text. | Noted |
| 4161 | 5 | 11 | | | | I would ask to reconsider the color design. It is slightly hard to distinguish the border of the areas due to the low contrast. | Will do. |
| 15058 | 5 | 11 | 1 | | | there are two "direction". Maybe remove one? | Noted |
| 10875 | 5 | 11 | 14 | | | Any reason to reference TAR instead of AR5. Chapter 8 in WGI will use some slightly different definitions and terms, so should be familiar with this | Agree |
| 14469 | 5 | 11 | 14 | | 18 | The understanding of this from a mechanistic point of view is a bit different:<br><br>Radiative forcing is a property of the atmosphere, that can be changed due to changes in concentrations of greenhouse gases in the atmosphere. These changes in concentrations are at least partly due to emissions caused by human activities. So in my view, emissions can be anthropogenic. Not the GHG concentrations, nor the radiative forcing. Moreover, CO2 absorbs infrared radiation, which is manily "outgoing" rather than "incoming".<br><br>So a more precise way of saying this would be something along the following lines:<br>The term "radiative forcing" is used to denote a change in the radiative balance of the atmosphere. A positive forcing leads to a more energetic, and hence warmer, atmosphere, whereas a lower forcing leads to less energetic, hence cooller, atmosphere. Radiative forcing is influenced by changes of concentrations of greenhouse gases, aerosols and troposheric ozone, partly due to anthropogenic emisisons.<br><br>The reference to AR4 would probaly better fit immediately after this modified sentence. | Text edited to remove language on incoming and outoing radiation and clarify meaning. Otherwise, the current text is consistent with the more detailed discussion in AR5 WG I, and the reader is now refered there for a more nuanced discussion of |
| 15983 | 5 | 11 | 15 | | | probably also possible to quote WG I AR5 here | Done |
| 10876 | 5 | 11 | 17 | | | Don't forget that land use change, via albedo and energy balances, also effects climate. Not just emissions. | Yes |
| 14468 | 5 | 11 | 2 | | 5 | This is clearly one of the examples where the different parameters in the Kaya approach are mutually dependent. | Noted |
| 15984 | 5 | 11 | 20 | | | contact WG I people whether there is an equivalent in AR5 | Done |
| 14471 | 5 | 11 | 22 | | 29 | "aggregated" would be a more precise term than "converted". | Text edited to clarify. |
| 14860 | 5 | 11 | 22 | 11 | 23 | You need to be more specific on the GWP values used. On which Assessment Report are they based? | Will try to be so. |
| 12856 | 5 | 11 | 25 | | | It would be good for this figure to portray the uncertainty bounds (ranges of the estimates) for each gas. The text on page 12 describes these uncertainty bounds, but the figure would more effectively show the ranges of the estimates. | Extremely difficuly to do in Figure. |
| 3513 | 5 | 11 | 12 | 11 | 13 | Change the title to "Global trends in flows of greenhouse gases and short-lived species" | Rejected: Titles of section were adopted |
| 6898 | 5 | 11 | 12 | | | Please ensure consistency with corresponding WGI Chapters and use latest data available. | Agree |
| 6899 | 5 | 11 | 18 | 11 | 20 | Update reference to WGI AR5, e.g., Chapter 8. | Done |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4370 | 5 | 11 | | 11 | | same fig as 1.4 | Will discuss with Chapter 1 writing team |
| 6900 | 5 | 11 | 22 | 11 | 22 | Not trends, but emissions of GHGs. Please correct. | Corrected. |
| 8944 | 5 | 12 | 1 | | | C02 emission increased 80% but atmospheric concentrations did not. This is about 18% | Not clear about purpose of this comment. Increase in concentrations is |
| 10877 | 5 | 12 | 1 | 12 | 4 | I presume you have used a GWP with 100 year time horizon. Should state this, and also mention that this is one choice of many (see Ch8 WGI) | Yes |
| 10878 | 5 | 12 | 10 | 12 | 13 | Check chapter 6 in WGI as this might be updated now. Also see Andres, R.J., Boden, T.A., Bréon, F.M., Ciais, P., Davis, S., Erickson, D., Gregg, J.S., Jacobson, A., Marland, G., Miller, J., Oda, T., Olivier, J.G.J., Raupach, M.R., Rayner, P., Treanton, K., 2012. A synthesis of carbon dioxide emissions from fossil-fuel combustion. Biogeosciences 9, 1845-1871. | Done |
| 15985 | 5 | 12 | 10 | | 14 | I understand (hope) that this is supposed to be a comparison/update to the AR4 rather than just a quote ... if so, the statement is not totally clear | Yes, Done. |
| 10879 | 5 | 12 | 14 | 12 | 24 | For the CH4 and N2O budgets, you shuld read and review WGI text which have specific sections on this. | Done |
| 14472 | 5 | 12 | 14 | | 16 | Tinus Pulles and André van Amstel (2010), An overview of non-CO2 greenhouse gases, Journal oif Integrative Environmental Sciences, vol 7 sup1 pp. 3-19 doi: 10.1080/1943815X.2010.505241 provide a recent overview of antropogenic emissions in relation to changing atmospheric conentrations. | Do not have access to Journal |
| 11841 | 5 | 12 | 14 | | | Here you could mention that methane is the second most important anthropogenic GHG, to be consistent with the paragraph before (co2 is most important) and after (n20 is third abundant…). | This is a good idea, but for interests of space, we did not do this. A new figure, however, does show the relative |
| 7319 | 5 | 12 | 20 | 12 | 22 | These lines state that "The third most abundant source of anthropogenic emissions comes from nitrous oxide (N2O) which is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste." For the last part of this sentence only ("combustion of fossil fuel and solid waste"), I would suggest that the authors perhaps meant NO2/NOx, rather than N2O. | Text edited to clarify. |
| 14473 | 5 | 12 | 20 | | 20 | … source ... should read ... greenhouse gas related to … | Done |
| 17430 | 5 | 12 | 23 | 12 | 23 | Why is it a given that uncertainty for CH4 and N2O will be larger? | Because fossil CO2 emissions are primarly dependent on the carbon content of fuel, which is relatively well known. CH4 and N2O emissions are highly process dependent and are, |
| 14474 | 5 | 12 | 25 | | 27 | Please be careful:<br>F-gases are long lived. CO2 is long-lived. CH4 and N2O can be considered as short lived.<br>The distinction here should therefore be made on a different parameter than "life time". | Agreed. Text edited. |
| 10749 | 5 | 12 | 3 | 12 | 3 | It should also be mentioned which time horizon that is used. | yes |
| 10880 | 5 | 12 | 31 | | | I have never heard them called "high GWP gases" before. Where does this come? I suggest use more standard terms. See WGI. | This is a term commonly used in economic and energy modeling. |
| 9316 | 5 | 12 | 34 | | | GHG may be changed to 'GHGs' and the following word 'emission' is suggested to be deleted. | Done |
| 6459 | 5 | 12 | 36 | 12 | 37 | “By far” should be deleted, because other sources & activities, such as transportation, show not-so-small emissions. | Text edited to clarify |
| 6519 | 5 | 12 | 37 | | | Delete "by far", as the other sources and activities are considerably large and important. | Text edited to clarify |
| 14863 | 5 | 12 | 37 | 12 | 37 | Add "production and" after Energy. If GHG emissions analysis is to be based on a consumption based approach, then this should be explicitly mentioned. | Text edited to clarify |
| 14475 | 5 | 12 | 38 | | 39 | This is fine to mention here. However care must be taken that this does not lead to double counting. The indirect emissions do not add to those in figures 5.2.1 and 5.2.2 and 5.2.3 and 5.2.4! | Care has been taken not to double count emissions. |
| 9315 | 5 | 12 | 4 | | | The word 'since' seems to be superfluous and suggested to be deleted. | Done. |
| 12297 | 5 | 12 | 5 | 12 | 24 | Please be consistent when referring to the anthropogenic part of the various GHG emissions. | Not quite sure what the comment refers to, but the chapter has been edited for |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14862 | 5 | 12 | 7 | 12 | 8 | If it is necessary to explain the "combustion of fossil fuels" then you have to add additional (to the power plants and transportation already mentioned) sources (e.g. boilers/furnaces in industry, boilers and other stationary equipment in residential/commercial sectors). I suggest deleting this sentence. | Agreed text deleted |
| 17429 | 5 | 12 | 8 | 12 | 8 | Combustion of fossil fuels takes place in buildings as well as power plants and transport | deleted |
| 12298 | 5 | 12 | 9 | 12 | 9 | This sentence should be balanced including both removal by sinks and emissions related to LULUCF. | sentence deleted |
| 3516 | 5 | 12 | 10 | | 13 | I would suggest to reformulate the paragraph as followed: 'In the 1990s, CO2 emissions originating from fossil fuel were estimated at 6.4 +/-0.4 Gt per year and that associated with land use changes ranged from 0.5 to 2.7 Gt per year with an average estimated at 1.6 Gt per year (IPCC 2007; Smith et al. 2011)'. | edited alomg these lines |
| 3524 | 5 | 12 | 17 | | | Replace 'human-related activities with 'human activities' | Yes |
| 3517 | 5 | 12 | 20 | | 24 | Please add a reference in the paragraph. | Reference added |
| 3518 | 5 | 12 | 26 | | | But, nothing is said before on the Kyoto Protocol. | Text edited to clarify. |
| 7709 | 5 | 12 | 28 | | | Fluorinated gases are sometimes used as….' should be replaced by 'Hydrofluorocarbons are mostly used as…..' because HFCs have been developed as alternatives to ozone depleting substances. | yes |
| 3515 | 5 | 12 | 5 | | | By using the term 'most important', do you mean 'CO2 is the most abundant anthropogenic GHG emissions'? | Text edited to claiify |
| 6901 | 5 | 12 | 5 | 12 | 5 | Please add the reference to WGI AR5 Ch8 for summary figure on present-day radiative forcing estimates for Anthropogenic and Natural Climate Forcings. | Done |
| 8420 | 5 | 13 | | | | figure 5.2.3 is not quoted in the text | Figure eliminated |
| 8419 | 5 | 13 | | 13 | | These data are too old (year 2000). I suggest to insert in the Chapter 5 the Box now in Chapter 10 – pag. 8-10, and use only the Sankey diagram now in Figure 10.2. | Data being updadte |
| 15059 | 5 | 13 | | | | Is other fuel combustion a sector? it looks confusing how the sectors are distinguished. is coal mining a end user? | Figure moved to Chapter 1 |
| 15555 | 5 | 13 | | | | This is a nice summarizing Figure regarding the sources of gaseous emissions, but it would become much clearer, when the Key Sectors in Section 5.7 (i.e. 7.7.1 to 5.7.5), namely Transport, Buildings, Industry, Agriculture+Forestry+…, Waste) would be referred to | Figure moved to Chapter 1 |
| 7459 | 5 | 13 | | | | Harvest management contributes 2.5% to GHG emissions. Some harvest management can lead to carbon sequestration. This is discussed in Chapter 11. Therefore, I think the 'negative', practices should be spelled out. | Needs to be dealt with by Chapter 1 where figure is now located. |
| 10881 | 5 | 13 | | | | Are these values consistent with WGI? Why use the metric values from SAR and not AR5 (at least AR4). I suggest to refer to the relevant section of WGI Ch8 for updated metric values. Note, AR4 GWPs will be used in climate policy from 2020 onwards and SAR ones are very old. | Because for the UNFCCC and other policy purposes, SAR GWPs are always used. So thoe are also used here for consistency. Because we are discussing |
| 14861 | 5 | 13 | | | | See comment No. 2 | See response above |
| 16018 | 5 | 13 | | | | very old data | Data being updated |
| 6902 | 5 | 13 | | | | GWPs have been updated since then in a number of IPCC reports, Ozone Assessment, WGI AR4, etc. | This is true, however SAR GWP values are still used for policy purposes, so |
| 12857 | 5 | 13 | 1 | | | This is a very good figure and should even be in the Summary for Policymakers and Technical Summary, but it currently is not legibile. It would be good to somehow enlarge the text labels, although the thin arrows will require work to keep the labeling clear and accurate. | Figure has been eliminated |
| 8346 | 5 | 13 | 1 | | | How about replacing world greenhouse gas emissions in 2000 with emission in 2005? Reference is as follows. Herzog T. (2009). World Greenhouse Gas Emission in 2005. World Resources Institute. http://pdf.wri.org/working_papers/world_greenhouse_gas_emissions_2005.pdf | Figure Moved to another Chapter |
| 13548 | 5 | 13 | 1 | | | Add reference to figure | Okay |
| 9062 | 5 | 13 | 2 | | | Figure 5.2.2. All data is for 2000. Be great if the data is more recent ( 2010 onwards) | Data being updated |
| 15928 | 5 | 13 | 7 | 13 | 9 | the last varifiable data set is from 2008 (?) I am sure several peer-reviewed publications carry more recent data (2009-2010-2011) / Using 2008 for a report that will be published in 2013 allows for a tremedous lag and may not provide the best available scientific viewpoints on stocks or trends for GHGs. | Changes are planned including data through 2010 |
| 5349 | 5 | 13 | | 13 | | Cant this figure be updated? This figure would be far more impactful if wasn't showing 14 year old data | Figure deleted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3519 | 5 | 13 | | | | Figure 5.2.2 shows data that is 12 year old. Is there any updated version that shows recent situation? Please add a text to explain whether the situation has changed or not since 2000. Replace 'absorptions' with removals' | Figure deleted |
| 3520 | 5 | 13 | | | | Please add the source of the figure. | Okay |
| 4371 | 5 | 13 | | 13 | | some figures in this flow chart are contradictory with numbers appearing in the text in different instances | Please be more specific. 2 charts have been removed (5.3 and 5.5) |
| 4372 | 5 | 13 | | 13 | | same fig as 1.4, excep mentionned time span is different | Figure eliminated |
| 8421 | 5 | 14 | | | | Usually REF means Economies in Transition; the term “Central Europe” is unclear. MAF is Middle East and Africa, not only Africa. | Yes |
| 4162 | 5 | 14 | | | | Definition of the regions should be more clearly documented or the literature should be refered. | Yes |
| 10435 | 5 | 14 | | | | This figure has potential to generate controversy | Yes? |
| 14864 | 5 | 14 | | | | See comment No. 2 | Yes |
| 7646 | 5 | 14 | | | | Explain or write out country/region akronyms. | Yes |
| 12303 | 5 | 14 | 13 | | | The regions need to be described. For instance is REF not explained in this chapter. | Yes |
| 9317 | 5 | 14 | 4 | | | Please add '(2007)' after Raupach et al. | Figure eliminated |
| 16205 | 5 | 14 | 4 | | 7 | Rapupach's abbreviations are not the same as the ones used in the text; harmonize figure and text | Figure eliminaterd |
| 3521 | 5 | 14 | | | | Include the share of North America in the figure. | However, such information can be extracted fom primary source. |
| 3522 | 5 | 14 | 3 | | 4 | Include data on 'growth rates' and clarify 'recently' (what is time period?) | See original reference |
| 15060 | 5 | 15 | | | | It would be nice if more up-to-date data and result was included. | Data being updated |
| 8945 | 5 | 15 | | | | Not clear. Factors not clearly explained in caption. | Accepted. The text has been revised. |
| 4163 | 5 | 15 | | | | Definition of the regions should be more clearly documented or the literature should be refered. | Figure eliminated |
| 14476 | 5 | 15 | | | | I have no idea what this figure legend means. Must be explained. | Figure eliminated |
| 5765 | 5 | 15 | | | | It is not clear what this figure relates to at this place as you do not work with what is shown here. A decomposition of the Kaya Identity, but what is the message associated with this, or is this figure only given for "decorative" purposes? Please delete or at least amend text and explain abbreviations. For example, what does "Pgef" mean? Gpi (PPP) is unclear, FSU too. Please keep in mind that this text is to be read not only by specialists familiar with your lingo! | Figure deleted |
| 14865 | 5 | 15 | | | | I suggest deleting Figure 5.2.5 (at least from this part of Chapter 5) as it is based on indicator analysis that appears later in this chapter | Agree |
| 7647 | 5 | 15 | | | | What is F = Pgef = Pgh? If explained in the text pls include ref to place in text. | Figure eliminated |
| 12304 | 5 | 15 | 2 | | | The figure caption needs to be extended with explanations of F, P etc. What is the relation between e.g. D1 and UAS, EU and Japan? Are the latter included in D1? Is it all the countries included? | Figure eliminated |
| 14478 | 5 | 15 | 20 | | 20 | The data reported by Annex I Parties on "indirect greenhouse gases" to UNFCCC have never been reviewed and might be quite incomplete and incomparable between these countries. I feel it a bit dangerous to cite these data and not use the data on direct greenhouse gases from the same source. These have been reviewed and the quality of those direct GHG emission data is quite high. | Peer revieweed literature along with other data soruces are cited to support the statements in the text. Given that the UNFCCC submitted emissions are also, in general, the emissions used for policy |
| 2219 | 5 | 15 | 6 | 16 | 24 | SOD should also review a key report which I could not find in the references so far: "Project Catalyst: Abatement opportunities for non-CO2 climate forcers, May 2011". It has BAU estimates by non-CO2 climate forcer (CH4, N2O, f-gasses, and notably Black Carbon. Also it has a detailed set of MACurves for each of the non-CO2 forcers, which would be relevant to include in AR5. Project Catalyst/ClimateWorks may be willing to share underlying details of the analysis and results. | Report needs to be peer reviwed. Appears to be a briefing paper not primary research |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15557 | 5 | 15 | 7 | 16 | 24 | Generally Section 5.2.2: The important differences between aerosols and GHGs should be made clearer. They are considered more or synonymously, but aerosol increases may cause cooling effects and the net effects seems to be small or even negative. The cited Figure SPM 2 (IPCC, 2007, p. 4), cited on page 11, line 20 Fig. clearly shows this finding. | Good points, intro text edited to make this point. |
| 12299 | 5 | 15 | 8 | 15 | 9 | Please be consistent, climate forcing or radiative forcing | Richard R (could not find, may be in |
| 15558 | 5 | 15 | 8 | 15 | 9 | Trends in aerosol consist not only of trends on secondary organic aerosols (SOCs) but also of changes in direct aerosol emissions (mineral dust, sea salt, pollen, vegetation fire, combustion processes, volcanic eruptions). Thus almost all GHG emissions also correspond to changes in aerosol emissions. This is also reflected by Fig. 5.2.6 regarding BC and OC. Both climate changes (wind climate, resulting vegetation changes) and direct land surface changes cause feedbacks on aerosols, which is particularly important since aerosols may either cool OR heat the lower atmosphere. | Text edited to note the influece of climate and land-use changes. |
| 4373 | 5 | 15 | | 15 | | legend does not explin acronyms and symbols | Figure eliminated |
| 6520 | 5 | 15 | | | | Explain the abbreviations in figure's legend. | Figure eliminated |
| 10882 | 5 | 15 | | | | Should be reference to WGI which covers this topic in detail | We are not aware that WG I discusses reactive gas and particulate emissions in detail. We reference here, however, the |
| 3525 | 5 | 15 | 7 | | 20 | Include in brackets the chemical formulae of gases, for e.g. carbon monoxide (CO). | Done |
| 6903 | 5 | 15 | 8 | 15 | 11 | Add reference to WGI AR5 Chapter 2, 6, 8 for the most up-to-date IPCC assessement of changes in atmospheric composition. | This section focuses on anthropogenic emissions of reactive gases not concentrations. As discussed by WG I, the relationship between anthropogenic emissions and ozone and particulate |
| 8422 | 5 | 16 | | | | I suggest to normalize data to the year 1990 (not 1985 – in the graph there is 1895…) | Noted: Figure has been re-drawn |
| 4029 | 5 | 16 | | | | the y-axis should read "1985" | Noted: Figure corrected |
| 8946 | 5 | 16 | | | | Not clear. Caption requires explanation of all the peaks, etc. | Noted: caption text edited to note that short-term variability is due to open- |
| 7460 | 5 | 16 | | | | CO should be CO2? | Rejected: Figure is correct and refers to |
| 10883 | 5 | 16 | | | | Perhaps there is a good reason, but why are there spikes in the CO and NMVOC emissions | Noted: caption text edited to note that short-term variability is due to open- |
| 9318 | 5 | 16 | 12 | | | It is suggested to add another factor 'and emission reduction regulations' after emission reduction technologies. | Rejected. Not all factors can be dealt with. |
| 12301 | 5 | 16 | 25 | 20 | 7 | Readability of section 5.3 is good due to the use of subtitles. Please consider the use of subtitles in other sections. | Editorial. This is part of the ongoing discussion between the editors. |
| 12300 | 5 | 16 | 25 | 26 | 2 | Most of section 5.3 could be placed in an Annex. You then get rid of close to 10 pages out of the 15 that you need to cut. | Considered. The part removed. |
| 15559 | 5 | 16 | 4 | 16 | 18 | An important finding should be mentioned, that regards unexpected climate side-effects of modern power-plants, which try to reduce coarse aerosols emissions (for health issues), but emit more ultrafine particles, which have a significant effect o clouds. Literature: "The climate penalty for clean fossil fuel combustion" W. Junkermann, B. Vogel, and M. A. Sutton, Atmos. Chem. Phys. Discuss., 11, 24567–24589, 2011; www.atmos-chem-phys-discuss.net/11/24567/2011/; doi:10.5194/acpd-11-24567-2011 | Rejected. The issue is too specific and detailed to be dealt with in this general section. |
| 6521 | 5 | 16 | | | | Explain the abbreviations in figure's legend. | Will do |
| 3527 | 5 | 16 | 19 | | 24 | As tropospheric O3 results from photochemical reactions of precursurs, it may be useful to include this in the section or to make reference to the chapter of the AR5 where this is addressed. | Text edited to note this and to refer to Myhre et al. (AR5). |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 14479 | 5 | 16 | | | | As indicated above, I have some difficulty in the story line of the chapter.<br><br>Since the chapter aims at identifying the (in my words) parameters of the Kaya approach, I would expect sections on the relation between population (growth) and gross production values, between gross production values and energy requirements etc.<br><br>The Kaya approach is telling the reader that these drivers are changes in these parameters. What this section then could look for is how all kind of "drivers" identified in the literature fit into the Kaya approach. Which ones do influence the per capita Gross Production, which ones the energy requirement per gross production and which ones the emissions per energy use.<br><br>As it is now, this section confuses and does not add value to the understanding of the changes in the parameters of the Kaya approach. | Accepted: The whole Chapter 5 is being rewritten in order to improve clarity in the relationship among factors of the decomposition and underlying drivers. |
| 11200 | 5 | 17 | | 18 | | There is an argument for including a new additional category here with the subtitle: "Governance and political ecology" (or just 'governance') and inserting a paragraph with references linked to the work of scientists like Agrawal showing how community forest governance and secure rights are positively correlated with intact and healthy ecosystems and low(er) emission levels when compared to other governance types and land uses. The need for much greater regulation of land acquisition could also be made in this additional sub-section under the same heading.<br><br>See refs: Persha L, Agrawal A, and Chhatre A (2011) Social and Ecological Synergy: Local Rulemaking, Forest Livelihoods, and Biodiversity Conservation Science 25 March 2011: Vol. 331 no. 6024 pp. 1606-1608<br><br>and Nepstad D, Schwartzman S, Bamberger B, Santilli M, Ray D, et al. (2006) Inhibition of Amazon deforestation and fire by parks and indigenous lands. Conserv Biol 20: 6573.<br><br>and Hayes, T M and Murtinho, F (2008) "Are indigenous forest reserves sustainable? An analysis of present and future land-use trends in Bosawas, Nicaragua" International Journal of Sustainable Development & World Ecology, Volume 15, Issue 6, 2008: 497-51 | Noted. Unfortunately we don't have the space available to include all literature deemed relevant |
| 10750 | 5 | 17 | 1 | 17 | 1 | Re: "….emission in GWP100 has increased...". again, rewording is needed. The emissions are weighted by GWP-100. | Noted: Chapter substantially revised, text phrase no longer exists. |
| 9466 | 5 | 17 | 13 | | 19 | This conflicts with page 4, lines 2-4. Are drivers strictly causes or are they associative? It would be helpful to pick a stable definition and ensure that the literature reviewed meets the standard. | Considered. It is clearly stated that they are not about cause-effect relationship. |
| 12858 | 5 | 17 | 23 | 17 | 35 | Here, the text should clearly identify consumption per capita as important as total consumption. | Considered. Per capita consumption is deal with in the text in following sections |
| 15988 | 5 | 17 | 23 | 18 | 9 | I am not sure whether the literature cited here is not misinterpreted or even worse there might be a conceptual error in the literature. There is no causality between increasing imports of GHG and consumption - I'd argue that a fair share of that is due to a higher carbon intensity of exporting countries (see e.g. Jakob and Marschinski, forthcoming in Nature Climate Change for a discussion) | Considered. The text asserts no causality. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14481 | 5 | 17 | 26 | | 27 | This is an accounting system indeed. It has nothing to do with understanding changes in GHG emissions over time. On the contrary: the accounting systems use information on emissions and allocates these following a specific set of accounting rules:<br>- aggregates geographically (as in UNFCCC and the Kyoto Protocol<br>- following a series of consecutive production steps<br>- following a specific material<br>etc.<br><br>In the Kaya approach I would say that "consumption" is one of the drivers of (gross) production (no economically functioning unit will produce significant numbers of products without a consumer needing it!). | Considered. No contradiction is identified. |
| 5766 | 5 | 17 | 3 | 17 | 6 | Please reverse order. Scientifically sound methodology would be to identify drivers as such first, and then weigh them to identify "major" drivers. | Rejected. The section is limited to talk about 3-4 preidentified factors. |
| 9319 | 5 | 17 | 32 | | | Please see if the word 'of' can be replaced with 'by'. | Accepted. The part removed. |
| 14482 | 5 | 17 | 36 | 18 | 9 | Apart from the emissions from the transport equipment itself (trucks, ships, airplanes, etc), international trade only influences the location of the emisisions. In the Kaya approach it will be mainly influencing the regional distribution of emissions | Considered. No contradiction is identified. |
| 10884 | 5 | 17 | 39 | | | I note the use of "driver or enabling factor", which may be sufficient, but studies currently just quantify the emission flows and not the drivers or enabling factors. As reviewers often say to me "if there is trade, there will be emissions embodied in trade" and it does not mean much more than displacing emissions. If the displaced emissions causes the global emissions to be higher than otherwise, then there is more relevance to trade. | Accepted. The chapter has now ensured a more consistent use of the terms "factors" and "drivers". You are correct that we are many explaining what has happened and not implying cause. An |
| 14480 | 5 | 17 | 5 | | 5 | I have understood that his framework is the Kaya approach. | Considered. No specific action is |
| 9465 | 5 | 17 | 7 | | 12 | However, in the land change science literature there has been little consensus on how to distinguish proximate vs. ultimate factors and whether drivers are causal. | Considered. The text discusses the difficulty of distinguishig them. |
| 6522 | 5 | 17 | 20 | | 22 | Make the description consistent with Table 1 (which should be Table 5.3.1.), as the text here deals very little with correlations between drivers, while Table 5.3.1 does not evaluate individual drivers at all. | Considered. Removed. |
| 18154 | 5 | 17 | 37 | 20 | 7 | Some references to studies from Statistics Norway may be added to the literature review: 1) Bruvoll, A., T. Fæhn and B. Strøm (2003): Quantifying central hypotheses on environmental Kuznets curves for a rich economy: A computable general equilibrium study, The Scottish Journal of Political Economy 50(2), 149-173. This study decomposes emission changes to study driving forces, including leakage effects and policy effects. See also 2) Fæhn, T. and A. Bruvoll (2009): Richer and cleaner – at others' expense?, Resource and Energy Economics 31(2), 103-122. | Considered. The part removed. |
| 7324 | 5 | 18 | 1 | 18 | 2 | MRIO studies can estimate consumption-based CO2 emissions but you can't lead this sentence. | Accepted. Understood as a comment. |
| 7325 | 5 | 18 | 1 | 18 | 2 | Other studies such as Cole and Elliot (2003) and Mangi et al. (2009) found international trade could have a both beneficial and detrimental effect on the environment varies and it depends on the pollutant and the country. http://dx.doi.org/10.1016/S0095-0696(03)00021-4 http://dx.doi.org/10.1016/j.jeem.2009.04.008 | Considered. The issue should better be discussed in 5.5. |
| 10885 | 5 | 18 | 1 | | | Maybe worth drawing on the "carbon leakage" literature and alternative definitions. See Peters, G.P., 2010. Managing Carbon Leakage. Carbon Management 1, 35-37.; Peters, G.P., Hertwich, E.G., 2008. CO2 Embodied in International Trade with Implications for Global Climate Policy. Environmental Science and Technology 42, 1401-1407. | Considered. The issue should better be discussed in 5.5. |
| 12859 | 5 | 18 | 10 | 18 | 15 | Here, the text should clearly identify per capita intensity as important as total population. | Considered. Everything is important. Per capita intensity is discussed in 5.4. |
| 14483 | 5 | 18 | 10 | | 15 | Main variable in the Kaya approach. Should be mentioned first! | Accepted. I hope that the new text is |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16251 | 5 | 18 | 16 | 18 | 20 | It is unclear what the authors mean with "urbanization": Is it the actual growth of cities due to migration (this always leads to an increase in emissions compared to when the city is stable), or is it include the use-phase of cities (emissions once the infrastructure stock have been built)? Emission data are usually only available for direct emissions from cities or rural areas. Drawing conclusions from such comparison regarding the impact of urbanization can be problematic, because it neglects the build-up of urban infrastructures, which is extremely emission-intensive, and even more confusing, because these emissions from the physical expansion of cities often occur in rural areas (steel and cement factories are often not located within urban areas). | Considered. See 5.4. |
| 14484 | 5 | 18 | 16 | | 20 | Probably influences both the per capita gross production and the consumption | Considered. That was the intention. |
| 7648 | 5 | 18 | 16 | 18 | 20 | There should be a reference to indirect emissions from cities (not just territorial emissions).<br>There is a recent review which summarises the current discussion: Baynes T & Wiedmann T, "General Approaches for Assessing Urban Environmental Sustainability", Current Opinion in Environmental Sustainability, forthcoming. | Rejected. The section is by design limited to regional and global assessment. |
| 4165 | 5 | 18 | 20 | 18 | 20 | Reference is needed here although it is commonly recognized that the "compact city" shows higher effeiciency in energy use. However, in the gigantic city, heat-island and water and waste management issues become barrier to achieve the high efficiency. | Rejected. The section is by design limited to regional and global assessment. |
| 8947 | 5 | 18 | 21 | | 25 | Human behavior is most fundamental but this analysis is short and vague. Some narrative examples of behavioral change would help. | Rejected. We have a behaviour section separately handling it. |
| 12038 | 5 | 18 | 26 | 18 | 46 | It is very important to stress the connection between economic growth and GHG emissions. Don't overemphasize mitigation potential of economic growth. See Jackson 2009 ("Prosperity without growth") | Accepted. I hope that the new text is more clearly describe it. |
| 13768 | 5 | 18 | 27 | 18 | 43 | I don't understand why the EKC literature is discussed here. It was not introducted for GHGs and does not apply to them. Is there any study that provides credible support for an EKC for CO2? Consumption is discussed above, and increase consumption leads to increased emissions. You can drop this section and replace it by the simple statement that there is no support for a reduction of CO2 emissions with growth at any level of wealth. | Accepted. Removed. |
| 14485 | 5 | 18 | 27 | | 27 | Please be aware that these are time derivatives: they represent changes and hence are of another order than the "drivers" mentioned earlier in this section | Considered. But not sure what it was meant. |
| 4164 | 5 | 18 | 3 | 18 | 4 | This contribution holds only if both import and export countires want to reduce GHG emissions. It seems to me, this is a part of the side-effects of economic growth. | Considered. No particular action is required. |
| 10887 | 5 | 18 | 30 | 18 | 43 | This section misses a lot of the relevant literature. EKC's are generally found (acknowledging the issues you raise) for local pollutants. I am not sure if anyone has found an EKC with a realistic turning point for energy or co2. Even so, disregarded whether GDP drives the EKC shape, if we reach ambitions of 80% reductions by 2050, all countries will follow an EKC. Thus, GDP may not cause an EKC, but we need to have an EKC! Also, there are several studies which show that if trade is include, then the EKC may not exisit. Suri, V., Chapman, D., 1998. Economic growth, trade and energy: Implications for the environmental Kuznets curve. Ecological Economics 25, 195--208: Rothman, D.S., 1998. Environmental Kuznets Curves - real progress or passing the buck? A case for consumption-based approaches. Ecological Economics 25, 177-194.; Aldy, J.E., 2005. An Environmental Kuznets Curve Analysis of U.S. State-Level Carbon Dioxide Emissions. Journal of Environment and Development 14, 48--72.; Peters, G.P., Hertwich, E.G., 2008. CO2 Embodied in International Trade with Implications for Global Climate Policy. Environmental Science and Technology 42, 1401-1407. | Considered. The EKC literature is taken out per other comments. |
| 10886 | 5 | 18 | 36 | | | Do you have a reference for this statement? | Considered. The EKC literature is taken out per other comments. |
| 12860 | 5 | 19 | 1 | 19 | 11 | Here, the text should clearly identify energy use per capita and energy intensity per unit of PPP-adjusted GNP as important as total energy use. | Accepted. The text revised to include them. |
| 14486 | 5 | 19 | 1 | | 11 | In the Kaya approach this is<br>G x (E/G)<br>and hence again something quite different than the earlier "drivers. | Considered. See the revised description. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14487 | 5 | 19 | 12 | | 12 | This could be a new section at a higher level in the outline. | Rejected. The section structure has |
| 14488 | 5 | 19 | 13 | | 22 | Is there any reason to prefer the one over the other?<br><br>To me it seems that these two (IPAT and Kaya) only use different "proxies" to try to correlate the emissions in time with changing major societal and economic variables. The application than in this chapter would be to extrapolate ("project") the future emissions, using projected values of these proxies.<br><br>Would there be any theoretical preference for the one or for the other? I don't see a reason for that, so it might be similar and the choice for Kaya in this chapter might be "accidental". The introduction states that the one is a refinement of the other. I would expect that energy intensity of the production process would be one of the proxies in IPAT, needed to understand the changes in the "efficiency of technology (T) used to generate 8 income" (page 9).<br><br>Given the international trade, the difference could also be on how production in one country/region of products, used in another is taken into account. At the global level this would not make any difference, unless a significant number of products would be produced that is never used. This would be rather surprising. | Accepted: The text is being revised and a new approach of the decomposition is being introduced. |
| 5767 | 5 | 19 | 13 | 19 | 31 | Please consider placing all three decomposition approaches in one box and refering to this box from the text. This here is the third or forth time the Kaya Identity is explained and this is, frankly, two or three times too often. | Considered. The space limitation does not make it possible. |
| 14489 | 5 | 19 | 23 | | 23 | This is the first time the "input-output framework" is mentioned in this chapter. I understand that this basically macro-economic approach is underlying the thinking of the authors of this chapter. My understanding so-far was a more technical one, where I was expecting the chapter to find (correlational, not necessarily causal) explanations for changes in greenhouse gas emissions in the past with a view of extrapolating those into a future where possible measures can or could be taken. | Rejected. The space is limited to explain it but references are provided in the text. |
| 14490 | 5 | 19 | 25 | | 28 | This in many other scientific disciplines could be seen as a multivariate analysis. | Considered. Could be. No particular |
| 13769 | 5 | 19 | 31 | | | Please see also Yamakawa, A., Peters, G.P. (2011) Structural decomposition analysis of greenhouse gas emissions in Norway 1990-2002. Economic Systems Research 23, 303-318. I wonder whether you could provide a brief summary of the findings. My understanding is that structural effects are difficult to identify, not because the structure is not changing but because the effect of structural change is not uniform. In additon, there may be problems with the data and the technique is very sensitive to small error in the data. | Considered. SDA part has been reduced due to the mandate to discuss Kaya identity in more detail. No room to expand on SDA, unfortunately. |
| 13770 | 5 | 19 | 32 | 20 | 7 | This section does not offer any insight. Of course there is an interaction. I think it would, in this connection, also be necessary to introduce the STRIPAT approach: Dietz, T., Rosa, E.A. (1994) Rethinking the environmental impacts of population, affluence and technology. Human Ecology Review 1, 277-300. Please note that this approach does not present an index decompostion but rather a multivariate regression analysis as it is common in social sciences. In many ways, it provides a more valid insight into how variables are connected. Elasticities as derive by Hertwich&Peters (2009) conform rather to this approach. | Considered. The mandate of the section is now to discuss the Kaya identity in more detail. |
| 14491 | 5 | 19 | 37 | | 41 | In multivariate analyses it is not unusual that explaining variables correlate. There is a range of statistical methods that can deal with such correlations.<br><br>The link to "causality" here is a bit confusing. There is or there is not a causality. The problem is whether or not the analyses can correctly find and identify such causality.<br><br>In my view this, and many similar sentences in this draft, confuse the (quantitative) analysis and the interpretation thereof too much. | Considered. Much of the sentences are removed. Again, this section cannot perform correlation or multivariate analysis. It is simply out of the scope of the section. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5768 | 5 | 19 | 39 | 19 | 41 | Ethics and responsibility are terms that imply justification or weighing of emissions. From a natural sciences point of view: an emission is an emission is an emission. The circular network thus has a starting point (the anthroposphere - atmosphere - boundary). Please do not intermingle "ethics" with "valuation" or "norm". | Considered. The part revised. |
| 8948 | 5 | 19 | 41 | | | Lip service to ethics and responsibility. Again reader needs more examples perhaps of virtuous behavior. | Rejected. This section does not deal with ethics and responsibility. The two |
| 14492 | 5 | 19 | 42 | | 45 | This paragraph is conceptually problematic for two reasons, partly due to the mathematical Kaya identity, being an identity:<br><br>1) I understand that with "driver" the authors refer to the decomposition of the trends in CO2 emissions as expressed in the "Kaya identity". So "energy consumption" in this paragraph would be Energy Consumption per Gross Production (E/G). It is quite unclear what exactly is meant in this confusing paragraph.<br><br>2) In the "Kaya identity", but also the IPAT approach, the population size is explicitly "decomposed" and therefore should not be included in the explanatory decomposition of the Energy Consumption driver. | Considered. The part revised. |
| 16019 | 5 | 19 | 5 | | | thats not true. CO4 and N2O-emissions are much more often releated to land use and deforestation. | Considered. No disagreement. The text only says that they are ALSO associated |
| 4374 | 5 | 19 | 39 | 19 | 41 | I cannot make sens of that statement | Considered. Revised and hope that it better addresses the issue. |
| 14493 | 5 | 20 | 1 | | 2 | A similar remark could be made here. Population should not be separated her, since it is already separated out in the top level decomposition. The "GHG emisison intentsity of each fuel type" is also separated out separately in the Kaya identity and should not show up here.<br><br>Furthermore, I assume that "transport" is mainly of interest as it adds to the energy requirement per gross production in the Kaya approach. Indeed parameters/variables that influence energy use in transport are modal shifts and fuel efficiency of the equipment. Another very important parameter here will be transport distance. Maybe that is meant by "transport requirement" here. But then: not per capita but per Gross Product. | Considered. The part removed. |
| 14494 | 5 | 20 | 5 | | 7 | ... but should always be answered within a well defined frame of mind. The chapter chooses the Kaya appraoch as such, but seems to forget about this in many instances. This does not help in answering the question:<br><br>"What is driving global GHG emissions" (please see the slight, but important difference in my sentence as compared to the one in the draft. | Considered. Not clear what was really meant by the comment. |
| 14495 | 5 | 21 | | | | To be useful in this chapter, this table would need some link to the analysis framework chosen: the Kaya approach. | Considered. The part removed. |
| 5769 | 5 | 21 | | | | Please consider giving the sources, e. g. numbered (see tables in IPCC 2003 GPG LULUCF for an example) with the table. | Considered. The part removed. |
| 7326 | 5 | 21 | 1 | | | Other studies such as Cole and Elliot (2003) and Mangi et al. (2009) found international trade could have a both beneficial and detrimental effect on the environment varies and it depends on the pollutant and the country. http://dx.doi.org/10.1016/S0095-0696(03)00021-4 http://dx.doi.org/10.1016/j.jeem.2009.04.008 | Accepted. These aspects have been incorpoated in the new version. |
| 6523 | 5 | 21 | | | | Table 5.3.1. should be symmetric. | Considered. Not clear what was really meant by the comment. |
| 8949 | 5 | 22 | | 24 | 4 | Delete all tjhis material or put in technical appendix. There is too much math and too much uncertainty. | Accepted. The part removed. |
| 10889 | 5 | 22 | | | | This will need much more explanation, as I do not even understand it. Is this a SDA type approach using a tierwise expansion? The text does not explain so much either. | Accepted. The part removed. |
| 15990 | 5 | 22 | | 25 | | Not sure whether the formal description always helps to understand the argument | Accepted. The part removed. |
| 10378 | 5 | 22 | | 22 | | equation (3) which is take the log form from equation (2) sames wrong, the log operation should take on the absolute variables instead of the change rate of the variables. | Accepted. See the earlier response |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10888 | 5 | 22 | 1 | 22 | 26 | Is this an assessment of the literature? It seems this is getting more into research? | Accepted. The part removed. |
| 14497 | 5 | 22 | 22 | | 26 | Do, in this framework, any other activities than "productive activities" occur? Are emission from product use (driving your private cars etc) not included?<br><br>Any of the terms "can be cancelled out". If you do so, what is the reason that the Kaya identiy had it originally? What are you loosing?<br><br>This is not so much a simplification as well a choice to not take into explicitly account the "Energy Use per Gross Production". I am not sure whether this would be a good idea. To me this parameter and the changers therein seems to be a major driver for changes in GHG emissions! | Considered. The simplified method has been published and was also used in previous AR. The section refers to the literature. |
| 14496 | 5 | 22 | 8 | | 11 | An explanation of what is meant by "zero order", "first order", etc is needed. | Accepted. The part removed. |
| 5770 | 5 | 22 | ? | 22 | ? | The equation given at the top of figure 5-1 is eq. (2), not (1). Please correct. | Considered. The part removed. |
| 4167 | 5 | 22 | | | | This subsection can be reduced, since most of the equations are very similar and well known. | Considered. The part removed. |
| 6524 | 5 | 22 | | | | Check if the equation (3) is correct. | Considered. The part removed. It shoud be deltaX+1. The equation editor is somehow not working and I am having |
| 14866 | 5 | 22 | | | | This section presents an overview of methodological issues regarding decomposition analysis. However, such an analysis is not really applied in the current version of the chapter. Even if the results of an index decomposition analysis are to be presented in later versions of the report, interested readers should be directed to the relevant literature. Therefore, I suggest deleting this section (that would reduce the size of the chapter by about 3 pages) | Accepted. The part removed. |
| 7710 | 5 | 22 | | 26 | | The description here are too much complicated and could be made shorter by skipping the intermediate calculation and by approaching only the results of the calculation. | Considered. The part removed. |
| 14498 | 5 | 24 | 1 | | 6 | From the mathematical point of view, this is rather unusual.<br><br>I could understand that at the highest level of detail, the mathematical formalism would take into account different values for the intensities g and h for different regions, different sectors and different fuels (your "third order"). The system then could be aggregated to decrease the demand for input data by either summing up over all fuels (your "second order") and subsequently over all sectors (your "first order"). The final step would be to aggregate over all regions, leading to your "zero order".<br><br>When you present it like this it is obvious that the correlations that could be found will be more coarse and probably have lower explanatory power, when going to the "lower order" approaches. this then simply is because less data are fed into the approach. So, in principle a higher "order" provides more insight, but has a higher data requirement.<br><br>In GHG Emisison Inventories these are not called "orders" but "tiers". it could be helpful to do the same in this chapter. | Considered. The part removed. |
| 14500 | 5 | 24 | 15 | | 18 | A similar remark here:<br><br>The sentence seems to confuse "energy use"and "fossil energy use". The problem here is rather the difficulty in getting reliable data on biomass fuel use as compared to fossil fuel use and has nothing to do with the mathematical formalism.<br><br>In other words: On "energy" the approach would work. Since data on non-fossil energy use are difficult to find. Therefore their influence on the "Gross World Product" would be difficult to find too. | Accepted. Fossile energy use is used. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14501 | 5 | 24 | 17 | | 17 | Only here I understand that in the Kaya identity Gross Production is understood by what economists measure as "GDP". If that is the case than the reasoning should be that GDP is not a perfect measure for what is believed to drive GHG emissions. This would be a similar remark as "the correlations are not perfect" or "we do not understand it all". This would be hardly a problem for the analyses, as long as there is a reasonable level of covariance. | Rejected. Not sure what exactly was suggested. |
| 14502 | 5 | 24 | 21 | | 21 | In my view this is mainly because economic input-output modelling does not see this transport. In a correlational study it might be very well possible to correlate passenger transport to wealth and/or private income as a first order approach. | Considered. No particular action is required. |
| 14503 | 5 | 24 | 23 | | 23 | "GDP is becoming a worse measure", rather than "the decomposition does no longer work". | Considered. No particular action is |
| 4168 | 5 | 24 | 28 | 24 | 28 | It should be noted that the equation (3) cannot be directly applied to the formulations in Figure 5.3.1 and equation (4), since equation (3) is not additive. | Considered. The part completely removed. |
| 8950 | 5 | 24 | 30 | | | IPAT does not get the same emphasis as Kaya -- should it? | Accepted. The text revised. |
| 10891 | 5 | 24 | 30 | 24 | 33 | "Here we propose", would be much better for an aritlce to be submitted and reviewed so that you can assess the literature instead of starting new research. | Accepted. The part removed. |
| 14504 | 5 | 24 | 33 | | 33 | Does this mean "... do explain the same reality, but use different variables in the decomposition"? Or does it mean something else? | Considered. The part is rewritten. |
| 4166 | 5 | 24 | 7 | 24 | 28 | It seems to me that the two issues listed here too much emphasize the factor (E/G) or (F/G) as the causal driving source of the emission. Kaya identity is no more than a decomposition experssion of the definition equation without the causality hypothesis but is sill convenient to understand the changes in the economy or energy demand and supply strucutre by looking the changes of these factors. | Accepted. The part revised. |
| 10890 | 5 | 24 | 7 | 24 | 14 | I do not see that Kaya only applies to energy? http://www.pnas.org/content/early/2012/04/10/1117054109.abstract And I think a look at the broader Kaya literature (IPAT also) will find lots of non-energy examples. | Considered. The literature mentioned uses the idea of decomposition. The original proposition of Kaya identity indeed deals only with energy related |
| 14499 | 5 | 24 | 7 | | 9 | This is not necessarily true. It would be if the aim was an understanding of causality, which the authors do not seek. There might be quite strong correlations to a country's (or the globe's) energy use and, fopr instance, the sizes of life stock kept in farms. | Considered. The part removed. |
| 4375 | 5 | 24 | 30 | 24 | 30 | I=PAT: explain those symbols, may be use more consistent symbols throughout, fig. 5.3.1 looks more consistent in that regard | Accepted. |
| 14505 | 5 | 25 | 1 | | 1 | Is this indeed, "only" a difference in allocation? What is the index "i" in the summation standing for in the formula on the bottom line of page 24? | The part removed. |
| 14507 | 5 | 25 | 16 | | 17 | Since "products" seem to play the role that "sectors" are playing in the production based approach, I would expect that the parameters/data her would need to be collected and used at the different products in the most detailed approach (a "third order" would also see that fuels might be different for different products). | The part removed. |
| 14508 | 5 | 25 | 17 | | 18 | Not "better represent" but "make better visible". I hope the authors are aware that the two approaches should never be added, nor even in part, since both of them are supposed to include all emissions. But all activities should always be included to estimate "global emissions"!<br><br>The difference is that some human activities can more easily be separated out in the one and others in the other. | The part removed. |
| 14867 | 5 | 25 | 23 | 25 | 25 | I think that a justification of the method applied is necessary | The part removed. |
| 15061 | 5 | 25 | 24 | | | typo | The part removed. |
| 14509 | 5 | 25 | 24 | | 24 | Why logarithmic ? Is this because the underlying variables cannot be negative? Or are lognormal distributions assumed? | The part removed. |

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| 14510 | 5 | 25 | 26 | | 33 | Please explain. Why would "population" not be further specified in for instance age groups? Urban/ non-urban? Income groups? Such further detail couldadd to the explanatory power of the approach.<br><br>So why do you need equations 8 and 9 and what is the essential difference? | The part removed. |
| 8951 | 5 | 25 | 3 | | 30 | Omit or put in a technical appendix. | The part removed. |
| 5771 | 5 | 25 | 3 | 25 | 7 | Please check. If "F(c)" on the left side of the equals sign is "emissions / expenditure" and "Y := expenditure", then "F(c) / Y" would be "(emissions / Y ) / Y". | The part removed. |
| 14511 | 5 | 25 | 34 | | 34 | "Added"? These probably are not always additive, especially when ther might be correlations between these different separations! | The part removed. |
| 14506 | 5 | 25 | 7 | | 7 | Why "life cycle"? What is happening with half products?<br>How would this work for instance with emissions from energy transformation (refineries, gas works etc) if the refinery produces different products from the same crude using a fraction of the crude as fuel? To what product would the fuel use be attributed? | The part removed. |
| 6526 | 5 | 25 | 26 | | 29 | Check if the equation (8) and (9) are correct. | The part removed. |
| 6525 | 5 | 25 | 9 | | | Check if the equation (4) is correct. | The part removed. |
| 15062 | 5 | 26 | | | | So far it is not clear where the life-cycle emissions come from. | The part removed. |
| 15991 | 5 | 26 | 4 | | 6 | With respect to the illustrative example shown: As the AR5 is supposed to be an assessment, I recommend to think again how to present your points here | The part removed. |
| 8347 | 5 | 26 | 7 | | | How about deleting Figure 5.3.1 because of duplication with 5.3.2 and shortening the volume? | The part removed. |
| 8952 | 5 | 27 | 1 | | | Does report have anything to say about reducing poplulation growth rate? | Rejected because this is beyond scope. This is a chapter about factors (and drivers) of GHG emissions, one being population; not about factors and drivers |
| 4030 | 5 | 27 | 13 | | | "per capita emissions between the highest (USA)" I wrong stetment. The highest per capita emission is in Qatar, eg see http://data.worldbank.org/indicator/EN.ATM.CO2E.PC | Rejected - Qatar is not a region in Raupach et al. reported here. |
| 18145 | 5 | 27 | 16 | | | RCP needs to be defined. | Accepted, revised; it is now defined. |
| 14514 | 5 | 27 | 2 | | 4 | This sentence confuses not only the reader, but apparently also the authors of the chapter.<br><br>In the Kaya approach there is only one term describing the population (P). Affluence is used in the IPAT (page 9), not in Kaya. In the Kaya approach an explicit choice is to try to model per capita production separately as the first "decomposition" step. This can only be done, while keeping the population size as independent variable by defining a per capita gross production. This term is then not related anymore to (the size of) the population. | Taken into account - Sentence rephrased based on the newly agreed terminology and Kaya explanation. |
| 18146 | 5 | 27 | 20 | 27 | 22 | While it is true to say that per capita emissions have doubled in Asia, for the sake of balance, it should also be stated that despite this, a) emissions per capita in Asia is still the lowest of all 5 regions and b) the OECD 90 and REF regions are still more than double and almost triple (OECD 90) the levels of Asia. | Rejected - This is explained later and clear from Figure 5.4.2. |
| 14515 | 5 | 27 | 4 | | 5 | No it does not. On page 9 it was implicitly and explicitly assumed that the terms in the Kaya approach (in my language parameters; the g, e and f in equation 1 on page 22) are time dependent and can change. With such changes the proportionality disappears! | Taken into account - Sentence rephrased based on the newly agreed terminology and Kaya explanation. |
| 14868 | 5 | 27 | 4 | 27 | 7 | See comment No. 1 | Rejected - Not clear what is comment |
| 14516 | 5 | 27 | 6 | | 6 | "… are at work behind ...": no... these are changing the average over time! | Accepted, text revised to changing |
| 7711 | 5 | 27 | 1 | 32 | 28 | This chapter might be lengthy and tedious and coule be much more compact and simple to reduce pages. | Taken into account. Reduced length, but assessment of key literure is needed to |
| 4377 | 5 | 27 | | 27 | | Fig somewhat redundant with fig 5.2.5 | Accepted - Figures revised and included as per instructions of CLAs. |
| 4376 | 5 | 27 | 16 | 27 | 24 | Missing definitions for acronyms (MAF, REF...) | Accepted - Provided. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10436 | 5 | 28 | 4 | 28 | 26 | This has to be rewritten eliminating the elasticity comparisons because for a technical, non economist audience, understanding this section would be problematic | Rejected. Elasticities are clearly explained and presenting them is |
| 14517 | 5 | 28 | 6 | | 7 | on page 27, lines 4 to 6 the contrary is stated! | Rejected because both pieces of text say: population size is proportional but |
| 4378 | 5 | 28 | 24 | 28 | 24 | definition of “transmission channels” ? | Taken into account - Revised according to the new chapter terminology. |
| 4169 | 5 | 29 | 13 | 29 | 19 | The income inequity between the rural and the urban area should be touched upon besides the policy issues. | Rejected - Income inequality discussed two paragraphs below. |
| 15992 | 5 | 29 | 20 | | 31 | Might want to think about infrastructure stocks here | Taken into account but: Literature checked/rechecked but infrastructure |
| 9087 | 5 | 29 | 26 | 29 | 28 | What is the definition of words "local or regional nuclear power" ? (small module reactor or something ?) | Accepted, text revised and Specified |
| 17431 | 5 | 29 | 32 | 30 | 1 | Did not understand paragraph | Accepted - text Rephrased to make it |
| 10892 | 5 | 29 | 32 | | | There should be a strong link to the chapter on urbanisation, and also, on system boundaries, this is a good paper Lenzen, M., Peters, G.M., 2010. How City Dwellers Affect Their Resource Hinterland: A Spatial Impact Study of Australian Households. Journal of Industrial Ecology 14, 73-90. | Rejected. Content of proposed publication not directly related to subject. |
| 15993 | 5 | 29 | 32 | | 33 | Not clear to me | Accepted - text revised -Provided |
| 12302 | 5 | 29 | 6 | 29 | 9 | This sentence is hard to understand. And to us the decline mentioned in the last part is only true for the REF Region. | Accepted - REF was dropped in the assembly process. Included now. |
| 6527 | 5 | 29 | 9 | | | REF seems missing at the end of the sentence. | Accepted - REF was dropped in the assembly process. Included now. |
| 18254 | 5 | 30 | | | | So, 1) a definition is needed to grasp the interrelationship between Science, Technology, Innovation and Diffusion and then using the concepts properly in the whole text. 2) An explicit description of an interdependent variables processes; that is to say, policies are not based only based on a linear model (from science to technology) ,but there are interrelated. 3) Another aspect which is becoming more important is that innovation is not only technological but also non-technological (organization, marketing, services). | Accepted, references will be added. 1) See chapter 3; 2) see chapter 3 and 5.1; 3) see chapter 3 |
| 5919 | 5 | 30 | 1 | | 4 | This could be added: Monni, S. and Syri, S. 2011. Weekly greenhouse gas emissions of municipalities: methods and comparisons. Energy Policy 39, 4755-4765. This article shows that in largest Finnish cities, per-capita GHG emissions were considerably below national average, mainly due to lower transportation emissions and efficient CHP heating. | Rejected. Content of proposed publication not directly related to subject. |
| 4170 | 5 | 30 | 20 | 30 | 27 | The authors should also touch upon the cases in African countries, since China and India have already grown up. See Karen Rajaona Daka and Jerome Ballet, "Children's education and home electrification: A case study in northwestern Madagascar", Energy Policy 39 (2011) 2866-2874 | Rejected - Considered but the paper says nothing about emissions. |
| 13551 | 5 | 30 | 3 | | | "Initial findings suggest that the level and structure of trade in 2004 reduced global emissions by 6%.". Not referenced or founded. Who calculated and used GTAP7 for this? Usin the DTA as a reference is very dangerous since the structure of the economy may differ significantly as from what is imported. Dangerous section - do what an AR is supposed to do, review sound scientific work and do not additoinal analyses yourself as author. | Accepted - this section has been deleted and replaced with a more comrpehensive discussion of causality. |
| 17432 | 5 | 30 | 5 | 30 | 6 | I'd suggest explaining the system boundary problem | Accepted - it is Explained. |
| 4379 | 5 | 30 | 28 | 30 | 50 | is there any reason to detail the Chinese case more than any other ? | Rejected because China has the Largest population and major changes in demongraphic drivers, such as urbanization. Ample literature relative to |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3259 | 5 | 30 | | 31 | | 1. At the beginning of the chapter, the authors could state that behaviour as driver of GHG emission is very defendant to the various aspects of conceptual framework (function, scale, roots and context)<br>2. Therefore the Kaya identity can perform well at global scale but will be more challenging to apply it at individual scale because of a different influence of various set of drivers and contextual underpinnings.<br>3. In paragraph 2-3: it might be good to address the issue of GHG offsetting through social corporate responsibilities. This is indeed a new trend in behaviour consisting of investing in carbon projects rather than reducing emission internally (e.g. Air transport companies, big firms etc.). Hence the companies maintain their own production attitude but concur to green activities. The chapter authors can take stock from carbon trust funds and emerging VCS for communities PES as part of the picture.<br>4. The paragraph 4 is a rather philosophical section where it is opportune (maybe) to mention the fuzziness of behaviour when it ties to qualitative aspects such as awareness, concerns, willing (good will). Assessing those variables are difficult and monitoring them through time at individual level very puzzling as individual behaviour change over time and depending to the social and economic context. This raises indirectly the issue of identity. Every person is a moving identity depending to the context (adjustment in behaviour influenced by many contextual factors including culture) the use of the conceptual framework can help.<br>5. The paragraph 5 could mention the opportunistic character of behaviour at organisational and personal level. Some changes or adoption of behaviour are related back to awareness or perception (also to incentives or penalties). An example is the handling of waste in developing countries vs. low income countries.<br>6. In Paragraph 6 it is proven that some changes of behaviour are imposed by a co-evolution of knowledge, information sharing, economy, demography, governance, policy, etc. An increase population density requires necessary changes in habitats, consumption, transportation, communication etc. This might be a place to address the regional differences of behaviour based on co-variation of many drivers. | Noted |
| 15995 | 5 | 31 | 21 | | 36 | could be interesting to also combine the argument with demographic trends in developed countries a little clearer | Rejected because the topic is Included in the studies assessed here. No change. |
| 9320 | 5 | 31 | 31 | 31 | 33 | How the same population can be ageing and without ageing? | Accepted, text revised - Explained. |
| 17433 | 5 | 31 | 34 | 31 | 36 | Sentence is not clear to me / appears to contradict itself | Accepted, text revised - Checked and |
| 9321 | 5 | 31 | 35 | | | Please replace 'what' with 'which'. | Accepted - Text redrafted. |
| 9088 | 5 | 31 | 5 | 31 | 7 | How is the impact of Fukushima nuclear disaster on CO2 mitigation by nuclear energy over the world ? | Rejected - Beyond the scope of this |
| 4171 | 5 | 31 | 8 | | | "Aged society" should be discussed together with the "low fertility society". | Rejected. Low fertility is a crucial determinant of aging. Yet population dynamics is beyond the scope of this |
| 6528 | 5 | 31 | 33 | | 36 | Check if "cohorts born before 1960" instead of "cohorts born after 1960" is correct, as the first half of the sentence seems contradicting with the second half of the sentence. | Accepted - Checked and corrected. |
| 17434 | 5 | 32 | 25 | 32 | 27 | Not clear if "lifestyle and popoulation density" belong to the start or end of the sentence (presumably the former?). House type is a nominal variable so not clear how it has a directional effect on energy use (also house type is mentioned here in the concluding paragraph but is not discussed earlier in the sub-section...) | Accepted - Sentence fixed. |
| 10893 | 5 | 32 | 30 | 32 | 38 | This paragraph needs some references, particularly considering you call it "controversial" | Editorial: This is the headline paragraph that summarizes the content of the |
| 9322 | 5 | 32 | 36 | | | The phrase 'actual such catch up growth in developing countries may be more capital and resource --' is not clear; it neede to be rephrased. | Accepted: Agree that this was badly phrased and it has been rewritten. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3092 | 5 | 32 | 7 | 32 | 10 | is this really an unexplored area? In the UK, this has been looked at e.g. in the evaluation of energy efficiency policy measures. See e.g. [http://www.decc.gov.uk/assets/decc/11/funding-support/3339-evaluation-of-the-delivery-and-uptake-of-the-carbo.pdf]. This directly contradicts the finding of the Greek study - e.g. page 29 in the priority group of the over 70s, it was easy to get people to opt for energy efficiency measures, whereas younger age groups (often living in rented, short-term accomodation) were less interested. Hence, the statement (based on just one Greek study) that 'the elasticity of demand is lower in an ageing society than in a young society' is totally unsupported and probably wrong. | Considered but related Paragraph was deleted. |
| 16942 | 5 | 32 | | | | See my opening remark about per-capita GDP versus per-capita emissions. This section would seem the natural place to include a more disaggregated version of the Figure 14-12, and that would start to give a "story" to accompany the mass of data already here. Whether or not the interpretation in our book (Chapter 1) is right, or the somewhat more negative view in the FOD Chapter 14 (see my comments to Ch.14), is for the authors to judge.<br>Since production vs consumption is also included in this section, this might be the place to try and also produce an alternate version of the diagram, in terms of consumption. This would help to illuminate to what extent the apparent reductions in Annex I are actually due to trade effects and how closely tied this is to time & wealth.<br>Such development would need to be dovetailed with Chapter 14 and maybe Chapter 4 on similar issues. □ | Taken into accoutn: Figure 5.5.2 will be revised to have GDP per capita on the X axis in line with this comment. Section 5.5.3. Deals with the consumption based accounting. The book referred to is still unpublished so we can't comment on that. |
| 14874 | 5 | 32 | | | | Productivity is mentioned in various parts of this section mainly as a potential way to increase incomes with little emissions impact. It would be useful to provide the readers with the definition of productivity used in the context of this chapter including parameters affecting productivity (following the example of energy intensity later on chapter 5). Productivity changes, at least in the shorter term, could be related to innovations, products of high quality and value, prices of production factors including human resources, etc. | Accepted: We have added a description of what we mean by producitvty and technological change. |
| 15133 | 5 | 32 | 34 | 32 | 34 | Productivity is lower in developing countries than in the developed world | Editorial: The statement is repeated intentionally as the first paragraph of each section serves as a kind of headline |
| 14875 | 5 | 33 | | | | In the figure legend you should specify whether emissions from biomass are excluded. | Noted: The data include all sources of greenhouse gases including from agriculture and land-use change. In general the report includes all sources unless otherwise stated. We will discuss |
| 13549 | 5 | 33 | 1 | | | Add references for data sources, fully unclear on what based | Editorial: This comment appears to refer to Figure 5.5.1 - the data is from standard sources provide by the IPCC TSU and will be fully referenced in the |
| 15997 | 5 | 33 | 2 | | | Abbreviations are not straight-forward to me - explain | Accepted: we have expanded the |
| 5772 | 5 | 34 | | | | Please explain whether you show general features or emissions etc. related to energy only, as indicated in the text (p. 33, lines 4 - 7). | Taken into account: Text was confusing and has been revised for clarity. |
| 8953 | 5 | 34 | 1 | | 3 | Accounting model vs. need for a dynamic model. Will IPCC address this? | Noted: We are covering it to the degree that literature provides information on causal effects. Kaya is simply a way of |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5297 | 5 | 34 | 1 | | | ADD: In democratic countries, the development of RE is based on several factors:<br>- Natural conditions (for wind and sun exposure…)<br>- Costs and benefits of RE<br>- Technological maturity<br>- Political incentives<br>- Social acceptability (see section 7.9.4.) | Rejected: This comment does not appear relevant at this point in the text and for us to add it somewhere it would need to be referenced to a reliable source. |
| 4172 | 5 | 34 | 1 | 36 | 2 | This subsection seems to me too general. At least the key "technological changes" which contributed to the economic growth after 1970 and their effects should be mentioned. More concrete description is preferable. | Rejected: This would take us into less relevant material. Economists think of technological change as contributing to increases in productivity. It's the implication of this which we are |
| 13550 | 5 | 34 | 1 | | | Add references for data sources, fully unclear on what based | Editorial: This comment appears to refer to Figure 5.5.2 - the data is from standard sources provide by the IPCC TSU and will be fully referenced in the |
| 15218 | 5 | 35 | | | | Productivity is lower in many developing countries than developed countries (Parente and Prescott, 2000) | Noted: We do not understand this comment as it is simply a quote of what |
| 13553 | 5 | 35 | 1 | 40 | | Similar concerns as on 5.6 but to a lesser extent on 5.5, i.e. a bit too much focused on Peters and Caldeire where there is much broader work out there, new databases (EORA, WIOD, EXIOBASE) that may be useful too. | Noted: This comment doesn't seem relevant to p35 as that page doesn't mention Peters or consumption based |
| 15929 | 5 | 35 | 13 | 35 | 15 | India is not a middle income country (check World Bank http://data.worldbank.org/about/country-classifications/country-and-lending-groups). South Africa and Brazil are a better match - If china must be talked about. | Rejected: India is a lower-middle income country according to the source cited by the commenter, whereas China is an |
| 15998 | 5 | 35 | 26 | | 40 | Authors might also want to consider the work from Christian Gross (Energy Economics, 2011 and some (as far as I know submitted) working papers) on the question of causality | Noted: Christian Gross is collaborating on these papers with David Stern who is the LA who wrote this section. The working papers you refer to are still in progress and haven't been submitted to |
| 12537 | 5 | 35 | 44 | | | An additional useful reference is Kevin P. Gallagher, 2009, "Economic Globalization and the Environment," Annual Review of Environment and Resources, Vol. 34: 279-304, DOI: 10.1146/annurev.environ.33.021407.092325 | Accepted: Reference added |
| 15134 | 5 | 35 | 8 | 35 | 9 | Productivity is lower in developing countries than developed countries | Noted: We do not understand this comment as it is simply a quote of what |
| 8954 | 5 | 36 | 1 | | 10 | Here some country or sector-level analysis -- case studies -- would be helpful, eg. former Soviet Union, India, Africa, which could communicate better than charts and generalities. | Rejected: This paragraph is simply a summary of what is in this section. Space is limited and some discussion of |
| 10380 | 5 | 36 | 10 | | | this paragraph seems not finished without an end punctuation. | Editorial: Text revised |
| 5773 | 5 | 36 | 28 | 37 | 38 | I suggest to use studies as references, not as topics. If you change the direction from where you write this part of the text will be shorter. "XY wrote …; AB found ..." just needs too much space compared to "[the outcome is … or … (AB 1999, XY 2000)". | Editorial: Revised the text in line with this comment. |
| 17435 | 5 | 36 | 32 | 36 | 32 | Meaning not clear to me | Accepted: We have revised the wording of the discussion of this paper. |
| 4173 | 5 | 36 | | | | Some empirical numbers are needed to show the long term structural changes in production. | Accepted: Added some global figures |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5350 | 5 | 36 | 9 | 36 | 10 | Please (robustly) substantiate the point with references to the peer reviewed literature that the switch from centrally planned economies to market economies facilitiaties greeenhose gas emissisons reductions. That is a very important point and it deserves at the least a few references to high quality literature and perhaps a few sentences explaining what is going on / what are the major drivers of this observed phenomenon. | Accepted: Added reference to Stern (2012, Energy Economics). |
| 18621 | 5 | 37 | | | | "All the studies show that reductions in emissions resulting from improvements in emissions intensity and changes in the structure of production and consumption have been offset by significant increases in emissions resulting from the volume of consumption resulting in an overall increase in emissions."<br><br>In reality a generalisation of a discussion of the rebound effects from different improvements (including policy driven actions)?<br><br>Interesting material on the volume growth in world trade (Doubling every 7 years between 1971 and 2010) measured in value. Physical tonnage is up from 5.4 to 10 billion tonnes between 1970 and 2005.<br><br>Demand for products by Annex B countries is repsonsible for 20% of the growth in CO2 emissions in non-Annex B countries.<br><br>Initial findings suggest that level and structure of trade in 2004 reduced global emissions by 6%. | Noted |
| 10894 | 5 | 37 | 23 | | | A more recent reference Minx, J.C., Baiocchi, G., Peters, G.P., Weber, C.L., Guan, D., Hubacek, K., 2011. A "Carbonizing Dragon": China's Fast Growing CO2 Emissions Revisited. Environ Sci Technol 45, 9144-9153. | Reference added |
| 15063 | 5 | 37 | 28 | | | remove JC | Rejected - I'm unsure what teh |
| 18148 | 5 | 37 | 7 | | | "GNE" to be defined. | Taken into account - phrase is not longer used after editing new text |
| 7327 | 5 | 37 | 8 | 37 | 12 | Peters et al. (2011) on Nature Climate Change updated these numbers up to 2010. doi:10.1038/nclimate1332 | Reference added |
| 14869 | 5 | 37 | | | | A comment regarding production technologies/practices (e.g. availability of efficient technologies in the countries of origin) is necessary, as it is the combination of of consumption and production that affect emissions levels (e.g. in the example regarding Annex B countries) | Noted |
| 10896 | 5 | 38 | | | | I think a great contribution to the "assessment" here would be to do a model comparison, see at least Peters, G.P., Davis, S.J., Andrew, R., 2012. A synthesis of carbon in international trade. Biogeosciences 9, 3247-3276. | Noted - page numbers makes it difficult to undertake such an assessment. However, data from different models has |
| 18149 | 5 | 38 | | | | Y axis is labelled MTCO2, however the figures show population, affluence and emissions intensity as well which are measured with different units. Label to be changed to show that figures are indexed to 1990. The title of the figures also may need to be changed to drivers of production/consumption emissions of the different regions. | Figure has now been deleted |
| 5774 | 5 | 38 | | | | Please adjust agenda of top-left panel: the order is not the same as in the other three panels. | Figure has now been deleted |
| 5775 | 5 | 38 | 2 | 40 | 7 | Please shorten this sub-chapter and re-order the text. It appears to be a little chaotic and jumps between topics. | Noted - more coherent structure has been introduced |
| 13774 | 5 | 38 | | | | Nice to see this analysis. However, maybe it would be possible to have consumption and production based emissions in the same figure; population and GDP will remain the same. | Accepted - new figure included |
| 4174 | 5 | 38 | | | | Structural changes in consumption are more significant. Transition from food, manufacturing products such as automobile and electric appliances to service industry (software, medical education, etc.) should be touched upon here. | Noted - section on causaility is extended |
| 9065 | 5 | 38 | 1 | 40 | 7 | 5.5.4 Embedded carbon in trade can be deleted due to limitations on nos of pages | Rejected - sections decided by IPCC beforehand and cannot be changed |
| 16000 | 5 | 39 | 1 | | 6 | It's not (ony) the demand for products but also the higher CI in exporting countries that has driven GHG emissions to a large part | Accepted - causality of emission transfers has been extended. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17436 | 5 | 39 | 12 | 39 | 12 | I think the words "the growth in" should be deleted? | Noted |
| 14870 | 5 | 39 | 18 | 39 | 23 | Add carbon to weak and strong leakage in order to be more precise. | Accepted- new text box added to explain |
| 10895 | 5 | 39 | 22 | 39 | 23 | I think it would be good to refer to the "carbon leakage" section in WGIII and include non-IOA references on this point | Accepted- new text box added to explain difference |
| 13773 | 5 | 39 | 34 | 39 | 39 | Please note that the paper by Hertwich&Peters 2009 which you already cite elsewhere quantifies total GHG emissions embodied in trade (Kyoto gases including CH2, CH4, N2O and F-gases). The emissions fall in the range identified here. | Accepted- new references added |
| 7330 | 5 | 39 | 40 | 40 | 7 | Which reference discuss about these findings? You mentioned GTAP 7 but don't cite any peer reviewed papers. I think Peters don't discuss about such results. | Noted - new figure is introduced and fully referenced |
| 17438 | 5 | 39 | 40 | 40 | 7 | Not my area of expertise; however I suspect this finding will attract some scepticism / may not apply in more recent years (e.g. given Chinese exports). Not sure I wholly agree with the conclusion that "countries will trade with those able to produce products more [energy] efficiently.." as many other factors (labour costs etc) will affect trade (unless these factors are accounted for in the methodology?) | Noted - the causes of international trade emissions transfer is now discussed more comprehenisively |
| 4175 | 5 | 39 | 40 | 39 | 41 | Why no reference on GTAP results is attached here? | Noted - new figure is introduced and |
| 9126 | 5 | 39 | 44 | | | If "the ratio of emissions embedded in exports to the emissions embedded in imports" is larger than one, it means that region is net exporter of the trade embedded CO2. In this context, It is difficult to understand why "larger than one ratio implying "their consumption base emission accounts would be lower if they were domestically self-sufficient". | Accpeted- this section as been re-worded |
| 5776 | 5 | 39 | 46 | 39 | 48 | The sentence is not clear. What does "this ratio" mean here? | Sentence deleted |
| 4176 | 5 | 39 | 47 | 39 | 48 | "(imports + exports )/2 " sounds too ad-hoc. Is there any literature to give rationale? | Sentence deleted |
| 6529 | 5 | 39 | 44 | | 48 | Give a reference paper or numerical calculations for Scandinavian regions and for China, as the description here is not clear enough. | References added |
| 4758 | 5 | 4 | | 4 | | I assume that "CO2" should be read as "CO2eq" | Accepted: The ES is being revised. |
| 12283 | 5 | 4 | 1 | 5 | 4 | Please apply the same sturcture for all sectors decribed, e.g. percent of global emissions, increase in absolute terms, etc. | Accepted: Sectoral sections are being reestructure following the same structure. |
| 12285 | 5 | 4 | 1 | 8 | 42 | Please consider to use subtitles to increase readability in the executive summary | Accepted: The ES of Chapter 5 is being revised and subtitles will be considered. |
| 2216 | 5 | 4 | 1 | 5 | 4 | This text comes across as incomplete. It should start in line 12 with stating a trend of total global GHGs and then a systematic (100%) breakdown of all emitting sectors. Hence, it should start with power (electricity generation) or energy generation more broadly (incl. extraction/transport), then the ones whcih are listed. The omission of energy is not explained, and thus energy should be included. | Accepted: The text is being revised. |
| 2217 | 5 | 4 | 1 | 5 | 4 | The listing of mitigation options is inconsistent. A) Either you talk about "technology options" like in the transport sentences (biofuels, fuel efficiency, etc.) OR you talk about policies like in buildings OR both (techs AND policies) in all sector descriptions consistently. | Accepted: The text is being revised, although mitigation options are not part of our chapter. Mitigation options are mentioned as examples and the list do not pretend to exhaustive. Please, refer |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 7162 | 5 | 4 | 1 | 71 | 26 | I agree that this chapter is too long. I personally also found it very unpleasant to read. Some of the problem with the chapter is the intended audience. For example, section 5.3 seems to be intended primarily for specialists. It seems to me that it qualifies more as a genuine research article than as a summary of recent research. I think it could be shortened considerably. It also seems to me that more effort is expended on the Kaya identity than seems warranted. But I admit that it is helpful as a means of organizing and structuring the subject matter contained in the chapter. So the use of the Kaya identy in the Exectuive Summary is probably justified. But, how common is the Kaya identity for this type of analysis? Are there other models and if so how do their results differ or amplify the results shown in the present chapter? In other words I am not sure how robust the present results really are. Maybe I missed the discussion on this point, but if they are fairly robust, then it should be possible to remove some of the details concerning the Kaya identity and its role in (or contribution to) the analysis and just focus on summarizing the results. The main conclusion of this section is clearly stated in lines 41 and 42 on page 8 (last paragraph of the Executive Summary), which suggests that technological change and individual behavior are key to climate change mitigation efforts. This is a clear and simple statement (and one that I am convinced is correct, but may, quite frankly, not be achievable on the ever shortening time scale needed to accomplish the urgent and necessary changes to society). As such I recommend that any material that does not support this simple conclusion (either directly or indirectly - by eliminating other possible mitigation strategies) be reduced or eliminated. Or if it is possible it could be moved to a supplementary materials section within the larger report. I think this chapter needs some ruthless editing, preferably by a non-author who is more familiar with the subject than I. | Accepted: The full text has been revised for the SOD and Chapter was shorten. |
| 7844 | 5 | 4 | 1 | 8 | 42 | It is suggested to check on coherence with the assessment of WG I. | Noted |
| 11835 | 5 | 4 | 1 | | | Executive summary: would it not be possible to give some uncertainty estmate for number such as "5GtCO2/yr" (Page 4, Line 20)? | Accepted: The text in the ES is being revised. |
| 11839 | 5 | 4 | 1 | | | Executive summary: the whole ES seems very long, could maybe shortened. | Accepted: The ES has been shorten |
| 5763 | 5 | 4 | 1 | 8 | 42 | The executive summary lacks references. The statements are neither backed by citations of literature, nor are they related to other sub-chapters of this chapter. I personally do not find this scientifically acceptable because there is no "proof" for the statements you make. | Accepted: The text in the ES is being revised. |
| 14854 | 5 | 4 | 12 | 4 | 13 | This paragraph does not add meaningful content. The ExecSum should mention what was learned, not what was done. | Accepted: The ES is being rewritten. |
| 11834 | 5 | 4 | 12 | 4 | 14 | This sentence is very general and unspecific, could be removed? | Accepted: The text is being revised. |
| 5230 | 5 | 4 | 12 | 5 | 4 | Energy demand and supply is not considered in executive summary although it has a special chapter 5.6 later in the text. I think the logics of the ordinary text part of the chapter should be followed also in the executive summary or very clear statement on differences in emission allocation logics should be given. | Accepted: The ES is being rewritten. |
| 4157 | 5 | 4 | 15 | 4 | 30 | GtCO2 (carbon only) or GtCO2e (equivalent)? Both transportation and industry sectors are the sources of non-carbon GHGs. | Accepted: The text, including the unit system used, is being revised. |
| 2218 | 5 | 4 | 17 | 4 | 17 | "vehicle materials" is not a mitigation option itself, it is a subpart of "fuel efficiency" - thus, those two elements should not be in the same list together. | Accepted: The sectoral sections of Chapter 5 are being revised and |
| 9464 | 5 | 4 | 2 | | 4 | It is important to verify that the studies you reference all define drivers this same way. It is not uncommon for the term drivers to refer to correlational relationships and not causal relationships. | Noted |
| 8940 | 5 | 4 | 2 | | | A 40-year history is too short. The data since about 1970 have to be compared with data from at least 100 years past. | Taken into account: Pre 1970 was included for the SOD for global emission |
| 2249 | 5 | 4 | 2 | 5 | 4 | Still this curious obsession with emissions. The greenhouse theory, for which no evidence has been found, is dependent on greenhouse gas CONCENTRATIONS, and since there is no scientifically established relationship between emissions and concentrations what possible relevance can there be in this constant concern for emissions? | Rejected: Please, refer to WGI for detail explanation. |
| 4759 | 5 | 4 | 20 | 4 | 25 | Could you also provide the share (%) of industry as the other sectors? | Accepted: The sectoral sections of Chapter 5 are being revised and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9422 | 5 | 4 | 20 | 4 | 25 | ・ Addition is needed for the description of the use of nuclear energy and for voluntary actions.<br>・ It would be appropriate to add, to the list of potential mitigation measures, the use of nuclear energy that has an effect similar to or greater than that of measures which use renewable energy as described in FOD.<br>・ The draft stipulates that the technological options for GHG mitigation can be coupled with policies. However, voluntary actions should be treated equally to policies and added, since there are cases of voluntary actions of the industry achieving significant effects as reported in Japan.<br>・ Refer to the following documents.<br><br>Okazaki et al. [1] showed that the Japanese steel industry responded to the Kyoto target by launching a voluntary action plan in 1996 a year prior to the adoption of the Kyoto Protocol with challenging quantitative target: 10% reduction of energy consumption in 2010 compared to 1990. Since then, the steel industry has made stead progress toward achieving these goals. As a result, the energy consumption in 2008 was 11.5% less in comparison to the 1990 level (equivalent to 12.1% reduction in CO2 emissions).<br>[1]Teruo Okazaki, Mitsutsune Yamaguchi (2011)<br>Accelerating the transfer and diffusion of energy saving technologies steel sector experience—Lessons learned Original Research Article<br>Energy Policy, Volume 39, Issue 3, March 2011, Pages 1296-1304<br>http://www.sciencedirect.com/science/article/pii/S0301421510008827<br><br>[1]page 1296 right column line15-23 | Rejected: Chapter 5 does not deal with mitigation options. Please refer to the Sectoral chapters in WGIII for detail information about mitigation options. |
| 9779 | 5 | 4 | 21 | 4 | 21 | suggest to delete "realized from 2002 attributed to industry growth in China" | Accepted: The sectoral sections of Chapter 5 are being revised and |
| 11734 | 5 | 4 | 22 | 4 | 25 | Nuclear power should be put into example of potential mitigation measures. | Rejected: Chapter 5 does not deal with mitigation options. Please refer to the Sectoral chapters in WGIII for detail |
| 16011 | 5 | 4 | 23 | | | renewable energy, local energy, feedstpcl change | Accepted: The sectoral sections of Chapter 5 are being revised and |
| 4760 | 5 | 4 | 24 | 4 | 24 | What is behind "energy pricing"? | 0.0 |
| 4761 | 5 | 4 | 26 | 4 | 30 | The statement assumed that "public measures" could trigger the phenomenom. Have you got evidence of this statement? | Accepted: The sectoral sections of Chapter 5 are being revised and |
| 14384 | 5 | 4 | 26 | | | Buildings 4GtCO2 sounds considerably lower than chapter Chapter 9's "30 percent" of energy-related emissions. Here (and there) may need to sort out direct versus indirect and attribution to "energy sector" or "building" for heating and cooling. | Accepted: The sectoral sections of Chapter 5 are being revised and coordinated with the sectoral chapters. |
| 14855 | 5 | 4 | 30 | | | Can you characterize the confidence In this statement? | Accepted: The sectoral sections of Chapter 5 are being revised and |
| 14385 | 5 | 4 | 31 | | | 11.5% for agriculture and 11.3% for forestry and land use looks very different from figure 11.1, where agriculture is much smaller relative to deforestation. May depend in part on whether "fires" are included in agriculture; would seem doubtful. | Taken into account: The Nos. will be varified with that in Ch 11 |
| 12850 | 5 | 4 | 31 | 4 | 40 | Due to uncertainties in quantification of greenhouse gas emissions and removals, use appropriate precision by reporting results with only two significant figures. For example, say "25%" rather than "25.3%." Otherwise, the results imply a precision of measurement that current estimation methods cannot reach. | Noted, all the Nos. have been rounded to significant figures. |
| 12851 | 5 | 4 | 31 | 4 | 40 | Due to uncertainties in quantification of greenhouse gas emissions and removals, use appropriate precision by reporting results with only two significant figures. For example, say "25%" rather than "25.3%." Otherwise, the results imply a precision of measurement that current estimation methods cannot reach. | Noted, all the Nos. have been rounded to significant figures. |
| 13762 | 5 | 4 | 31 | 4 | 37 | The emissions from FOLU are quite uncertain. The level of precision suggested by the numbers here is not justified. | Noted, all the Nos. have been rounded to significant figures. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14856 | 5 | 4 | 31 | 4 | 37 | Can you characterize the confidence In this statement? | Taken into account: The first sentence is based on the emission data provided by IPCC. The second sentence has been |
| 7457 | 5 | 4 | 31 | 4 | 32 | “Agriculture contributed 11.5% to total global emissions in 2008, whereas forestry and other land uses (FOLU) contributed 11.3%“. I contend that the ‘forestry’ contribution is mainly caused be cutting down trees for pastoral and arable land use purposes. Most wood for productive use is harvested, causing little if any reduction in the growing stock. Therefore, this statement about ‘forestry’ should be amended. | Taken into account: The sentence has been modified |
| 11836 | 5 | 4 | 31 | 4 | 37 | Would be good to also get the emissions not only as percentage but also as absolute numbers (GtCO2/yr) as in the sections before | Accepted |
| 16012 | 5 | 4 | 31 | 4 | 40 | Why only relative numbers? | Accepted |
| 8417 | 5 | 4 | 32 | 4 | 33 | I suggest to add data on the emission trend in the forestry sector. | Accepted |
| 12287 | 5 | 4 | 34 | 5 | 5 | Please use same accuracy when referring to increase in global poplulation (doubled or 82,7%) | Noted. The figure has been rounded uo |
| 8941 | 5 | 4 | 34 | | | Does the word breeding imply any support for Genetic Modification of crops? This may be contentious. | Taken into account: The sentence is |
| 17414 | 5 | 4 | 34 | | | "An increase in food production can be reached through breeding of stress tolerant cultivars/breeds of crops, livestock, fish and forest trees that will increase food, feed and fuel production without enhancing GHG emission." This seems like a highly optimistic statement and is notably provided without a citation. Recommendation dropping this blanket statement and replacing with a much more sophisticated discussion of the interactions among agricultural production, adaptation strategies (of which breeding is just one of many) and mitigation potentials. Same comment for Ch 5, p-53. | Taken into account: The sentence is deleted |
| 10790 | 5 | 4 | 35 | 4 | 37 | This is counterintuitive and should be substanciated; actually, agriculture will expand into poorer and less productive lands, therefore increasing emissions | Taken into account: The sentence is deleted |
| 12852 | 5 | 4 | 37 | 4 | 37 | Because of the importance of global forest emissions, it would be good to mention here that tropical deforestation causes most greenhosue gas emissions in the forest sector, with additional periodic pulses from wildfire in temperate and boreal forests. | Taken into account: The sentence has been modified |
| 7318 | 5 | 4 | 38 | 4 | 40 | Executive summary for Chap 5 states the following: "Waste GHG emissions represented in 2008 the 2.9 % of global GHG emissions, compared with 2.6 % in 1970 year (medium agreement, robust evidence). Waste related GHG emissions increased by 193.5 % in the same period (medium agreement, robust evidence)." It would be helpful to state the actual numbers rather than just the %'s. | Accepted: The section on waste and the ES are being revised. |
| 12286 | 5 | 4 | 38 | 4 | 40 | Please clarify if " waste GHG emissions" and "waste related GHG emissions" is the same. | Accepted: The section on waste and the ES are being revised. |
| 13218 | 5 | 4 | 40 | 4 | 40 | 193.5% should be replaced by 90 % : see comment on page 53 line 21 | Accepted |
| 14857 | 5 | 4 | 41 | | | Is there an objective definition of 'significant contributor?' Given how small waste GHG total is (2.9%) the level required to make something a 'significant contributor' must be small indeed. Many other things must also be significant contibutors that are not called out. | Accepted: We are removing all adjectives from the text and replacing them by actual numbers, percentages, |
| 14858 | 5 | 4 | 42 | 5 | 4 | Useful information here would be the effectiveness of these methods, not just a listing. | Noted |
| 8418 | 5 | 4 | 43 | 4 | 44 | "Municipal solid waste is a significant contributor to greenhouse gas emissions". The contribution is 3%, I would change significant with “not negligible” | Accepted: We are removing all adjectives from the text and replacing |
| 12284 | 5 | 4 | 5 | 4 | 5 | Please include definition of short-lived species | Figure eliminated |
| 2250 | 5 | 4 | 5 | 4 | 8 | There is no doubt whatsoever that the most important greenhouse gas is water vapour. The question is, is its changes anthropogenic?. Human acivities undoubtedly have a major influence on the presence of water vapour in the atmosphere, so you must admit it. | Rejected - water vapor is the most important greenhouse gas but its concentration is mainly driven by the concentration of the non-condensing greenhouse gases - CO2, CH4 etc. While changes in land use etc. might have an effect on humidity and hence the greenhouse effect we don't know of |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11837 | 5 | 4 | 6 | | | This abreviation (PPP) is mentionned several times but only introduced later. I think this is also the case for other abreviations. Would be more appropriate to introduce acronyms at the first time of use. | Editorial |
| 4156 | 5 | 4 | 9 | 4 | 11 | Increased percentage seems misleading. Fraction in GWP or carbon equivalent values should be refered, since these are already used in the past IPCC reports. | Accepted: The text is being revised. |
| 4519 | 5 | 4 | | | | 5 pages is too long for an executive summary. Suggest shortening and focusing only on key insights. | Taken into account - shortened |
| 6897 | 5 | 4 | 5 | 4 | 8 | This statement in the Executive Summary seems misplaced here. This Chapter does not (and it should not!) provide an assessment of the relative importance of individual GHGs in terms of concentrations and/or radiative forcing. This is assessed in the WGI AR5 contribution, Ch2 and 8. Please make sure to refer to the WGI AR5 in the underlying text supporting the statement "CO2 continues to be the most important ....". | Rejected: We are informed by WGI to include this statement. |
| 10791 | 5 | 4 | | | | the executive summary needs rewriting in style of an assay, with logical conclusions and not a mere sequence of sentences, with only a weak link among them. | Editorial |
| 4027 | 5 | 4 | | 4 | | Use of terminology: "CO2 emissions" and "GHG emissions" seem not to be consistently used. Sometimes it seems to be CO2eq not CO2 e.g. lines 20-25, 31-40 on p.4. Suggest double checking. | Taken into account - consistency improved |
| 2338 | 5 | 4 | | | | Some points in the Executive Summary can be summarized. For instance, the analysis based on the data about the sector based emission (Industry GHG emission, Waste GHG emissions and Agriculture GHG emission- page 4) are more detailed in the Executive Summary. | Taken into account - ES shortened |
| 12282 | 5 | 4 | 1 | | | Please shorten the Executive Summary by focusing on the most important key findings. The summary shouldbe no more than two pages. | Taken into account - shortened |
| 4369 | 5 | 4 | 20 | 5 | 20 | I am puzzled by the use of the word “moderately” to characterize an increase of 60% !!! | Taken into account: we are removing most adjectives and repalcing them with concrete figures (i.e. numbers, |
| 17437 | 5 | 40 | 1 | 40 | 1 | What "country differences" are being referred to? | Noted. This section has been reworked so that this sentence no longer forms |
| 13552 | 5 | 40 | 1 | 46 | 1 | On various places in the document I have the feeling authors are a bit biased to papers they know or have written. Section 5.6 is a bit too much dependent on work of Grubler, where without denying his quality, there must be more of such work out. | Noted: This seems ineviatble though. It's the role of reviewers to make us aware of additional papers that we should cover. |
| 4177 | 5 | 40 | 12 | 40 | 12 | Is "energy consumption" a "final energy consumption" ? | Taken into account: Added "primary" to |
| 18150 | 5 | 40 | 13 | 40 | 16 | a) The manner in which the percentages were derived from Fig 5.6.1 requires explanation.<br>b) It should be noted that despite the high percentage increases in energy consumption/capita in non-REF/OECD 90 region over the last 40 years, total consumption is still many times lower (about 400%? in OECD 90 case) thatn in the REF/OECD-90 regions. The high percentage increases were likely necessary to meet basic needs and in some instances further growth may be necessary to assure that these needs are met. | Noted/Accepted: The percentages are simply the increase from 1970 to 2010. Added a statement that per capita energy use in developing countries is still only a quarter of that in developed |
| 16001 | 5 | 40 | 14 | | | Please be more explicit: which countries do you consider to be transition economies; transition economies = EIT? | Taken into account: We have changed this to "Reforming Economies" These are the former USSR and formerly |
| 16020 | 5 | 40 | 15 | | | same %-numbers for "Latin America" and "Middle East and Africa"??????? | Accepted: Data revised |
| 5777 | 5 | 40 | 20 | 40 | 25 | First, this information here is redundant. Second: What does this imply? Why is the outcome of the analysis influenced by the choice of how "income" is measured and compared? | Accepted: Deleted these references to market exhange rates |
| 3622 | 5 | 40 | 28 | 40 | 28 | Please add for the source of Granger causality and co-integration "(Granger (1969, 1986, 1988))". Please cite as: Granger, C.W.J. (1969). Investigating causal relations by econometrics models and cross spectral models. Econometrica 37, 424-438. Granger, C.W.J. (1986). Developments in the study of co-integrated economic variables. Oxford Bulletin of Economics and Statistics 77, 213-228. Granger, C.W.J. (1988). Some recent developments in a concept of causality. Journal of Econometrics 39, 199-211. | Accepted - added some references to Granger's papers |
| 10897 | 5 | 40 | 3 | 40 | 7 | References for this? | Noted. Reference has now been |
| 10898 | 5 | 40 | | | | This reference may be relevant at several stages in this paper, relating to fossil fuel trade and further linking to consumption of goods and services Davis, S.J., Peters, G.P., Caldeira, K., 2011. The supply chain of CO2 emissions. Proceedings of the National Academy of Sciences 108, 18554-18559. | Noted: This paper might be relevant to the energy supply section below |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4380 | 5 | 40 | 13 | 40 | 13 | Again the term “fairly moderate” reflects more subjectivity than objectivity, what is considered an acceptable increase in GHG emission per capita ? | Rejected: It's moderate relative to growth in energy use in developing |
| 18622 | 5 | 41 | | | | Discussion on energy efficiency (page 41) is a little bit shaky, there are process limitations (as well as economic limitations) to take into consideration.<br><br>(Also important to sort out if discussing economy, energy or carbon efficiency)<br><br>Just using the most efficient technology would lead to improvements even for coal but builds on pricing resources including externalities.<br><br>Partly also depending on how things are calculated (statistical methods). Conventional nuclear fission extremely inefficient from a pure energy content perspective but is that interesting? Interesting to compare gas and coal as such? | Accepted. There are many considerations and limitations. It is still correct as indicated in the comment that using most efficient technology would improve energy system for all conversion chains. Text revised accordingly. However, the st |
| 16022 | 5 | 41 | 10 | 41 | 11 | to much sources | Editorial. We think these references can be useful to the reader. |
| 3038 | 5 | 41 | 21 | | 29 | See above comment specific to lighting. Even though "abundant opportunities for improving energy efficiency exist at every link in the energy chain," for lighting specifically history shows such efficiency gains do not lead to lowered energy use [Tsao, J.Y., Saunders, H.D., Creighton, J.R., Coltrin, M.E., Simmons, J.A., 2010. "Solid state lighting: an energy-economics perspective." Journal of Physics D: Applied Physics 43 (35), 354001; also Saunders, H.D. and Tsao, J.Y. "Rebound effects for lighting," Energy Policy, 49(2012): 477-478] | Accepted. Rebound effect will be mentioned here but also the point that energy use would have increased more rapidly without efficiency improvement. Thus, the net effect is still one of saving; |
| 9358 | 5 | 41 | 24 | 41 | 29 | "Shifting to more efficient fuels (e.g., natural gas)" should be deleted from the sentence because you cannot argue it without considering energy security and economical aspect.<br>According to a report issued by the Ministry of Economy, Trade and Industry of Japan, not only the efficient utilization of natural gas and nuclear but also coal is important for energy security and economical aspect. Please refer http://www.enecho.meti.go.jp/topics/hakusho/2010energyhtml/1-1-3.html | Rejected. Security issue and economics are important for all fuel choices, but natural gas can be both economic and can increase security as has been the case in the US with the shale gas. It is |
| 11735 | 5 | 41 | 27 | | | Fuel itself doesn't have the efficiency and almost all combined cycle power plants are using natural gas. So it's not nesesarry the sentence [more efficient fuel (eg., natural gas) and]. | Accepted. It is correct that fuels themselves do not have “efficiency” but their conversion to other energy forms has and as such natural gas is most efficiently converted to electricity and |
| 3623 | 5 | 41 | 5 | 41 | 5 | Please add "Econometric analysis of the Granger causality of China's economic development and primary energy demand reveals that only since the introduction of economic reforms in China in 1978, economic development has a significant expalantory power for energy consumption and related CO2-emissions (Oberheitmann and Frondel, 2006)." Please cite as: Oberheitmann, A. and Frondel, M. (2006). The Dark Side of China’s Increasing Economic Prosperity: Will Energy Consumption and Global Emissions Rise Drastically? Bleischwitz, R. and Budzinski, O. (eds.): Environmental Economics – Institutions, Competition, Rationality. Berlin: VWF, 207-224. | Rejected: This is too specialised a finding from a literature with literally hundreds of papers to include in this short section. |
| 16021 | 5 | 41 | | | | shorter because some parts are redundant | Accepted: Section has been drastically shortened in response to this and other |
| 14871 | 5 | 42 | 13 | 42 | 15 | What is the basis of the comparison? Is it heating furnace vs. heat pump without considering production of electricity? | Rejected. The basis of comparison is the difference between the first and second- |
| 15064 | 5 | 42 | 18 | | | citation format is incorrect. | Accepted and corrected. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12097 | 5 | 42 | 19 | 42 | 21 | "The theoretical potential for efficiency improvements is thus very large, and current energy systems are nowhere close to the most efficient levels suggested by the Second Law 21 of Thermodynamics." This claim is unreferenced - please add this text and reference from IEA. "For instance, as the International Energy Agency (IEA) reported in 2006, The energy intensity of most industrial processes is at least 50% higher than the theoretical minimum determined by the laws of thermodynamics. Many processes have very low energy efficiency and average energy use is much higher than the best available technology would permit." Reference - International Energy Agency (2006) Energy Technology Perspectives 2006: Scenarios and Strategies to 2050, IEA, Paris | Accepted. Both the IEA and GEA reports will be cited. The later refers directly to the exergy potentials. |
| 9359 | 5 | 43 | | | | Good figure. It would be more useful for readers to explain in more depth how the developed contries such as Japan have managed to improve its energy intensity /GDP per capita. | Noted with appreciation. It is difficult to add new explanatory text due to sever |
| 14519 | 5 | 43 | 1 | | 15 | This is a example that makes my underlying problems with the analyses in this chapter quite clear.<br><br>There seems to be a confusion between the concepts that are assumed to influence any of the parameters, intensities or other variables and the way these are measured. I'll try to explain using figure 5.6.4.<br><br>The figure presents historic recordings of Energy Use per Gross Production as a function of Gross Production per capita. These indeed are two important parameters in the Kaya approach. Apparently data are available in two different measures of Gross Production (PPP and MER). What I would expect is that the authors would choose one of the two or even a combination, that would best reflect what is expected to be the underlying concept, rather than presenting both. I have no idea how exactly this figure now could be interpreted and why it is here.<br><br>What probably could be done is concluding that the relation between (E/G) and (G/P) could be approximated by a straight line (total production only?) on a double logarithmic plot with all of them more or less the same slope. It would then be very interesting to find explanatory variables or proxies for the different intercepts of the straight lines. This would help quantifying the parameters in the Kaya approach application in scenarios.<br><br>I would expect that any relation would be with the total energy use and not with "commercial" only. Use of energy in production processes (in TJ) will be largely independent of the original source of the energy fossil or something else! The processes need a certain amount of energy but in many cases the process equipment can be relatively easily chosen to take into account the different origins of the energy. | Rejected. It has been an explicit decision of the writing team to use both measures of GDP, namely MER and PPP. The use of one or the other makes a big difference. IPCC has been vehemently criticized in the past for not making this clear. |
| 15930 | 5 | 43 | 11 | 43 | 12 | This is a poor, or at least a very incomplete explanation of the differences in accounting methods. Please expand or delete. | Accepted and reworded. |
| 5778 | 5 | 43 | 9 | 43 | 14 | It is not clear what is meant here. The description of the "direct" method does not make sense. | Accepted and reworded. |
| 16003 | 5 | 44 | 25 | | | Might be intersting to mention that EI in China (at least when measured in PPP) has increased after having reached global level in the early 2000s, see e.g. Steckel et al. 2011 | Partially accepted. EI in China did experience an increase between 2002 and 2004, but EI has continued to decline since then (Enerdata, 2012). Furthermore, Steckel et al., 2011 state |
| 5779 | 5 | 44 | 37 | 44 | 48 | Suggest to delete paragraph, redundant. | Accepted and deleted. |
| 4351 | 5 | 44 | 37 | 44 | 40 | introduction of risk of substantial souorces of CO2 from forests is reasonable but enphasys of the risk may confuse the readers of this chapter who want to understand mitigation potential of forest ecosystem. | Accepted and reworded. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8425 | 5 | 45 | | | | Please explain better what is included in both numerator and denominator of every data.<br>“All PE carriers and CO2 emissions” means that CO2 from biomass combustion is included in the numerator and GJ of biomass primary energy is included in the denominator.<br>“Without biomass CO2 (but incl. biomass PE)” means that CO2 from biomass combustion is not included in the numerator but GJ of biomass primary energy is included in the denominator.<br>For the sake of clarity, I suggest to add the line of carbon intensity of only fossil fuels (CO2 from biomass combustion is not included in the numerator and GJ of biomass primary energy not included in the denominator).<br>It must be also underlined that the assessment of the amount of biomass primary energy use is very uncertain, far more than fossil fuels PE. | Accepted. A new line added. This will be done next week. |
| 4178 | 5 | 45 | 26 | | | It is not clearly mentioned how "energy intensity" and "energy efficiency" differently work as a driving force. It seems to me that the latter is a driving force while the former is an outcome of structure changes. | Rejected. The section is about carbon intensities. However, the statement is not supported by appropriate references |
| 14520 | 5 | 45 | 32 | | 40 | I propose to build this text on the information and explanations in the 2006 IPCC Guidelines, Energy Volume's introductory chapter. This presents tables with default values of energy per mass/volume of all relevant fuels (NCVs, if needed you can also find an explanation of the difference with GCVs) and of carbon contents, leading to default emission factors.<br><br>I would expect IPCC to use their own publications if possible. | Accepted. The IPCC publications now cited, both the WGII SAR as well as 2006 Guidelines. This will be added next week. |
| 13033 | 5 | 45 | 34 | 45 | | This sentence indicates that oil is now the dominant fossil fuel, replacing coal. However, coal is still by far the dominant fossil fuel in terms of total electricity production. See p. 24: http://www.iea.org/textbase/nppdf/free/2010/key_stats_2010.pdf | Rejected. This is factually correct – oil is still the major energy source worldwide. However, it is also true that coal is the major source of electricity even though |
| 8423 | 5 | 45 | 37 | 5 | 43 | I would generalize, using “renewables” instead of hydropower. | Accepted and reworded. |
| 9360 | 5 | 45 | 38 | 45 | 43 | It should be deleted because the shift mentioned here seems to be caused by the aspect of the energy security rather than the increase of energy conversion.<br>In the UK nuclear power station was introduced with a view to improve energy security as a main motivation.(Adam Corner et al,2011) | Rejected. The sentence provides a phenomenological statement and does not provide causality as suggested by the comment. There are many reasons |
| 8424 | 5 | 45 | 44 | 46 | 2 | I found this paragraph (and the following Figure 5.6.5) very difficult to follow.<br>Usually, CO2 emissions from biomass (biogenic Carbon) are not counted in emission inventories, so if CO2 from biomass is accounted must be clearly stated.<br>It is hard to believe that “biomass, like fossil fuels, has also contributed significantly to increases in atmospheric concentrations of CO2”, because CO2 levels in the atmosphere in the last 10.000 years, before 1750, have had very small variations (see figure SPM1 in AR4-WG1). | Rejected. Biomass resulting from deforestation associated with expansion of global land-use (mostly for agriculture) has been the major source of carbon emissions until fuel wood has been substituted by coal; see the estimates of |
| 7461 | 5 | 45 | 48 | 46 | 2 | “Historically, emissions related to land-use changes (deforestation) have far exceeded carbon releases from energy-related biomass burning, which suggests that in the past, biomass, like fossil fuels, has also contributed significantly to increases in atmospheric concentrations of CO2 (Grübler et al., 2012)”. If wood etc. is not burnt for energy, then it will rot and release CO2 and CH4 etc. Therefore, energy related biomass burning should be discounted. It is land clearing for agriculture that is the main cause of CO2 release from woody biomass etc. However, some will have been used in construction etc., this is a long-tem store of C. | Rejected. Biomass burning related to energy uses (e.g. cooking or ore smelting) would result in CO2 emissions if associated with deforestation or not based on sustainable agricultural practices where the CO2 uptake through |
| 17439 | 5 | 45 | 5 | 45 | 5 | Fuel mix may not determine energy use but I would argue that by definition it determines CO2 emissions. Perhaps historically the correlation has been fairly weak, however in future it would be expected to be stronger e.g. With a greater share of renewables. | Accepted. “Fuel mix” deleted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 5351 | 5 | 45 | 44 | 46 | 7 | Given the caveat at the bottom of page 45 about it not being approproiate to assume biomass in the past was carbon neutral, please consider taking out that line in Figure 5.6.5. This might be a case where it would be better to note use the same exact graphic that was in the paper that is being referenced if it causes difficulties communicating the points in Chapter 5. | Rejected. Instead an new line has been added in response to Comment 8425/595. This will be done next week. |
| 9297 | 5 | 45 | 27 | 47 | 30 | In order to facilitate sustainable development, the cement industry in Japan has developed co-processing technologies for energy mix. The reference shows a case study to utilize municipality wastes as alternative fuels and materials. (MORIMOTO, NGUYEN, CHIHARA, HONDA and YAMAMOTO; Journal of Life Cycle Assessment, Japan, Vol.2 No.4 October 2006 "Proposals for Classification and an Environmental Impact Evaluation Method for Eco-Services: Case study of Municipal Waste Treatment in Cement Production") and (Makoto HOKI and Hideto MASHITA, Journal of the Japan Institute of Energy, Vol. 87, 749 -752, (2008), "Trend of Biomass Use in the Southeast Asian Countries") | Rejected even though an important point. The reason is that it is too specific and given the server page limitation there is no obvious way of including the reference by adding just a word or two. |
| 14872 | 5 | 46 | | | | The figure could be quite misleading, implying that a carbonization occur since 1850. It would be useful if you could add another line excluding not only CO2 emissions but also PE from biomass | Accepted and changed, also see Comment 8425/595. |
| 9089 | 5 | 46 | 16 | 46 | 17 | Decarbonization by nuclear seems to be quite difficult due to Fukushima for the future. At least not easy than before. Authors are recommended to prudently correct the sentence. | Accepted and reworded. |
| 5780 | 5 | 46 | 19 | 46 | 25 | Delete footnote - it is just "the Kaya Identity explanation" repeated again. | Accepted and deleted. |
| 11736 | 5 | 46 | 8 | 46 | 21 | Pacala et al. showed 15 options to reduce the emissions in which 5 are the near-zero emission technologies. And also 0.3% of 2.0% can not be ignored. These indicates that existing low carbon technologies are expected to play a major role in the long-term stabilization of carbon emissions. Last Phrase should be amended to [This means higher carbon emissions compared to historical experience, so it gets more and more important to accelerate the decarbonaization by using low carbon technologies.]<br>1.Pacala et al.:[Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies], send attachment by another e-mail. | Accepted, last sentence reworded. |
| 16004 | 5 | 46 | 8 | | 11 | plus: carbonization has mainly been driven by coal (e.g. Steckel et al. for a decomposition of carbon intensity in a Kaya framework) | Accepted and reworded. |
| 8426 | 5 | 47 | 11 | 47 | 11 | “presently stand at $80” It is better to show the average price in 2010 and 2011, because what is “present” is not clear for an IPCC report | Accepted and rewritten to reflect the suggestion. |
| 2574 | 5 | 47 | 15 | 47 | 17 | Mention to the infrastructure lock-in by the use of shale gas, World Energy Outlook 2011 | Accepted, but lock-in refers to many infrastructures not only to shale gas ones. |
| 5781 | 5 | 47 | 30 | 47 | 30 | Footnote from "conventional Uranium" is missing. | Accepted. Footnote added. |
| 16005 | 5 | 47 | 5 | | 6 | What does that tell us about GHG emissions? If oil is getting scarce i.e. more expensive, that would probably make coal to liquid more attractive; this should be discussed in this respect | Rejected. The page limitation is severe and adding new arguments is not possible especially as the suggested one refers to the future possibilities and not |
| 5352 | 5 | 47 | 10 | 47 | 14 | This sounds a lot like "peak oil." Please be careful here. There are many potential reasons for the observed trends. Suggesting that there is no more oil that can be had "working at maximum capacity" seems to be a real strech. Humanity has a very poor track record of prediciting peak oil but an amazingly strong track record of innovation that moves previous uneconomic or technically impossible to produce oil into oil that is flowing into global markets. | Accepted. The intention was not to rephrase the “peak oil’ arguments. Text has been revised. |
| 5353 | 5 | 47 | 15 | 47 | 17 | Cant cite the truly pesimistic Howarth et al 2011 article for a basic fact like shale gas production is growing. It would be far better to cite something that speaks directly to the narrow point being made here which is shale gas production is growing. Consider replacing the Howarth citation here with IEA, Golden Rules for a Golden Age of Gas, 2012, International Energy Agency: Paris. p. 150. EIA, World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States 2011, Energy Information Administration, US Department of Energy: Washington, DC. DOE, Modern Shale Gas Development in the United States: Primer, 2009, Office of Fossil Energy, US Department of Energy: Washington, DC. p. 116. | Accepted and additional references added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5354 | 5 | 47 | 18 | 47 | 30 | Please make sure that the numbers presented here are consistent with the data in Chapter 7 that speaks to the same issues. | Accepted. The overlap must be avoided. See also response to Comment 13775/79. I will try to make suggestions |
| 8955 | 5 | 48 | | | | Figure is labeled poorly. | redrwan |
| 4179 | 5 | 48 | | | | Is it possible to touch upon the difference in "freight transportation" and "passenger transportation" growth? | shares given limited by page numbers |
| 7462 | 5 | 48 | | | | . Not all the colors are identified. | redrawn |
| 5782 | 5 | 48 | | | | Please redraw figure. Years are not given correctly and legend is missing in parts. | rdrawn |
| 5231 | 5 | 48 | | | | The legend of Figure is partly lost in the copy. | redrwan figures |
| 2220 | 5 | 48 | 1 | 48 | 1 | Where is the power / energy sector? Strange to not include it in the overview chapter | under energy chapter |
| 17440 | 5 | 48 | 15 | 48 | 16 | Sentence is not clear to me | text redrafted |
| 10437 | 5 | 48 | 20 | 48 | 31 | Not necessary | redrafted |
| 3624 | 5 | 48 | 20 | 48 | 31 | What is the relative contribution of transportation by sea and by air? | given in new text |
| 17441 | 5 | 48 | 26 | 48 | 27 | Sentence is not clear to me - cars are Light Duty Vehicles too. | corrected |
| 16006 | 5 | 48 | 28 | | | Try to avoid citing the AR4 as a resource … if you do, you should explain what's new in AR5 | looking back in history it may have some |
| 15007 | 5 | 48 | 8 | 48 | 10 | Updated data of WEO2011 are available. | noted used IPCC data |
| 4382 | 5 | 48 | | 48 | | I cannot read axis labels, legend appears incomplete | figures redrawn |
| 4381 | 5 | 48 | 7 | 48 | 9 | Numbers are contradictory with fig 5.2.2 | figures redrawn |
| 8556 | 5 | 49 | | | | PHRASEOLOGY TOO OBSCURE AND DEFINITIVE<br>"Land use changes including planning and public transport also shape GHG growth from transport sector but these drivers are effective over large time scales(ITF, 2010)."<br>RECOMMEND CLEARER STATEMENT... SUCH AS<br>"Land use changes including planning and public transport may also shape GHG growth from transport sector but these drivers require large time scales to be effective (ITF, 2010)."<br>ALSO SEE COMMENT 14 | noted will adjust |
| 8557 | 5 | 49 | | | | REPORT DOES NOT MAKE SUCH A FINDING.<br>"Land use changes including planning and public transport also shape GHG growth from transport sector but these drivers are effective over large time scales(ITF, 2010)."<br>COMMENT: Reference should be deleted | noted will adjust as necessary |
| 4180 | 5 | 49 | | | | "Heating" and "electricity consumption" should also be explicitly shown. I don't see the reason why only air-conditioning is separately shown. | redrafted |
| 15010 | 5 | 49 | 19 | 49 | 21 | Only carbon tax? How about other policies? | noted |
| 15011 | 5 | 49 | 22 | 49 | 24 | EV and biofuels do not necessarily reduce the GHG emissions. Only if selection is appropriate. | noted but dealt with in Sector Chapter 8 |
| 15012 | 5 | 49 | 24 | 49 | 27 | In terms of the previous sentence, this part must be more concrete. | redrafted |
| 2223 | 5 | 49 | 28 | 50 | 39 | Suggest to add the technological mitigations (wall insulation, multilayered windows, LEDs, solar heating, heat pumps, etc.) | Mitiagtation in Chapter 8 |
| 2179 | 5 | 49 | 28 | 50 | 39 | There should at least a sentence or two about the important role Chine's building/construction industry has on the overall projectory of the global GHG emissions from the building/construction sector | noted |
| 15008 | 5 | 49 | 3 | 49 | 4 | Reference is gray literature, and not appropriate here. | Grey literature allowed |
| 2221 | 5 | 49 | 32 | 49 | 32 | Why is the unit CO2 and not CO2e, in refrigeration there should be a lot of f-gases | noted and corrected |
| 13554 | 5 | 49 | 32 | | | Again an unreferenced figure or not clear where data come from. | now referenced source of data |
| 3086 | 5 | 49 | 33 | | | emissions from buildings are not just from houses and offices but include all sorts of other buildings e.g. retail, warehouses, data centres, public sector buildings (schools etc) | data sources used has residential, commercial/institutional |
| 15009 | 5 | 49 | 9 | 49 | 9 | "Local" environment is better to clarify the kind of concerns. | redrafted text |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6530 | 5 | 49 | 24 | | 26 | Modify the description, taking into consideration that life-cycle GHG emissions of at least HEVs and PHEVs can be smaller than that of conventional gasoline vehicles regardless of the actual generation mix, as shown on IPCC/SRREN(2011) Figure 8.16. | under Transport Chapter |
| 16899 | 5 | 5 | | | | Please make clear that wealth is not equal to emissions. Emissions are driven by the technology embedded in the existing capital stock. Future emissions will be driven by decisions we make regarding what technologies to deploy as we grow economies and replace our old capital stock. | Noted: The chapter is organized based on the IPAT decomposition so that the level of emissions depends on both the size of the GDP and the level and type of technology deployed. Income levels will likely affect those technologies adopted and this is discussed in the chapter but there is still plenty of opportunity to adopt more or less environmentally |
| 16013 | 5 | 5 | 1 | | | aerobic landfilling, seperate collection of waste fractions, pre-… | Accepted |
| 12289 | 5 | 5 | 15 | 5 | 17 | Is this true also if we want to define the MAIN driver(s)? You might consider to move this entire paragraph to the body of the text and delete it from the summary. | Accepted: The ES is being revised. |
| 15054 | 5 | 5 | 17 | | | should be a dot not comma | Editorial |
| 4762 | 5 | 5 | 23 | 5 | 23 | The "Kaya identity" is interesting however several criterias are inter-dependent (interactions between those drivers). It is difficult to conclude … | Accepted: The Section 5.3 where Kaya identity is introduced as well as the ES |
| 12853 | 5 | 5 | 23 | 5 | 23 | It would be good to provide proper credit here and say "…the Kaya identity, a refinement of the IPAT identity,…" | Accepted: The Section 5.3 where Kaya identity is introduced as well as the ES |
| 4763 | 5 | 5 | 33 | 5 | 33 | What is behind "indirect effects"? | Taken into account: Fixed based on the new chapter terminology. |
| 7641 | 5 | 5 | 33 | 5 | 33 | It is not clear what is meant by "indirect effects of population on emissions". | Taken into account: Fixed based on the new chapter terminology. |
| 9313 | 5 | 5 | 34 | | | Please see if the phrase 'The emissions increase --' is actually 'The emission increase ---'. | Editorial - text has changed |
| 9314 | 5 | 5 | 39 | | | Please see if the word 'in' needs to be added at the end of the line. | Editorial - text has changed |
| 15055 | 5 | 5 | 40 | | | what other factors, could you give examples | Accepted, text revised; fast economic growth and reliance on fossil fuels - |
| 16248 | 5 | 5 | 42 | 5 | 43 | The meaning of the sentence is unclear. What is meant with the "initial stage", what with "further urbanization"? Does it refer to e.g., the first million people in a city versus the third or fourth million (progression in size)? Or is it the build-up of stocks versus the use of stocks (stock development)? Or does the statement refer to the fact that developing countries often have higher emissions in urban areas than in rural areas (on a per capita level), whilethe opposite is often the case in industrialized countries (progression in income disparity rural-urban)? | Accepted; all these items play a role. Revised and better explained. |
| 15056 | 5 | 5 | 43 | | | what is the emission? Total emissions or emission per capita? urbanization doesn't necessarily lead to a decrease of emission. It is really depending on the city initial set-up and the definition of urban area if you compare the U.S. and the Europe. | Accepted - It is per capita; revised based on revisions in Section 5.4. |
| 16249 | 5 | 5 | 43 | 6 | 2 | Meaning of sentence is unclear: Do the authors mean that it is unclear whether a declining household size might have a positive or negative impact on emissions, or that the extent of the negative effect is difficult to determine? | Accepted. The sentence has beeen rephrased. |
| 2251 | 5 | 5 | 5 | 5 | 7 | Gross misrepresentation of facts. Current population increase is almost exclusively in Africa and parts of india. Most of the rest of the world has a declining population, or is soon facing it. The GDP of the entire Western world is in the doldrums and many countries are hardly moving at all. All this is admitted in Chapter 14. What are you goiung to do about it?. | FT: This is CLA text, but facts remain facts. |
| 16014 | 5 | 5 | 5 | | | population has doubled since 1970 (in other part is named rise of 82%, page 4 line 33/34) | Ferenc T and CLAs - FT: This is not my |
| 12288 | 5 | 5 | 6 | 5 | 6 | Please define PPP | Accepted: We are revising the text. |
| 16203 | 5 | 5 | 6 | | | define PPP; define GWP100 | Accepted: We are revising the text. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10748 | 5 | 5 | 7 | 5 | 7 | The wording "...global GHG emission in GWP100 has increased.." should be changed. The emissions are weighted by GWP-100. | Accepted: We are revising the text. |
| 7845 | 5 | 5 | 7 | | | Emissions in GWP 100 is not a very common and scientific langauge. It is suggested to refer to CO2e. | Accepted: We are revising the text. |
| 4520 | 5 | 5 | 8 | 5 | 30 | This executive summary names as a driver “consumption” as well as “economic growth” in line 8 and “output” in line24. Why are different terms used; I do not understand the reason? Suggest that the same terms be used or that the difference be explained and motivated. Shortening and avoiding discussing overlapping drivers several times would help the summary. The discussion of consumption-based accounting come up later; suggest that consumption be discussed at that point. | Accepted: The ES is being revised. |
| 17442 | 5 | 50 | 1 | 50 | 1 | "1990s" not "1900s" | redrafted |
| 5783 | 5 | 50 | 12 | 50 | 15 | Please add a reference sustaining the attribution "The cause of the greenhouse gas emissions in buildings is largely attributed to electricity use." If you include cooking (for example), you include a substantial amount of households using gas or "biofuels". The same holds true for heating purposes. | redrafted |
| 9981 | 5 | 50 | 12 | 50 | 15 | The cause of GHG emission in buildings is attributed to not only electricity use but also fossil fuel use such as natural gas. In addition, this part should explain that "heat pump technology" has potential to reduce GHG emission from electricity use in buildings, as described in (IEA, 2011, page16). This literature is listed in the No51 line of this table. | redrafted |
| 3089 | 5 | 50 | 14 | | | is it largely electricity use? Certainly in countries with a high heating demand (e.g. central and northern Europe) it's actually fossil fuels for heating. Worth making the distinction here, may be supported with a few examples. | redrafted |
| 17443 | 5 | 50 | 14 | 50 | 15 | Reference needed for statement about electricity use | noted-redrafted |
| 4181 | 5 | 50 | 14 | 50 | 14 | Air-conditioning is partly given by gas-based equipment. | redrafted |
| 11286 | 5 | 50 | 16 | 50 | 22 | We suggest including also "Building design" (buildings that are not properly designed according to the local climate and use wrong building materials, tend to consume more energy than environmentally friendly architecture). Majority of existing modern buildings were designed and built when energy was cheap, as a result, they rely heavily on electricity for lighting, cooling and heating. | redrafted |
| 11529 | 5 | 50 | 16 | 50 | 27 | The number of causes and drivers for emissions from houses are far from complete. I miss reference to factors such as changes in climate (in many places of the world some warming has occured resulting in lower heat demand and in some places to higher cooling demand), behaviour (e.g. driven by energy prices), family size and heating systems. | redrafted |
| 3087 | 5 | 50 | 2 | | | is this supposed to read 1970s and 1980s (instead of 1900s)? Need to explain why economic decline in the EIT affected buildings emissions - is it about falling service sector emissions? Energy prices increased in the EIT and that may have had an impact on residential sector emissions. Plus there's been quite a lot of retrofitting of buildings and district heating systems which were notoriously inefficient. | noted will be considered |
| 11737 | 5 | 50 | 28 | 50 | 31 | IEA shows that heat pomp is one of key technology in building sector. Adding [such as introducing heat pump technology] after [an opportunity to deploy GHG mitigation options] would be better.<br>1.IEA:[Technology road map], http://www.iea.org/papers/2011/buildings_roadmap.pdf | now in Chapter 9 |
| 17444 | 5 | 50 | 28 | 50 | 35 | References needed | Accepted (References added) |
| 3088 | 5 | 50 | 3 | | | Chapter 9 says buildings account for 32% of global final energy and 23% of global primary energy use. Where does the 40% come from and does it refer to primary or final energy use? Which figures are correct?There needs to be consistency between chapters! | noted-to be reconciled |
| 2222 | 5 | 50 | 3 | 50 | 7 | The three sentences are very very hard to understand. The 40% in sentence 1 are clear (though the chart on the previous page shows only direct emissions (no electricity)), then the breakdown in sentence 2 does neither add up to 40% not to 100%. Finally, in sentence 3, 110% of what are they growing to? | noted will be adjusted |
| 14873 | 5 | 50 | 3 | 50 | 5 | In chapter 9 it is mentioned "In 2009 buildings accounted for 32% of total global final energy use (IEA, 2012)". Here, the share of buildings is "more than 40% of global energy used". I suggest using the most recent reference (that is IEA 2012) | noted-to be reconciled |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3090 | 5 | 50 | 35 | 50 | 36 | Need to have a date and clarify potential here, i.e. 30% is cost-effective potential by 2030 (see chapter 9). Technical potential is much higher. For which year is the IPCC (2007) potential? | only considering historical trends |
| 11842 | 5 | 50 | 35 | 50 | 35 | This statement needs a reference. | noted/redrafted |
| 5784 | 5 | 50 | 35 | 50 | 36 | These two sentences are redundant, please delete one. | noted/redrafted |
| 16024 | 5 | 50 | 35 | 50 | 36 | redundant. And the potential is much higher. | redrafted |
| 10384 | 5 | 50 | 35 | 50 | 36 | the number is inconsistent (29% and 30%) | redrafted |
| 17445 | 5 | 50 | 43 | 51 | 1 | suggest re-naming "manufacturing industries and constrauction" as "Other manufcaturing industries and construction" (i.e. other than chemicals etc, given that on p.51 lines 7-16 chemicals (and others) are then described as being part of manufacturing). The reason that this category is the largest contributor is presumably just because it is more aggregated? | correct/indicated in new draft |
| 2224 | 5 | 50 | 45 | 50 | 45 | Check if not rather CO2e, given a lot of non-CO2 in industry | taken care of in new draft |
| 4985 | 5 | 50 | 5 | 50 | 6 | Sentence: of this 21 % …….10 % from Industrial buildings. The sum of this is only 48 %, what is the source of remaining 52 %? | redrafted |
| 13515 | 5 | 50 | 5 | 50 | 6 | Sentence: of this 21 % …….10 % from Industrial buildings. The sum of this is only 48 %, what is the source of remaining 52 %? | redrafted |
| 3085 | 5 | 50 | 8 | 50 | 11 | Why has the US been singled out here? Other countries have interesting emission statistics for buildings too. Would be more interesting to have e.g. some OECD or EU figures vs developing country figures here. The fact that US building emissions exceeds the combined emissions of Japan, France and the UK doesn't necessarily tell the reader much - the population of those three countries is about 60 mill lower than those of the US and there's a lot of difference in all sectors. Emissions per m2 would be more interesting. | redrafted |
| 16023 | 5 | 50 | 8 | | | In the US buildings account for …. | redrafted |
| 10383 | 5 | 50 | 8 | | | "GHg" should be "GHG" | noted and corrected |
| 4383 | 5 | 50 | 3 | 50 | 5 | Contradictory with fig 5.2.2 which indicates 15.3% of emissions attributed to buildings | redrafted |
| 12098 | 5 | 50 | 38 | 50 | 39 | "energy efficiency in homes has become more prevalent in the past several years, largely in the OECD countries." An example would be good | Noted will be considered |
| 12099 | 5 | 50 | 38 | 50 | 39 | Coverage here regarding energy efficiency in residential buildings here does not address issues for energy efficiency in residential homes for the global poor, yet it is here that the largest energy efficiency potential exists. Please see Mills, E. (2005) 'The specter of fuel-based lighting', Science, vol 308, pp1263–1264 and Weiszakcer et al (2009) Factor Five:Transforming the Global Economy through 80% Improvements in Resource Productivity. Earthscan London - pp 92-96 available at http://www.naturaledgeproject.net/Factor5-Chapter2-ResidentialBuildingsSub-Chapter.pdf.pdf | noted-source to be reviewed |
| 6531 | 5 | 50 | 1 | | | "1980s" instead of "1900s"? | redrafted |
| 7463 | 5 | 51 | | | | Lime production is a reversible reaction and does not lead to and increase in CO2. CaCO3 (heat) = CaO + CO2. When used in the soil in absorbs CO2 and increases the pH. Ca(OH)2 + CO2 = CaCO3 + H2O. Similarly with lime in cement, some CO2 is reabsorbed when it sets. | noted- basing on IPCC 2006 industrial processes sources. |
| 17447 | 5 | 51 | 17 | 51 | 18 | should this sentence go before lines 15-16? (I think it would make more sense that way) | noted |
| 17446 | 5 | 51 | 2 | 51 | 2 | does the 16% growth refer to the period 1970 - 2002? | removed |
| 17448 | 5 | 51 | 21 | 51 | 24 | More accurately "The drivers for growth of GHG in industry....." ? Discussion is rather brief - could more space be devoted to it? | noted but allocated space limits also |
| 11738 | 5 | 51 | 25 | 51 | 29 | Nuclear power should be put into example of GHG mitigation options. | now in sectior chapter |
| 9361 | 5 | 51 | 25 | 51 | 30 | It should also add nuclear power as one of the potential mitigation measures.<br>Besides the voluntary action should be added as one of the policies because it is effective in the Japanese industry. Okazaki et al (2011) showed the effecitve example of the Japanese steel industry. | noted-mitigation options in Sector chapters |
| 10385 | 5 | 51 | 25 | 52 | 6 | There exist many spelling mistake as 'feedstocj', 'anf' and so on | noted will spell check |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9423 | 5 | 51 | 25 | 51 | 30 | ・ Addition is needed for the description of the use of nuclear energy and for voluntary actions.<br>・ It would be appropriate to add, to the list of mitigation options, the use of nuclear energy that has an effect similar to or greater than that of measures which use renewable energy as described in FOD.<br>・ The draft stipulates that the technological options for GHG mitigation must be coupled with policies. However, voluntary actions should be treated equally to policies and added, since there are voluntary actions of the industry achieving significant effects as reported in Japan.<br>・ Refer to the following documents.<br><br>Okazaki et al. [1] showed that the Japanese steel industry responded to the Kyoto target by launching a voluntary action plan in 1996 a year prior to the adoption of the Kyoto Protocol with challenging quantitative target: 10% reduction of energy consumption in 2010 compared to 1990. Since then, the steel industry has made stead progress toward achieving these goals. As a result, the energy consumption in 2008 was 11.5% less in comparison to the 1990 level (equivalent to 12.1% reduction in CO2 emissions).<br>[1]Teruo Okazaki, Mitsutsune Yamaguchi (2011)<br>Accelerating the transfer and diffusion of energy saving technologies steel sector experience—Lessons learned<br>Original Research Article<br>Energy Policy, Volume 39, Issue 3, March 2011, Pages 1296-1304<br>http://www.sciencedirect.com/science/article/pii/S0301421510008827<br><br>[1]page 1296 right column line15-23 | noted- will see what is applicabnle and what goes to sector chapters |
| 9323 | 5 | 51 | 3 | | | Please add 'in' after 'realized'. | noted-whole text redrafted |
| 11994 | 5 | 51 | 31 | 51 | 33 | Looking at the number of registered projects is giving the wrong pictures as these 0.6% actually represent more than 50% of the actually issued CERs!!! In other words, the CDM has already had an enormous impact and there is still a huge potential to use the CDM to reduce emissions in the industry sector. Please look at the large amount of research performed under the High Level CDM Policy Panel on their dedicated webpage at cdmpolicydialogue.org. | noted and will be reviwed. |
| 13694 | 5 | 51 | 31 | 51 | 33 | Replace "CDM has … another 0.6%" by "CDM has been highly successful as an instrument to reduce emissions from industry, as large-scale options in Brazil, China, India and South Korea to reduce the industrial gases HFC-23 and N2O were mobilized rapidly (see Michaelowa and Buen (2012) for an account of this process). By August 2012, two thirds of the one billion isued CDM credits came from these project types (UNEP Riso Centre 2012). CDM has also mobilized waste heat recovery in heavy industry; the over hundred projects of this type have generated more than 50 million credits to date (ibid.)". References: Reference: Michaelowa, A.; Buen, J. (2012): The CDM gold rush, in: Michaelowa, A. (ed): Carbon markets or climate finance?, Routledge, Abingdon, p. 1-38; UNEP Riso Centre (2012): CDM pipeline, download at www.cdmpipeline.org. (Data should be updated at the time of finalization of AR5.) | not included in new version |
| 10978 | 5 | 51 | 25 | 51 | 29 | A one of the examples of mitigation measures, it is suitable to add the use of nuclear energy. | belongs to Chapter 7 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12101 | 5 | 51 | 25 | 51 | 30 | Paragraph starting with "There is a wide range of GHG mitigation options in the industry sector....." misses out3 key GHG mitigation strategies for industry sectors and manufacturing sectors such as 1) waste heat loss minimisation and waste heat recovery Reference for this - US DOE (2008) Waste Heat Recovery: Technology and Opportunities in U.S. Industry. US DOE at http://www1.eere.energy.gov/manufacturing/intensiveprocesses/pdfs/waste_heat_recovery.pdf + US DOE (2004) Waste Heat Reduction and Recovery for Improving Furnace Efficiency Productivity and Emissions Performance. A Best Practices Process Heating Technical Brief. US DOE. http://www1.eere.energy.gov/manufacturing/tech_deployment/pdfs/35876.pdf - 2) Combined Heat and Power - Co/Tri Generation - Ref Oland, C. (2004) Guide to Combined Heat and Power. Prepared for the U.S. Department of Energy. Industrial Technologies Program. Prepared by Oak Ridge National Laboratory. At http://www1.eere.energy.gov/manufacturing/tech_deployment/pdfs/guide_chp_boiler.pdf 3) improving the operational energy efficiency of manufactured products, appliances, IT vehicles, industrial and commercial cooking equipment. Whilst energy efficiency of product manufacturing processes is important, it is important to note that that life cycle analysis shows that for most “energy using” manufactured products (vehicles, computers, electric motors, appliances, engines, toner cartridges and buildings) over 70% of the total life cycle energy use occurs over the 5-30 plus years of operation<br><br>For example - Product, % of lifecycle energy usage from operation , reference.<br>Cars, SUVs, pickups, buses - 65-74% (Chester, M.V. and Horvath, A. (2009) Environmental assessment of passenger transportation should include infrastructure and supply chains. Environmental Research Letters, vol. 4, no. 2, pp. 1-8)<br>US Family Sedan 85% (Sullivan, J. L., et al., 1998, Life cycle inventory of a generic U.S. family sedan – Overview of results USCAR AMP Project, proceedings of Total Life Cycle Conference Land, Sea and Air Mobility, SAE International P-339, pp.114)<br>Passenger transportation (private and public): 63-70% 63-70% (Chester, M.V., Horvath, A. and Madanat, S. (2010) Comparison of life-cycle energy and emissions footprints of passenger transportation in metropolitan regions. Atmospheric Environment, vol. 44, no. 8, pp. 1071-1079.))<br>Aircraft 69-79% (Chester, M.V., Horvath, A. and Madanat, S. (2010) Comparison of life-cycle energy and emissions footprints of passenger transportation in metropolitan regions. Atmospheric Environment, vol. 44, no. 8, pp. 1071-1079.))<br>Residential Buildings 80-90% (Ramesh, T., Prakash, R. and Shukla, K.K. (2010) Life cycle energy analysis of buildings: an overview. Energy and Buildings, vol. 42, no. 10, pp. 1592-1600)<br><br>Lighting – All Forms 98%<br>Office Buildings 86%<br>ICT network and mobile phones (e.g., 2G and 3G, not office network): 84%<br>79 -84%<br>□ | mitigation options in sector chapters now |
| 6532 | 5 | 51 | 31 | | 32 | Modify the description, as CERs issuance up to 2012 for the industry projects including Cement, EE Industry, HFCs, N2O, PFCs and SF6 are expected to dominate 65% of the total issuance, according to UNEP RISO Center. | noted and excluded |
| 12863 | 5 | 52 | 18 | 52 | 18 | Add "Forests cover approximately 30% of global land area (FAO 2010)." Food and Agriculture Organization (FAO). 2010. Global forest resources assessment 2010. FAO, Rome, Italy. | Accepted |
| 4986 | 5 | 52 | 19 | 52 | 20 | Sentence: Forest fires-post burn decay was the largest contributor …….(23.5%). The sum of % ges is almost 100 (99.8 %). Does that mean, contribution of FOLU to GHG emission consist almost only from these three items? | Taken into account: New data have been presented |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13516 | 5 | 52 | 19 | 52 | 20 | Sentence: Forest fires-post burn decay was the largest contributor …….(23.5%). The sum of % ges is almost 100 (99.8 %). Does that mean, contribution of FOLU to GHG emission consist almost only from these three items? | Taken into account: New data have been presented |
| 12861 | 5 | 52 | 2 | 52 | 3 | Say instead "Agricultural lands, including croplands and rangelands, occupy 40–50% of the ice-free land surface of the Earth and are expanding (Bartholomé and Belward 2005, Ellis et al. 2010)." Bartholomé, E. and A.S. Belward. 2005. GLC2000: A new approach to global land cover mapping from Earth observation data. International Journal of Remote Sensing 26: 1959-1977. Ellis, E.C., K.K. Goldewijk, S. Siebert, D. Lightman, and N. Ramankutty. 2010. Anthropogenic transformation of the biomes, 1700 to 2000. Global Ecology and Biogeography 19: 589-606. | Accepted |
| 17415 | 5 | 52 | 37 | | | Recommend a citation for this statement: "Consumption of livestock and aquaculture products is increasing because of increased income and production." | Taken into account: The sentence has bene deleted |
| 7464 | 5 | 52 | 39 | 52 | 42 | “The world population is expected to increase to 9.3 billion in 2050 causing greater demand for food but per capita land availability will be reduced to 0.152 ha (UNFCCC, 2012). This will necessitate intensification of agriculture and influence GHG emission”. Tempering population increase must be given prominence! | Noted |
| 12864 | 5 | 52 | 43 | 52 | 43 | For industrial agriculture as the main cause of tropical deforestation, cite Gibbs et al. 2010. Gibbs, H.K., A.S. Ruesch, F. Achard, M.K. Clayton, P. Holmgren, N. Ramankutty, and J.A. Foley. 2010. Tropical forests were the primary sources of new agricultural land in the 1980s and 1990s. Proceedings of the National Academy of Sciences of the USA 107: 16 732-16 737. | OK |
| 7465 | 5 | 52 | 43 | 52 | 47 | “Large-scale agro-industrial expansion is the dominant driver of deforestation. Across the tropics the total net increase in agricultural area was more than 100 million ha between 1980 and 2000, and more than 55% of new agricultural land came from intact forests, 28% from disturbed forests and 8% from shrub land (Gibbs et al., 2010). Land-use change for production of biofuel and livestock expansion is another driver of agriculture influencing GHG emission” The population in developing countries increase by about 75% between 1980 and 2000. In my opinion, this is the dominant driver of deforestation. I examined the rate of deforestation in every sub-Saharan African country between 1980 and 1990, and compared it to the increased demand for arable land based on the productivity for grain crops and population increase. This accounted for over 90% of deforestation. It is written up as Chapter 11 in Climate Change and Africa (2005). Ed. Pak Sum Low, Cambridge University Press, England U.K. | Noted |
| 12862 | 5 | 52 | 7 | 52 | 27 | Due to uncertainties in quantification of greenhouse gas emissions and removals, use appropriate precision by reporting results with only two significant figures. For example, say "30%" rather than "29.9%." Otherwise, the results imply a precision of measurement that current estimation methods cannot reach. | Accepted |
| 10969 | 5 | 52 | 7 | 52 | 17 | This comment about the agricultural contribution should specifically note that it is based on the 100-year GWP as the way of comparing GHGs, and that there are an increasing number of papers suggesting alternative metrics as more appropriate for use in the context of a stabilisation scenario. | Noted |
| 5786 | 5 | 52 | 9 | 52 | 18 | Please rework this paragraph. Not all water bottles end up in the ocean and it does not become clear why garbage is collected and what is done with it that warrants comparison with biomass. In addition, biomass can be garbage, too, depending on the definition of garbage / waste. | Noted. Not clear what was intended, but the section has been rewritten. |
| 3528 | 5 | 52 | | | | In principle, 'Fisheries and Aquaculture' is included in 'Agriculture' sector and the title of the section 5.7.4 should simply be 'Agriculture, Forestry, and Other Land Uses (AFOLU)' to be consistent with chapter 11. Otherwise, please justify why 'Fisheries and Aquaculture' is treated separately. | Accepted |
| 3529 | 5 | 52 | | | | The analyses of emissions trends between 1970-2008 need to be improve by including the interannual variability of emissions for the sector (AFOLU) and the categories (for e.g. enteric fermentation, rice cultivation, forest fires) during the period. It may be useful to include a graph showing the trend and thus the interannual variability. This will help to better see what happened during that period. | Accepted |
| 4182 | 5 | 52 | | | | The contribution of fertilizer and other chemicals in agriculture sector to the GHG emission should also be touched upon. | Accepted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8600 | 5 | 52 | 2 | 52 | 2 | Other reference than UNFCCC (2012) (ie. the original study) should be citing the statement that "Agricultural lands occupy about 40–50% of the Earth's land surface and are expanding" | Taken into account: The reference of FAOSTAT 2012 has been included and |
| 5355 | 5 | 52 | 43 | 52 | 46 | Is there an IPCC definition of "large-scale agro-industrial"? That sounds like jargon here in Chapter 5. It might make sense in the paper that is cited here but the authors of Chapter 5 should rephrase this so readers don't have to hunt down this Gibbs et al 2010 paper to learn what is and what is not within the bounds of this term. | Taken into account: The text has been modified |
| 5785 | 5 | 52 | 1 | 53 | 8 | This section is rather weak. You do not include any information on fisheries (besides two sentences on aquaculture), statements are not backed by references (e. g., lines 43, 47) and with all the numbers given in the first three paragraphs - did you consider putting them in a table? | Taken into account: The text has been deleted |
| 10386 | 5 | 53 | 1 | 53 | 2 | the unit for economic potential is hard to read | Accepted, will be clarified |
| 17449 | 5 | 53 | 17 | 53 | 18 | This sentence appears rather randomly | Accepted, the sentence will be revised |
| 10387 | 5 | 53 | 19 | 53 | 21 | the numbers are misspelt where the dot '.' punctuation appears to be ',' | Accepted, the numbers will be revised |
| 13217 | 5 | 53 | 21 | 53 | 21 | What is meant by "with an increment of 193, 5 %(" ? The relative increase from 734 to 1400 is 90% consistent with a relative share of a total emissions iicreasing by 80% evolving from 2.6 to 2.9 % | Accepted, the numbers will be revised |
| 5787 | 5 | 53 | 25 | | | I suggest to put this in a figure as the content would become much easier to understand. | Accepted, will be analyzed the form |
| 17416 | 5 | 53 | 6 | | | "Because of scarcity of land andavailability of new technologies many of the underperforming or waste lands will be rehabilitatedcontributing towards enhanced food production and influencing GHG emission." This also seems highly optimistic and lacks a citation. Strongly recommend reframing this as a recommendation rather than a prediction for the future. | Accepted. The text has been revised. |
| 18540 | 5 | 53 | | | | Much of the text and data in this section may be more aptly placed in the excursus section on Waste in Chapter 10. Please liaise with Ch 10 CLAs on this point. | Accepted, the liaison with Chapter 10 was realized in Vigo |
| 12102 | 5 | 53 | 10 | 54 | 26 | This entire waste summary offers no estimate of the potential GHG mitigation potential of the strategies summarised. This paper provides such an estimate. Bahor, B (2009) Integrated waste management as a climate change stabilization wedge. Waste Management & Research http://www.seas.columbia.edu/earth/wtert/sofos/wmr_nov09_p839.pdf This peer reviewed paper has calculated that integrated waste management offers an entire Socolow/pascala Wedge of GHG mitigation. | Accepted, the reference will be revised |
| 5356 | 5 | 53 | 13 | 53 | 16 | What is the citation and more importantly what is the significance for Chapter 5 of the following passage? "For example, 89 billion plastic water bottles are sold every 13 year throughout the world, and as garbage these bottles and other residues go to the ocean forming 14 the denominated ¨garbage island ¨ as the constituted by 6 millions tones of plastic between 15 California and Japan, or form accumulations in the coasts, rivers, lakes, and others." | Accepted, will be delated |
| 4384 | 5 | 53 | 15 | 53 | 15 | I am not an expert in that area, but 6 millions tons seems way under current estimates seen or heard in the news recently, a source should be cited | Accepted, will be delated |
| 5357 | 5 | 53 | 19 | 53 | 21 | The authors of this section of Chapter 5 might want to look at Kuo et al 2011 for an example of how high MSW collection rates can be and the contribution of WTE facilities ....Kuo, J.-H., et al., Emission of carbon dioxide in municipal solid waste incineration in Taiwan: A comparison with thermal power plants. International Journal of Greenhouse Gas Control, 2011. 5(6): p. 1443-1453. DOI:10.1016/j.ijggc.2011.03.001 | Accepted, the reference will be revised |
| 3530 | 5 | 54 | | | | I would suggest that you merge Figures 5.7.4 and 5.7.5 and include emissions from Waste incineration. Please clarify whether the emissions are expressed as CO2-equivalent. | Accepted, maybe the figure change |
| 5788 | 5 | 54 | 11 | | | Footnote "1A" is not related to the text, can be deleted. | Accepted, wii be deleted |
| 7320 | 5 | 54 | 7 | 54 | 10 | These lines cite numbers from the TS for the AR4.WGIIIand thus have not been updated for the AR5. Moreover, it would be better to reference the specific studies Monni et al. (2007) and EPA (2007) cited in Chap. 10.AR4.WGIII which were the basis for these numbers. | Accepted, we will revise the reference and try to improve the data |
| 17450 | 5 | 54 | 7 | 54 | 10 | would this be better represented in a chart? | Accepted, we think about the best |
| 17451 | 5 | 55 | 12 | 55 | 16 | does not appear to follow from earlier part of the paragraph | Accepted, we will move in the text or |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15291 | 5 | 55 | 21 | 55 | 22 | It is stated that waste incineration is a method for mitigation. This is true for degradable waste but not for plastics where incineration with energy recovery is causing more emissions than landfilling, at least in a time perspective of a century (Eriksson, O. and Finnveden, G. (2009): Plastic waste as a fuel – CO2-neutral or not? Energy and Environmental Science, 2, 907-914). | Accepted, we will revise the reference and try to improve the text |
| 15292 | 5 | 55 | 24 | 55 | 25 | The statement could be modified to "Recycling is in general an effective means…". A reference could be added, e.g. Tyskeng, S. and Finnveden, G. (2010): Comparing energy use and environmental impacts of recycling and incineration. Journal of Environmental Engineering, 136, 744-748 or some of the references in this metasynthesis. | Accepted, the reference will be revised and the statement modified |
| 4183 | 5 | 55 | 24 | 55 | 24 | Recycling does not always result energy saving. Usually, especially in waste plastic recycling, recycling needs more energy than once-through production but contributes to conservation of land-fill space and resources. | Accepted, will be written more clear and exact utilizing other references |
| 10899 | 5 | 55 | 28 | | | Energy intensity as behavioural change? I guess aspects could be, but not all aspects. Energy intensity as framed in the Kaya or IPAT is often Energy/$. Energy intensity may have a strong technology aspect to it. I am not sure why you want to call this behavioural change, but perhaps explain in more detail. | Accepted (new additional text and figure on drivers and factors has been brought in to link behaviour to the Kaya identity) |
| 13555 | 5 | 55 | 28 | | | The section on behavioral change is a bit an open door. No real analysis of successful policies, quantified assesssment of what is possible in terms of reductions of impacts, etc. Should be expanded if the section aims to provide avenues for consumptoin oriented emission reductions. | Accepted (text has been revised majorly; additional examples proposed to be added by Michael) |
| 18707 | 5 | 55 | 39ff | | | Cite at least one or two of the "various studies" mentioned here | Noted |
| 5789 | 5 | 55 | 41 | | | Footnotes 2 and 2A are misplaced. Please move to where they belong. | Noted. Removed |
| 5358 | 5 | 55 | 1 | 55 | 26 | There is a significant literature that speaks to the benefit of combusting MSW in terms of CO2e that really ought to be referenced here. There are many issues surrounding waste to energy facilities but whether they reduce GHG compaired to landfills isn't one of them. This body of knowledge should be cited here in this Section of Chapter 5. Luckow et al 2010 summarizes some of this literature... Luckow, P., et al., Large-scale utilization of biomass energy and carbon dioxide capture and storage in the transport and electricity sectors under stringent CO2 concentration limit scenarios. International Journal of Greenhouse Gas Control, 2010. 4(5): p. 865-877. doi: DOI: 10.1016/j.ijggc.2010.06.002 Cleary, J., Life cycle assessments of municipal solid waste management systems: A comparative analysis of selected peer-reviewed literature. Environmental International, 2009. 35(8). Consonni, S., M. Giugliano, and M. Grosso, Alternative strategies for energy recovery from municipal solid waste Part B: Emission and cost estimates. Waste Management, 2005. 25: p. 137-148. | Accepted, we will revise references , and introduce the theme of MSW combustion - waste for energy production |
| 18153 | 5 | 55 | 24 | 55 | 26 | The statement "Recycling is an effective means to reduce energy use, CO2, NH4, N2O emissions and waste at the source at the same time" is inaccurate and wrong. Emission taxes, emission permits or direct emission regulations represent efficient measures to reduce emissions. Recycling is generally a costly instrument to reduce emissions, and the effects is highly unclear. Further, waste as such does not represent a clear problem in the GHG context. The important focus is on the methane and CO2 emissions from waste, and how these are handled. Such emissions can be reduced and even eliminated, even if the waste amounts increase. | Accepted, will be written more clear and exact utilizing other references |
| 18152 | 5 | 55 | 9 | 55 | 12 | Sentence needs rewording. | Accepted, will be written more clear or |
| 8956 | 5 | 56 | 1 | | 5 | Hard to grasp without some detailed case studies of consumption patterns. | Accepted (text revised) |
| 5790 | 5 | 56 | 10 | 56 | 10 | Is this a "lack of real or imaginary opportunities" or does the theory indicate an imaginary lack of opportunities (what may only be conceived, not real, while imaginary opportunities are not existent in reality). | Accepted (this text has been deleted) |
| 18709 | 5 | 56 | 14 | | | Would be useful to get an example of the institutional and physical structures that influence or constrain behavior. | Noted (to include an example where possible from peer reviewed literature) |
| 10901 | 5 | 56 | 15 | 56 | 17 | What is the citation for "several studies". Also, the data is in emissions while the sectio is about energy intensity. It is no surprise that countries have large co2 per capita differences given different energy systems and resources, but you need data on energy consumptino per capita. | Accepted (text modified to reflect variation in energy consumption per capita; Citation added accordingly) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18710 | 5 | 56 | 16f | | | There are regional differences of the same magnitude within countries as well, e.g., NY and CA have much lower CO2 emissions than other US states, for reasons similar to those given in lines 17 and 18. | Accepted (original text deleted and modified) |
| 17417 | 5 | 56 | 20 | 56 | 28 | This chapter begins talking about energy choices, but then invokes an example of eating choices. Recommend caution in conflating all GHG-emitting activities under the category of energy. | Accepted (text modified to link emissions to dietary choices) |
| 18711 | 5 | 56 | 22 | | | what are "inherent behaviors"? | Noted (Inherent behaviour refers to behaviours that are historically/culturally |
| 10900 | 5 | 56 | 23 | 56 | 28 | Some references would be good. And this is in terms of "emissions" and vegetarian vs meat is not so much about energy intensity (in the fossil sense). This example does not really fit in this section, at least without rewording considerably to make it an energy efficiency issue. | Accepted (Reference added and text reworded) |
| 18712 | 5 | 56 | 23 | 57 | 6 | All the results mentioned in this passage should beprovided with references to the studies from which the results come. I have at least 6 instances where i would have liked to see the paper that substantiated a claim made, from vegetarianism and CO2 emissions to rebound effects. | Accepted (References added) |
| 5303 | 5 | 56 | 32 | | | ADD; In 2012, the French government announced a new law imposing progressive tariff on energy (gas, electricity) beyond a basic necessity threshold (under which the cost is decreased by between 3% and 10% from present tariff). The problem is finding clear and quantifiable criteria for the threshold. Three levels are to be taken into account according to the number of occupants and the region. But there is concern as poor people tend to live in energy inefficient housing and thus, could pay a high tariff just to remain in the basic comfort zone. | Rejected (does not fit in with the context in this section and not strongly supported by literature) |
| 17452 | 5 | 56 | 32 | 40 | | References needed | Accepted (Reference added) |
| 17453 | 5 | 56 | 48 | 49 | | References needed | Accepted (References added) |
| 18713 | 5 | 56 | 48 | 57 | 6 | It may be better to move this important distinction to the beginning of the section, and to perhaps organize the section around the distinction. | Accepted (text revised) |
| 18708 | 5 | 56 | 9f | | | Can the label "ipsative theory" be explained or defined? And what are imaginary opportunities and why do they matter? Should it be "imagined"? | Accepted (text deleted) |
| 17454 | 5 | 57 | 1 | 6 | | References needed | assmbled will be added to Zotera. |
| 10903 | 5 | 57 | 15 | | | "annihilated" is perhaps not the best word to use here. Referneces also. Will there be another section in WGIII discussing technological change? Point to that. | Accepted, word will be changed to "reduced". |
| 3041 | 5 | 57 | 26 | | 28 | I believe the AEEI concept was originally due to Manne & Richels [Manne, A.S., Richels, R.G., 1992. Buying greenhouse insurance—the economic costs of Co2 emission limits. MIT Press, Cambridge.] | Accepted, add original ref |
| 10902 | 5 | 57 | 5 | | | Some references for the "rebound effect" would be good. Is there a section in WGIII which covers this in detail? Link to that. | Accepted (text of both the behaviour section and technological change |
| 10905 | 5 | 57 | | | | What is "technocal change"? Perhaps needs a definition. How is technology change seperated from efficiency improvements (which were earlier classes as behavioural). It can be argued that the definition is somewhat arbitrary depending on the sector detail Weber, C.L., 2009. Measuring structural change and energy use: Decomposition of the US economy from 1997 to 2002. Energy Policy 37, 1561-1570. | Accepted, will be added to the Glossary. Chapter introduction will include a figure clarifying term. |
| 3296 | 5 | 57 | 7 | 61 | 19 | This is a strong, informative section and should be retained as is. | Thank you. |
| 16025 | 5 | 58 | 16 | 58 | 17 | to much sources | Rejected, we felt these sources were |
| 12039 | 5 | 58 | 24 | 58 | 47 | The importance of subsidies and state-led programs in R&D for technological change as well as investment should be mentioned, e.g. Energy Transition Policies in Germany towards renewable energy sources. | Accepted, will search for references |
| 8957 | 5 | 58 | 37 | | 40 | Where have exceptional R&D efforts been undertaken, how have they succeeded, and how can they be expanded? | Accepted, if literature can be found. See also 12039 and 5360. |
| 3264 | 5 | 58 | 45 | 59 | 30 | The de la Tour 2011 paper is cited heavily, and yet it is only one paper on the Chinese PV industry (and one that many experts in this field believe took a rather superficial look at technology transfer in the industry). Suggest citing a much broader body of evidence on the Chinese PV industry, or would be even better to use other industries and other countries in this section to build a broader case. | Accepted, other references will be looked up and text will be changed accordingly |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10904 | 5 | 58 | | | | Earlier sections of this chapter also discuss historic patterns of energy change, but draw on different literature. Structural and Index decomposition analysis is relevant here. The CLA (Sangwon Suh) should be able to point to the literature, or see earlier sections in the chapter | Accepted, Suh will be asked |
| 5360 | 5 | 58 | 24 | 58 | 47 | For what it is worth, Dooley identified a number of these historical drivers that are discussed here in 1998. Dooley, J., Unintended consequences: energy R&D in a deregulated energy market. Energy Policy, 1998. 26(7): p. 547-555. | Accepted, although reference is relatively old so we will need to see whether to include it. |
| 5359 | 5 | 58 | 30 | 58 | 40 | The work of Alpanda, S. and A. Peralta-Alva 2010 is a useful example of how a step level change in an economy's energy efficiency has happened and might be worht citing here. Alpanda, S. and A. Peralta-Alva, Oil crisis, energy-saving technological change and the stock market crash of 1973-74. Review of Economic Dynamics, 2010. 13(4): p. 824-842. DOI: 10.1016/j.red.2010.04.003 | Accepted, thank you for the reference |
| 13556 | 5 | 59 | | | | I would have expected a discussion of rebounds in the consumption section | Noted - however they were allocated |
| 5791 | 5 | 59 | 1 | 59 | 30 | Please rework this section. It is not paramount WHO found something, but what has been found and what is still not understood or included. As it is a statement like in lines 10 to 17 leaves the reader with the question "And what does this imply?" as you offer no insights beyond a mere description. Please give some more thought to what are the core findings regarding system aspects and concentrate thereon. | Rejected. Unclear what the comment refers to. WHO is not quoted on this page. |
| 3265 | 5 | 59 | 10 | 59 | 17 | The discussion of Technological Innovation Systems repeats what is already discussed at more length in Chapter 4. Suggest deleting from this chapter. | Noted |
| 4184 | 5 | 59 | 26 | 59 | 30 | The acquisition procedure of skills and know-hows in industry should be documented based on broader literature. For instance, it is well understood in Japan that the retired engineer and managers were broadly hired by Chinese companies and taught them. | Rejected. Impossible to provide such detail and no peer-reviewed references suggested. |
| 17455 | 5 | 59 | 29 | 30 | | Meaning not clear to me | Agreed, sentence has been removed as |
| 2225 | 5 | 59 | 31 | 60 | 12 | This is a super interesting and very tricky topic, very limited literature. 1) Check out the work from Steve Sorrell at UKERC (http://www.ukerc.ac.uk/support/tiki-index.php?page=0710ReboundEffects), 2) it would be really helpful to get NUMBERS on this from the equilibrium models, isn't there anything? e.g. if one would reduce fuel efficiency by 30% in all new cars, would they actually drive more? | Noted - now been included |
| 15065 | 5 | 59 | 43 | | | this is a problem on citation. | Noted |
| 3043 | 5 | 59 | 43 | | 45 | The backfire condition is slightly subtler than stated here: for a CES function, the elasticity of substitution between energy and other inputs need only be greater than one minus the energy value share [H.D. Saunders, "Fuel conserving (and using) production functions," Energy Economics 30 (2008) 2184 2235] | Saunders work now included |
| 3044 | 5 | 59 | 45 | | 49 | Actually, a response to Howarth showed his result depended on an extreme assumption of Leontief (fixed factors) production. A number of researchers (e.g., Sorrell) seem to treat this rebuttal as definitive. [H.D. Saunders, "Does predicted rebound depend on distinguishing between energy and energy services?" Energy Policy 28(6-7) (2000b) 497 500.] | Saunders work now included |
| 9255 | 5 | 59 | 10 | 59 | 15 | Does the TIS approach take into account recent developments in social media as informers and influencers? 2008 is 5 years old; we should be looking 5+ years ahead. | TIS is not incompatible with social media, and this chapter looks at |
| 10906 | 5 | 59 | | | | This is drawing on quite old literature. What has happened since AR4? What does the latest literature say? | Accepted- considerable number of new references have been added |
| 6517 | 5 | 6 | 1 | | 2 | Modify the description after "while", as it contradicts with the descriptions of P.31 line 27-28, P.32 line 11-12, and P.32 line 27. | Accepted. The sentence has beeen rephrased. |
| 16015 | 5 | 6 | 1 | 6 | 2 | Why is this efect not clear? Decline of household size cause more squere meter living space, more waste, more furniture and electric domestic products more energy use, more cars etc.) | Rejected - Because that's what the literature says - see Section 5.4. |
| 16900 | 5 | 6 | 14 | | 16 | Seems to contradict lines 3 through 8 on page 7? | Rejected: There is no contradiction. Page 7 says that changes in energy intensity are affected by structural change, p6 says that they are less |
| 16016 | 5 | 6 | 14 | 6 | 16 | sometimes is it more and sometimers less important that depends of the special situation | Accepted: The ES is being revised. |

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| 7642 | 5 | 6 | 14 | 6 | 14 | What is meant by "sector shifts". Increase in output in one sector at the cost of another sector? It might be worth mentioning that the effect of such shifts are deemed to be less important because the amount of embodied (life-cycle) emissions are not strongly affected (if this is what the argument is trying to say). | Accepted: The ES is being revised. |
| 8815 | 5 | 6 | 17 | 8 | 41 | There appears at least a tension between page 6 '17 Economic growth, in turn, is related to the level of consumption of goods and services; once the level of consumption is isolated as an individual driver of emissions, it is by far the most significant driver in both developed and developing countries (high agreement, robust evidence). This is the conclusion of numerous studies that have undertaken a structural decomposition analysis to identify the role of different drivers.' and page 8 '41 In view of this assessment, technological change and individual behaviour becomes key aspects for future efforts on climate change mitigation.' Given the acknowledgement of the rebound effect on page 7 this tension appears profoundly ideological, as if the authors of this chapter cannot question consumerism which is the institutionalised driver of unsustainable consumption and CO2 production by individuals and organisations. Simplifying here for brevity the causal chain of this consumerist driver of emissions goes via two routes to most likely one source. (1) Conventional economics is based on the utilitarian ethical assumption that more consumption is good - effectively turning greed from a classical vice (cf. Aristotle, etc.) into a virtue 'greed is good' - this is recognised JM Keynes among others. This is then closely linked to politician in 'liberal' 'representative' 'democracy' effectively buying votes by forever promising better material standards of living to all, as the politician have bought into the utilitarian ethical assumptions embodied in economic practice (2) As Kevin Anderson (2009, Climate change in a myopic world, Tyndall Briefing Note No. 36 – May 2009, http://www.tyndall.ac.uk/sites/default/files/bn36.pdf) writes 'Do we continue to pay lip service to the issue of climate change, and hope future generations will understand our preference for barely-veiled hedonism over stewardship?' In similar but much stronger terms Wenz argues that consumerism harm everybody, societies the Earth System specially that it implicated in suffering of the global poor including increases in some causes of malnutrition, health effects of pollution, greater inequity, unjust displacement from traditional neighbourhoods resulting in poorer living and working conditions, family break up and child prostitution. Indeed, he then compares selfishness and indifference in rich consumers with German citizens in Nazi Germany (Sandler R and Cafaro P (Eds.) (2005, 199-207) Environmental virtue ethics, Lanham, Md.: Rowman and Littlefield). I shall not dwell on if there is truth in what Wenz argues what this makes ideologues who promote consumerism. Perhaps the most important analysis of the causes of consumerism as the cause of environmental stress is Tim Jackson's 2002 'Consumer Culture as a Failure in Theodicy' (in Consumption, Christianity and Creation - Proceedings from an Academic Seminar held on 5th July 2002, Sheffield: Centre for Sustainable Consumption) most notably the lack of understanding of philosophical ideas of virtue by authors in Jackson including Malthus and Nietzsche. See MacIntyre A (1990, Three Rival Versions of Moral Enquiry. London: Duckworth) for a philosophical discussion of the problems Nietzschean ethics. So it can be argued that ultimately the causal chain of wanton climate change emissions can be traced back to the hedonism justified by poor theology by Rev. Malthus. | Noted |
| 12290 | 5 | 6 | 17 | 6 | 21 | Should this important finding on the role of consumption be included in the SPM? | Accepted: The SPM is being written. |
| 16017 | 5 | 6 | 17 | 6 | 21 | redundant | Accepted: The ES is being written. |
| 12291 | 5 | 6 | 22 | 6 | 25 | Please state confidence or agreement in statement on effect of trade. Also, should this statement be included in the SPM? | Taken into account: Implying cause to trade related emissions is not easy and this uncertainity has now been reflected in the re-write. Additional references, including Jakob and Marschinski (1012) |

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| 12533 | 5 | 6 | 24 | | | While gross trade volume has certainly grown as the global economy has grown, the pattern in the relative proportion of traded goods and services to global GDP over the last 150 years is more mixed. This raises interesting questions concerning whether terms of trade are a real driver or instead a consequence of deeper structural shifts in global economic systems, relative costs of primary inputs, and patterns of population growth and demographic transition. This may have important implications for policy structure to affect production and consumption patterns aggregated to a global scale. | Accepted - in an atempt to recognise the complexity of international emissions transfers, additional text has been added to recognise the causes and not just describe the current situation. The text does still not provide a comprehensive assessment of how each driver affects |
| 16901 | 5 | 6 | 26 | | 32 | Good! Manufacturing is linked to emissions with the existing energy system/technologies. Manufacturing needs energy, which creates emissions. Trade lets manufacturing move from developed to developing countries, providing benefits to both countries. | Noted |
| 13763 | 5 | 6 | 28 | 6 | 30 | I would dispute the evidence classification. Is there any evidence that points in the other direction? Some industrialized countries, such as Canada, Australia, and until a decade ago, Norway, have predominantly high emissions intensity exports, i.e. natural resources. For these countries, consumption-based emissions are hence lower than territorial ones. However, this does not contradict the statement presented here. It just needs to be made clar that not all developed countries have low emissions intensities. | Taken into account - covered with the addition in figure in section 5.5.3 |
| 7643 | 5 | 6 | 31 | 6 | 32 | I think this has been said previously. | Noted - Section is rewritten. |
| 12534 | 5 | 6 | 33 | | | It is asserted that trade is not a driver of global emissions per se, but an argument to the contrary can be made, because trade may privilege luxury, “high value” or high-embedded carbon production and consumption over subsistence. This may be a useful avenue for research. | Accepted - in an attempt to recognise the complexity of international emissions transfers, additional text has been added to recognise the causes and not just describe the current situation. The text does still not provide a comprehensive assessment of how each driver affects |
| 7458 | 5 | 6 | 39 | 6 | 42 | “Long-term statistical records show improvements in energy intensities of economic outputs (measured by GDP) by more than a factor of five since 1800 when traditional biomass fuels are included in the measure of energy inputs, corresponding to an average decline of total energy intensity of about 1% per year”. For 210 years at 1% increase per year will give an 8 fold increase not 5! | Accepted. The mistake must have occurred during the shortening of FOD text. I will provide the correction next week with relevant references. |
| 2252 | 5 | 6 | 9 | 6 | 9 | "The OECD showed considerable growth levels" which have now ceased. | Rejected: First, the chapter refers to economic growth over the 1970-2010 period. While GDP did fall in most countries in the 2008-9 recession, the |
| 13557 | 5 | 60 | | | | I miss in the section on lock in of infrastructure a reference to a very insightful Science 2010 paper of Davis and Caldeira, who caclulated how much CO2 emission still will be emitted by infrastructure available in 2010 during its normal still remaining economic lifetime | thanks, ref added. |
| 5923 | 5 | 60 | 23 | | 32 | I find it slightly strange that coal-CCS for developing countries is mentioned in a negative sense. In reality, for instance Germany is at the moment building 19 GW of new fossil capacity, largely due to the decision to abandon nuclear power. This is new fossil capacity without any CCS, a good example of lock-in to the worst options with regard to climate change. Shouldn't this be mentioned as well ? | accepted. Changes made |
| 12618 | 5 | 60 | 29 | 60 | 32 | Bioenergy and CCS is a very valid technology but may be constrained by the availability of sustainable biomass. This must be taken into account when estimating the infultration of bio CCS into any overshoot scenario. | accepted, changes made |
| 12661 | 5 | 60 | 29 | 60 | 32 | Bioenergy and CCS is a very valid technology but may be constrained by the availability of sustainable biomass. This must be taken into account when estimating the infultration of bio CCS into any overshoot scenario. | accepted, changes made |
| 17456 | 5 | 60 | 31 | 32 | | worth mentioning possible constraints on large scale BECCS (availability of resources/land etc; fact that emissions may actually increase if appropriate land use controls are not in place) | accepted, changes made |

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| 5792 | 5 | 60 | 31 | 60 | 31 | What does "BECCS" stand for? | accept, give full |
| 17457 | 5 | 60 | 39 | 60 | 43 | is this relevant to infrastructure? | accetped, changes |
| 3045 | 5 | 60 | 4 | | 12 | This section is somewhat out of date. Numerous researchers have now made rebound estimates that are well above this. A good source of a richer and more recent bibliography is [ref: H.D. Saunders, "Historical evidence for rebound in 30 US sectors, and a toolkit for rebound analysts," (2011, under review) available at http://works.bepress.com/harry_saunders/9/] This particular paper shows direct rebound magnitudes of 50% and more for certain sectors.<br>Frondel et al. report rebound magnitudes of around 60% for private transport in Germany [Frondel, M., Ritter, N., Vance, C., "Heterogeneity in the rebound effect: Further evidence for Germany." 2012 Energy Economics 34(2): 461-467.].<br>Recently, Stern and Kander have reported results for 150 years worth of data for Sweden that give rise to economy-wide energy efficiency rebound in excess of 75% over that period. [Stern, D.I. and A. Kander (2012). "The role of energy in the industrial revolution and modern economic growth." The Energy Journal 33(3):125-152]. For analysis showing how the Stern and Kander results deliver this rebound magnitude, see [H.D. Saunders, "Rebound implications of the Stern and Kander article" (under review) (2012) Available at: http://works.bepress.com/harry_saunders/33 ] | Accepted. The text and references has been revised. |
| 12540 | 5 | 60 | 43 | | | Drop or reword the phrase, "especially for BRIC after the centre of gravity of global economy moved to Asia." There is no objective meaning to "centre of gravity of global economy," and neither Brazil nor a substantial portion of Russia are in Asia. If the phrase remains, it should refer to the relative development of the trade-oriented coastal economy of Asia from Karachi to Seoul. | accepted, changes made |
| 17458 | 5 | 60 | 47 | 60 | 48 | comment of Germany and Japan appears rather randomly and does not relate to infrastructure. (It might fit better at the end of the first paragraph on p.61?) | accepted. Deleted |
| 16026 | 5 | 60 | 7 | 60 | 8 | to much sources | Rejected, we felt these sources were |
| 10910 | 5 | 60 | | | | A relevant reference here is http://www.sciencemag.org/content/329/5997/1330.full.pdf | accepted, literature reviewed and added |
| 17916 | 5 | 60 | 14 | 60 | 17 | Please link the use of the term 'infrastucture' to the definition in the Glossary. | accepted. Links made to the glossary |
| 5361 | 5 | 60 | 23 | 60 | 25 | This reviewer does not follow the stated causality of post WWII and low energy prices and today's GHG emissions. What's the specific technical point being made here and is it an important one. If yes, I would elaborate the point and cite additional peer reviewed literature that is focused specifically on the point being made here rather than pointing the reader to a massive IPCC report that was writen in 2007 and that somewhere contains something that relates to this issue. | noted. Additional literature is being searched to further substantiate and specify this point. Text will be changed in the following revisions. |
| 4385 | 5 | 60 | 29 | 60 | 31 | more undefined acronyms | accepted. Full terms are given. |
| 17805 | 5 | 61 | | 62 | | Health co-benefits: I found it disappointing and reductionist the way on how the health co-benefits have been dealt with - there is a whole series in the Lancet of 2009 - with six chapters dealing with the cobenefits for human health of mitiagtion | noted, will assess |
| 17459 | 5 | 61 | 1 | 61 | 5 | is this relevant to infrastructure? Also the comment on highway vehicles is not clear to me. | accepted, rewrite |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9424 | 5 | 61 | 15 | 61 | 19 | ・ Addition is needed for the description of voluntary actions.<br>・ The draft claims that absence of policy intervention leads, through the lock-in effect, to loss of consumption and of welfare. However, voluntary actions should be treated equally to policy intervention and added, since there are cases of voluntary actions of the industry achieving significant effects as reported in Japan.<br>・ Refer to the following documents.<br><br>As examples of successful voluntary actions, Wakabayashi has analyzed the case of decreasing the standby power of devices in Japan and the case of PFC emission reduction in the global semiconductor industry [1] [2]. The program for decreasing the standby power of devices in Japan set the goal of lowering the standby power of every major device to 1W or less by the end of fiscal 2003, the most ambitious goal in the world, and strong commitment of the industrial association achieved this goal for all devices. The semiconductor industry successfully reduced PFC emission through voluntary actions as the participating corporations shouldered burdens greater than those dictated as the norm by business standards, in order to mitigate global warming.<br>The evaluation report for fiscal 2011 of the third party committee on the Japan Business Federation's voluntary action plan on the environment, released on April 23, 2012, reported that CO2 emission from the industry and from the energy conversion sector (34 categories of business) in fiscal 2010 was 443.47 million tons, which was a 5.3% increase over fiscal 2009 and 12.3% decrease from fiscal 1990, the basis year, and evaluates this result highly as the result of persistent efforts of the industry to achieve the goal in accordance with its voluntary action program [3].<br>Okazaki et al. [4] showed that the Japanese steel industry responded to the Kyoto target by launching a voluntary action plan in 1996 a year prior to the adoption of the Kyoto Protocol with challenging quantitative target: 10% reduction of energy consumption in 2010 compared to 1990. Since then, the steel industry has made stead progress toward achieving these goals. As a result, the energy consumption in 2008 was 11.5% less in comparison to the 1990 level (equivalent to 12.1% reduction in CO2 emissions).<br>[1] Masayo Wakabayashi<br>"Success case study of voluntary actions in Japan, 1: Action to decrease standby power of devices," Socio-Economic Research Center, Central Research Institute of Electric Power Industry, Discussion Paper<br>（SERC Discussion Paper）：SERC11035<br>http://www.climatepolicy.jp/thesis/pdf/11035dp.pdf<br>[2] Masayo Wakabayashi<br>"Success case study of voluntary actions in Japan, 2: Semiconductor industry's actions to reduce PFC emission to mitigate global warming," Socio-Economic Research Center, Central Research Institute of Electric Power Industry, Discussion Paper<br>（SERC Discussion Paper）：SERC11041<br>http://criepi.denken.or.jp/jp/serc/discussion/download/11041dp.pdf<br>[3] Evaluation report for fiscal 2011 of the third party committee on the voluntary action plan on the environment<br>http://www.keidanren.or.jp/policy/2012/029.pdf<br>[4]Teruo Okazaki, Mitsutsune Yamaguchi, (2011) | rejected, as voluntary actions are not linked to locked in effect assessments. |
| 17460 | 5 | 61 | 17 | 61 | 18 | Meaning not clear to me | accepted, changes made |
| 8958 | 5 | 61 | 27 | | | Along with co-benefits there may be unintended consequences or side effects, such as reducing sulfur emissions making GH warming stronger. | noted, but this is addressed alswhere. |
| 8985 | 5 | 61 | 27 | 62 | 23 | This section is missing several of the key recent references on the air pollution and health co-benefits of GHG mitigation. These include: van Vuuren DP, Cofala J, Eerens HE, Oostenrijk R, Heyes C, Klimont Z, Elzen MGJd, Amann M (2006) Exploring the ancillary benefits of the Kyoto Protocol for air pollution in Europe. Energy Policy 34:444-460, and the review article: Bell ML, Davis DL, Cifuentes LA, Krupnick AJ, Morgenstern RD, Thurston GD (2008) Ancillary human health benefits of improved air quality resulting from climate change mitigation. Environmental Health 7 | accepted, added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8986 | 5 | 61 | 27 | 62 | 23 | In addition, the health co-benefits of reducing short-lived climate forcing agents was addressed by: Shindell D, Kuylenstierna JCI, Vignati E, van Dingenen R, Amann M, Klimont Z, Anenberg SC, Muller N, Janssens-Maenhout G, Raes F, Schwartz J, Faluvegi G, Pozzoli L, Kupiainen K, Hoglund-Isaksson L, Emberson L, Streets D, Ramanathan V, Hicks K, Oanh NTK, Milly G, Williams M, Demkine V, Fowler D (2012) Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security. Science 335 (6065):183-189 | accepted, changes made |
| 8987 | 5 | 61 | 27 | 62 | 23 | Our own work has shown that methane emissions abatement also has ozone air quality and health co-benefits, as methane is an ozone precursor. See West, J. J., A. M. Fiore, L. W. Horowitz, and D. L. Mauzerall (2006) Global health benefits of mitigating ozone pollution with methane emission controls, Proceedings of the National Academy of Sciences, 103(11): 3988-3993, doi: 10.1073/pnas.0600201103, and West, J. J., A. M. Fiore, and L. W. Horowitz (2012) Managing ozone air quality by reducing methane emissions: abatement costs and mortality benefits in scenarios to 2030, Climatic Change, 114: 441-461, doi: 10.1007/s10584-012-0426-4. | accepted, changes made |
| 8988 | 5 | 61 | 27 | 62 | 23 | We plan to submit a paper this fall that estimates global co-benefits for air quality and human health of GHG mitigation, building upon the RCP scenarios. Since we use the RCP scenarios, we expect that this will be a good way of relating this chapter to the work of WGI and WGII. I will send the paper to the authors of the chapter when it is submitted. | noted, thanks. Waiting…. |
| 11739 | 5 | 61 | 37 | 61 | 42 | Nox and Sox can be removed with high efficiency as Taylar et al. and Yeah et al. show in their respective paper.It isn't appropriate to link reducing the greenhouse gasemissions with improving air quarity.These sentence should be deleted all.<br>1.Taylar et al.:[Regulations as the Mother of Innovation],<br>http://gspp.berkeley.edu/academics/faculty/docs/mtaylor/Taylor%20et%20al%20-%20Reg%20as%20Mother%20of%20Innov%20-%20LaPo%2005.pdf<br>2.Yeah et al.:[Technology Innovations and Experience Curves for NOx Control Technologies],<br>http://gsppi.berkeley.edu/faculty/mtaylor/taylor_expcurvenox.pdf | rejected. As developing countries can be in a different situation, it is factually correct.even in developed countries, lower carbon based energy consumption will lead to lower cost of conventioanl pollution control |
| 10643 | 5 | 61 | 37 | 61 | 42 | Nox and Sox can be removed with high efficiency as Taylar et al. and Yeah et al. show in their respective paper.It is not always the case ambient air qualityt can be also improved by climate change reponses.<br>1.Taylar et al.:[Regulations as the Mother of Innovation],<br>http://gspp.berkeley.edu/academics/faculty/docs/mtaylor/Taylor%20et%20al%20-%20Reg%20as%20Mother%20of%20Innov%20-%20LaPo%2005.pdf<br>2.Yeah et al.:[Technology Innovations and Experience Curves for NOx Control Technologies],<br>http://gsppi.berkeley.edu/faculty/mtaylor/taylor_expcurvenox.pdf | rejected. As developing countries can be in a different situation, it is factually correct.even in developed countries, lower carbon based energy consumption will lead to lower cost of conventioanl pollution control |
| 9362 | 5 | 61 | 37 | 61 | 42 | It should be deleted because air quality is adequately protected in the developed countries including Japan by implementing up-to-date Sox/Nox/Dust removal system to the coal fired power plant. | rejected. As developing countries can be in a different situation, it is factually correct.even in developed countries, lower carbon based energy consumption |
| 17461 | 5 | 61 | 40 | 61 | 40 | caveat: lower energy will lead to lower air emissions IF energy source is carbon (combustion) based | noted, with thanks. Change |

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| 16943 | 5 | 61 | | | | This is not an area I have much expertise but I have had cause to review some of the literature recently. I was struck by the apparent scale of local air pollution impacts and apparent “co-beneifts”, despite the big reductions in eg. sulphur referred to (eg. p.62 lines 14-23). I’d suggest that this section should look more closely at the environment / health co-benefits including the efforts to put quantitative values on these, to which we refer in Chapter 1 of Grubb, Hourcade and Neuhoff (section 1.4); see most notably the US data we cite from NY-NAS and AER.<br>The IPCC chapter cites the OECD study Bollen (2009) and it might be worth including their core diagram on relationship between CO2 abatement costs and LEP co-benefits (also discussed in Chapter 6 of Grubb, Hourcade and Neuhoff). In that chapter we also note that the biggest co-benefits may be due to reducing the level of energy subsidies. | noted, incorporated |
| 9063 | 5 | 61 | 20 | 67 | 42 | 5.10. Co-benefits and trade-offs of mitigation actions can be deleted due to limitations on the nos of pages, and it is also covered in chapter 6 | noted, will communicate |
| 11843 | 5 | 61 | 27 | | | A little introduction of how these cobenfits were identified and selected would be good. I assume that there are more co-beneifts possible, which are mayb not documented yet or may not be included for other reasons. | accept |
| 12100 | 5 | 61 | 27 | 62 | 47 | The current text is a good start but would be much more effective if it included all the other numerous important co-benefits of climate change mitigation including, to name a few a) many energy efficiency measures also deliver water efficiency savings (Ref - Retamal, M.L., Abeysuriya, K.R., Turner, A.J. & White, S. 2009, 'Water energy nexus literature review', Institute for Sustainable Futures, UTS, Sydney, Australia. at http://www.isf.uts.edu.au/publications/retamaletal2009wenlitreview.pdf) b) biodiversity co-benefits from investing in reafforestation and habitat restoration for carbon biosequestration (Ref - Dickson, B., Dunning, E., Killen, S., Miles, L. & Pettorelli, N. Carbon Markets and Forest Conservation: A Review of the Environmental Benefits of REDD Mechanisms. United Nations Environmental Programme — World Conservation Monitoring Centre, 2009; available at http://www.unep-wcmc.org/medialibrary/2010/10/05/d26fb1d3/Environmental%20Benefits%20from%20REDD.pdf.) c) increasing soil carbon improves soil productivitiy (Ref - d) integrated waste management and higher levels of recycling - save energy, reduce GHGs and reduce waste to landfill. (Ref - Bahor, B (2009) Integrated waste management as a climate change stabilization wedge. Waste Management & Research http://www.seas.columbia.edu/earth/wtert/sofos/wmr_nov09_p839.pdf) e) Recycling organic waste streams from cities and using them to restore nutrients to the soil and soil productivity in peri-urban areas. f) Many mitigation strategies also help with adaptation - eg: energy/water efficiency nexus opportunities reduce both energy and water demand, insultating buildings, improving soil productivity, investing in natural capital to name a few. More co-benefits and more refs can be sent if interested. | accepted, changes made |
| 5920 | 5 | 61 | | 62 | | Only health-benefits have been mentioned. Also benefits to other air pollution problems (acidification, eutrophication, ground-level ozone) could be mentioned. Suitable references are e.g. Syri S., Karvosenoja N., Lehtilä A., Laurila T., Lindfors V. & Tuovinen J.-P. 2002. Modeling the impacts of the Finnish Climate Strategy on air pollution. Atmospheric Environment 36: 3059-3069. , Syri S., Amann M., Capros P., Mantzos L., Cofala J. & Klimont Z. 2001. Low-CO2 energy pathways and regional air pollution in Europe. Energy Policy 29: 871-884. | rejected, not mitigation policy |
| 10907 | 5 | 61 | | | | There is a larger literature to draw upon. Maybe some is covered in WGI, but otherwise the work of Shindell et al should point to the relevant recent literature http://www.sciencemag.org/content/335/6065/183.abstract. But, it is worth noting that there is a large literature on climate and health co-benefits that does not seem to be captured here. | noted, will consider and coordinate with sectoral chapters |

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| 4031 | 5 | 61 | | | | After the second paragraph, suggest adding the following text: "Implementation of selected measures to mitigate black carbon and tropospheric ozone could help avoid 0.6–4.4 and 0.04–0.52 million annual premature deaths globally in 2030, while more than 80% of the health benefits are estimated to occur in Asia (Anenberg et al. 2012)." The full reference: Anenberg, S.C., J. Schwartz, D. Shindell, M. Amann, G. Faluvegi, Z. Klimont, G. Janssens-Maenhout, L. Pozzoli, R. Van Dingenen, E. Vignati, L. Emberson, N.Z. Muller, J. Jason West, M. Williams, V. Demkine, K. Hicks, J.C.I. Kuylenstierna, F. Raes, and V. Ramanathan. Global Air Quality and Health Co-Benefits of Mitigating Near-Term Climate Change through Methane and Black Carbon Emission Controls. Environ Health Perspect 120:831–839 (2012). http://dx.doi.org/10.1289/ehp.1104301. The authors should also amend Table 5.10.1, accordingly (the Health Impacts section). | accepted, changes made |
| 5362 | 5 | 61 | 16 | 61 | 18 | Not sure the point(s) being made in this sentence are as policy relveant as the authors of this section of Chapter 5 might think they are. The world we live in today is being compared to an idealized world that has perfect foresight and has the ability to share costs equitably over time. Not sure this comparison helps policymakers all that much. | acceted, changes |
| 11740 | 5 | 62 | 1 | 62 | 5 | Deleate all. Refer to No.25. | accepted, deleted |
| 9982 | 5 | 62 | 1 | 62 | 3 | This part should be deleted totally because SOx/NOx emission can be technically decontaminated by installing SOx/NOx removal equipments into coal power plants, as shown in (Margaret, 2005, page369-370, Fig9) and (Sonia, 2005, page3 and 6).<br><br><Reference><br>[1] Margaret R. Taylor, Edward S. Rubin, and David a. Hounshell (2005).<br>Regulations as the Mother of Innovation: The Case of SO2 Control LAW & POLICY, Vol.27 No.2 April 2005<br>[2] Sonia Yeah, Edward S. Rubin、Margaret R. Taylor, and David A Hounshell (2005). Technology Innovations and Experience Curves for NOx Control Technologies<br>Journal of Air Waste Management Association 2005 Dec.;55(12):1827-38. Available at: http://gsppi.berkeley.edu/faculty/mtaylor/taylor_expcurvenox.pdf | accepted, deleted |
| 9363 | 5 | 62 | 1 | 62 | 3 | It should be deleted because the emissions of SO2 are already tightly controlled by implementing SO2 removal system. | accept, delete. |
| 4032 | 5 | 62 | 10 | 62 | 13 | The last sentence represents a controversial statement. Yes, it's correct to say that introducing modern cook stoves would deliver huge health benefits. However the benefit for radiative forcing is not that much obvious. The improved stoves often reduce emissions of organic carbon more that those of black carbon. Emissions of organic carbon in general lead to cooling thus cancelling out the climate benefit of the black carbon mitigation (see discussion in section 2.4.5 of "Integarted Assessment of Black Carbon and Tropospheric Ozone", UNEP/WMO 2011, available at http://www.unep.org/dewa/Portals/67/pdf/BlackCarbon_report.pdf). Therefore the wording could be as follows: "One study has suggested that in India around two million premature deaths, particularly in women and children, could be averted by introducing 150 million improved efficiency cook stoves over a decade (Wilkinson et al., 2009). However as regards to the sign of the resulting radiative forcing the uncertainty is particularly large for this mitigation option because biomass combustion emits significantly more organic carbon, which produces a cooling effect on the atmosphere, compared to black carbon, which is a warming agent. The improved stoves often reduce emissions of organic carbon more that those of black carbon (UNEP/WMO 2011)." | accepted, changes made |
| 17462 | 5 | 62 | 14 | 62 | 43 | not clear to me how this relates to health benefits | accepted, deleted |
| 12619 | 5 | 62 | 3 | 62 | 5 | 30% is the upper range currently. Some estimates are as low as 20-25%. This range should be presented. | noted, deleted. |
| 12662 | 5 | 62 | 3 | 62 | 5 | 30% is the upper range currently. Some estimates are as low as 20-25%. This range should be presented. | noted, deleted. |
| 17463 | 5 | 62 | 32 | 62 | 39 | not clear to me how this relates to transport safety/economic co-benefits (most of it seems more relevant to the health co-benefits section) | accepted, changes made |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3626 | 5 | 62 | 40 | 62 | 46 | Employment co-benefits can also be lost, e.g. if they are dependent on government subsidies and subject to strong international competition such as in the solar energy industry. In Germany, competition with Chinese producers led to bankruptcies in this industry after the feed-in tariff was reduced. | rejected, this is not relevant as international trade applies to all the sectors, not just to solar pv |
| 9364 | 5 | 62 | 40 | 62 | 46 | It should be deleted because what is happening in Finland does not necessarily apply to other countries. Employment creation is realized as a result of the policy tradeoff.(Berndes and Hansson,2007) | accepted, rewrite |
| 5793 | 5 | 62 | 41 | 62 | 46 | Please rework this paragraph as "labor markets may recover" is somewhat redundant to "employment may recover". | accepted rewite |
| 9298 | 5 | 62 | 24 | 62 | 39 | The reference shows economic co-benefit for both of the cement plant and local government to treat municipality wastes in the cement kiln as well as reduction of GHG emissions. (Susumu Sano, Akira Kato, Tomoyuki Iino, Nobuo Kasiwazaki, Toshihiko Matsuto and Nobutoshi Tanaka, Journal of the Japan Society of Material Cycles and Waste Management, Vol.16, No.5, p.341, 2005 “Effects of CO2 Emissions from the Utilization of Municipal Solid Waste as Alternative Fuel and Raw Materials in Cement Production”) | accepted, changes made |
| 5363 | 5 | 62 | 1 | 62 | 5 | This entire paragraph is missing a number of citations to the underlying peer reviewed literature. These points need to be substantiated with references to the peer reviewed literature and not just asserted. | accepted, will add |
| 10908 | 5 | 62 | | | | I guess this is quite a small sample, I would imagine there are many other economi co-benefits. For example, taking the MAC discussed in Chapter 3 I think shows there are many economic win-wins. | noted, will assess |
| 4386 | 5 | 62 | 24 | 62 | 24 | improper title, economy is not dealt with in this section | rejected. Economic is different from |
| 5364 | 5 | 62 | 25 | 62 | 31 | This entire paragraph about "energy security" is technically very weak. Need to have citations to back up the points being made here. Moreover, what is the science or technical literature that substantiates benefits of energy security as described here? If a nation still imports any oil then it is still susceptable to price shocks and the resulting economic damage. Having a Strategic Petrolium Reserve and a storng military are arguably the best energy security tools that are employed by the United States. Neiher one of those are very GHG friendly. If there are sound technical points to be made about energy security then please make them in a sound technical fashion (i.e., drawing on a broad body of high quality peer reviewed literature). Otherwise, delete this policitical sloganeering about "energy security." The US could in the name of energy security exploit its large unconventional hydrocarbon resources but that would likely result in the opposite of a "co-benefit" (see for example Dooley, J., R. Dahowski, and C. Davidson, The potential for increased atmospheric CO2 emissions and accelerated consumption of deep geologic CO2 storage resources resulting from the large-scale deployment of a CCS-enabled unconventional fossil fuels industry in the U.S. International Journal of Greenhouse Gas Control, 2009. 3(6): p. 720-730.) For a more general discussion about the lack of technical meaning of the concept of energy security and its related concept of energy independence see Council on Foreign Relations, National Security Consequences of U.S. Oil Dependency Report of an Independent Task Force, 2006, Council on Foreign Relations: New York. p. 90. | rejected. It is co-benefit, not for the sake of energy security |
| 4387 | 5 | 62 | 32 | 62 | 39 | paragraph more relevant with section 5.10.1.1 | accetped, changes made |
| 4033 | 5 | 62 | | | | After the second paragraph suggest adding the following text: "Food security: Implementation of selected measures to mitigate black carbon and tropospheric ozone would increase annual crop yields of wheat, rice, maize, and soy combined by 30 to 135 million tonnes due to ozone reductions in 2030 and beyond (Shindell et al. 2012)." The full reference: Shindell, D., J.C.I. Kuylenstierna, E. Vignati, R. van Dingenen, M. Amann, Z. Klimont, S.C. Anenberg, N. Muller, G. Janssens-Maenhout, F. Raes, J. Schwartz, G. Faluvegi, L. Pozzoli, K. Kupiainen, L. Höglund-Isaksson, L. Emberson, D. Streets, V. Ramanathan, K. Hicks, Kim Oanh N. T., G. Milly, M. Williams, V. Demkine, and D. Fowler. Simultaneously mitigating near-term climate change and improving human health and food security. Science, 13 January 2012: Vol. 335 no. 6065 pp. 183-189 DOI: 10.1126/science.1210026. The authors should also amend Table 5.10.1, accordingly (the Economic section). | accepted, changes made |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 11741 | 5 | 62 | | | | Rathzel and Uzzell show the jobs versus climate change dilemma is likely to seriously impact on workers worldwide. It's too early to refer the relationship between climate change action and job employment.This section should be deleted.<br>1.Rathzel and Uzzell:[Trade unions and climate change: The jobs versus environment dilemma.] , send attachment by another e-mail. | rejected, it should be included, positive or negative |
| 4259 | 5 | 62 | | | | This might be a place to consider the health co-benefits and their effects on the macroeconomy. See for example Keogh-Brown and colleagues submitted for publication - draft paper could be shared if there is interest. Also some policies such as those that promote active travel can avert health service costs Jarrett J, Woodcock J, Griffiths UK, Chalabi Z, Edwards P, Roberts I, Haines A Effect of incresing active travel in urban England and Wales on National Health Service costs. Lancet 2012; 379:2198-205 | noted, change |
| 10644 | 5 | 62 | | | | Rathzel and Uzzell argue the jobs versus climate change dilemma is likely to seriously impact on workers worldwide. At the moment there is no eviden to support the relationship between climate change action and job employment.<br>1.Rathzel and Uzzell:[Trade unions and climate change: The jobs versus environment dilemma.] , send attachment by another e-mail. | rejected, it should be included, positive or negative |
| 17464 | 5 | 63 | 14 | 63 | 14 | what does the 77% refer to? | accepted, changes made |
| 9268 | 5 | 63 | 15 | 63 | 20 | The IPCC draft report is correct in regard to impacts on water consumption, SOx, NH3 and NOx in regard to post-combustion capture using current generation amine solvents.<br><br>A key reason for the increased water consumption is the relatively high heat release when CO2 is absorbed into the current generation of amine solvents, which then requires significant quantities of cooling water to take away the heat in the absorber, and high quantities of steam in the stripper to release the absorbed CO2. The use of high quantities of steam then significantly reduces the amount of power generated in the host power plant.<br><br>The new generation of post-combustion capture solvents (such as hindered amines and potassium carbonate) have a much lower heat release when CO2 is absorbed, meaning cooling water requirements are either significantly reduced or can be replaced in part or in full by air cooling. The quantity of steam used in the stripper to release the absorbed CO2 is also reduced, meaning that more power is generated relative to the current generation amine solvents. | accepted, changes made |
| 12620 | 5 | 63 | 17 | 63 | 18 | Studies have shown that CCS can be done with little to no increase in water consumption. See the study IEA GHG WATER USAGE AND LOSS ANALYSIS OF BITUMINOUS COAL FIRED POWER PLANTS WITH | accepted, changes made |
| 12663 | 5 | 63 | 17 | 63 | 18 | Studies have shown that CCS can be done with little to no increase in water consumption. See the study IEA GHG WATER USAGE AND LOSS ANALYSIS OF BITUMINOUS COAL FIRED POWER PLANTS WITH | accepted, changes made |
| 4185 | 5 | 63 | 18 | 63 | 20 | Does this sentence on CHP emission mean NOX or other air pollutant? In terms of GHG, the distance between the cite and consumers does not matter. | accepted, changes made |
| 5921 | 5 | 63 | 18 | | 22 | The side-impacts of CHP have been written in a biased and untrue way, which does not represent reality in most countries with a cold climate, which utilise CHP. In these countries, building extensive, large CHP systems in cities has replaced traditional house-size or block-size heating systems, using coal, oil or wood. Thus CHP has resulted in dramatically improved air quality ! Today, large CHP plants in Europe mostly have very efficient flue gas cleaning systems, required by EU LCP directive and national legislation. A hypothetical shifting to e.g. smaller-size biomass-based systems as a climate change mitigation measure would significantly damage air quality in these cities. | accept, changes made |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5298 | 5 | 63 | 19 | | | ADD: At least two important social dimensions need to be taken into account.<br>The first is that there is a movement away from individuals being strictly consumer and they are potentially becoming producers of energy: solar on the roofs, small wind power, geothermal. In addition, due to new energy technologies and market liberalisation, consumers can choose form different energy producers/distributors and even from different types of energy (carbon based or RE), or finally, even the time of day at which they may consume more energy.<br>The second relates to the social un/acceptability issue. As regards wind power, it is often rejected by local communities, even after a communication campaign and thus cannot always be implemented even when the other technical and natural conditions exist, mostly for aesthetics and NIMBY reasons.<br>What we do not know yet is the impact of the level of unacceptability on the different energy measures and effective renewable deployment. The same argument applies to solar panels for example, judged to be often too expensive (or the return on investment is considered too long) by families or small firms, as there are issues with adding isolation to existing habitat, while dams are for local environmental impacts. Without state subsidies the development of these forms of energy may well be under optimal in the short term, until costs diminish. With sufficient development, this may even in the middle run, play a role on grid equilibrium especially large scale ones, such as the emerging European. Even when these measures are successfully implemented, one has to take into account the rebound effect. □ | partialy accepted: tradeoffs part only. The other part is not related to risk tradeoff issues |
| 9498 | 5 | 63 | 23 | 63 | 27 | delete this paragraph - There is no explanatory reason why these challenges can be overcome at a cost | accept, delete |
| 9425 | 5 | 63 | 23 | 63 | 27 | · Deletion or addition is needed as shown below.<br>· The draft claims that the challenges imposed by the deployment of intermittent generation can be overcome at a cost. However, it is inappropriate to use the word 'cost' without specifically describing what it represents. Either this sentence should be deleted, or the nature and magnitude of the cost should be specifically described. | accept, delete |
| 9256 | 5 | 63 | 28 | 63 | 40 | Biofuels combined with CCS have the ability to reduce atmospheric CO2, and this should be mentioned (along with the negative aspects) to give balance. | noted, but this is not the place to address such issue. Therefore, rejected |
| 4186 | 5 | 63 | 29 | 63 | 32 | This statement is applicable only to the crop-based ethanol cases. Cellose based fuel and sugar cane residual based fuel are not the cases. | accept, changes made |
| 17418 | 5 | 63 | 29 | | | Missing from this discussion is the GHG emissions that are associated with clearing new land for food production. This is an important potential perverse outcome of unsophisticated biofuels policies. | reject: meaning implied and clear |
| 5794 | 5 | 63 | 7 | 63 | 40 | What is a "negative co-benefit"? Sorry, this sounds like an invention to hurt no-one by hiding the truth. I suggest to use "side effect" or "secondary effect" as neutral words instead. | accepted and changes made. glossary and X-cutting |
| 5365 | 5 | 63 | 13 | 63 | 17 | There is a large body of literature about the life cycle impacts of CCS. There are even a couple of meta analysis of this literature. This is a complex issue and needs to be dealt with more carefully than what is here in the FOD. There is a critical difference between increases in non-GHG emissions on a perkwh basis and the total impact in a basin, a region, a nation or the planet. That difference is whether or not the climate policy is depressing the total amount of coal that is being used. One also needs to consider the impacts associated with not using CCS and / or not addressing cliamte change for many of the LCA impact categories. Lastly the point about CCS using more water is true for post combustion capture systems on (again!) a per kwh basis. However any climate policy stringent enough to cause large scale adoption of CCS systems probably also changes many other aspects of the energy system and therefore it is not clear for a basin or a region if there is more or less water consumed. Also there is no technical rationale for assuming that only post combustion capture systems will be used for the rest of time. Many advanced CCS power systems have very different water use patterns than a post combustion capture unit does.IEAGHG, Water Usage and Loss Analysis of Bituminous Coal Fired Power Plants with CO2 Capture, 2011, IEAGHG: Stoke Orchard, Cheltenham, UK. p. 816. | accepted, changes made |
| 11742 | 5 | 64 | | | | Employment effects(local) on the table shoud be deleted. Refer to No.27. | noted, table to be deleted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 9257 | 5 | 64 | | | | What's an FE (add to caption)? CCS should appear under Carbon Efficiency rather than infrastructure efficiency? Why will CCS increase water consumption? - pressure relief wells will produce water (though it will in many cases be saline to some degree and need treatment). Under capacity building, oil/gas knowledge and technology can be used for storage of compressed air (banking green energy), and CCS. Under Technological Risks, the danger of spills stems not so much in consumption and trade as from exploiting more difficult reserves. The biggest risks are development of cheaper technology in CCS, renewables and energy efficiencies being too slow. | noted, table to be deleted |
| 10645 | 5 | 64 | | | | The same as my previous comment. | noted, table to be deleted |
| 6533 | 5 | 64 | | | | Make Table 5.10.1. more comprehensive and precise. For example, whereas it puts productivity increase as a co-benefit of carbon efficiency, productivity almost always decline if carbon efficiency is increased by political intervention. Otherwise, delete the table so as not to create a biased view on the balance of co-benefits and trade-offs. | noted, table to be deleted |
| 7466 | 5 | 64 | | | | Social. Employment effects. The trade in biomass energy is a large (rural) job creator worldwide. | noted, table to be deleted |
| 5795 | 5 | 64 | | 66 | | In the text, there is no reference made to this table. "Options": You mean "Electrification of Transport"? What does "FE" stand for? This abbreviation is not explained. "Impacts on energy access & affordability": consumer spending will only go down if BF, RE etc. are competitive in monetary terms. And CCS has technological risks, too. | noted, table to be deleted |
| 15931 | 5 | 64 | | 64 | | RE (esp wind and solar) will have a definite + co-benefit on water consumption when compared to conventional power generation. | noted, table to be deleted |
| 9269 | 5 | 65 | | | | See comments made on same issue (reference: Chapter 5, page 63 lines 15 to 20). In the table, row "Water Consumption" and column "System/Infrastructure Efficiency", should note that the extent of water increase will depend on the type of capture process used. Prospective technologies (i.e. hindered amines and potassium carbonate) can substantially reduce this impact. | noted, table to be deleted |
| 7467 | 5 | 66 | | | | Land use. Bioenergy use. By using more of the annual net primary production, bio-energy use could have a positive effect. Biodiversity. By reclaiming degraded land for bio-energy, it could have a positive effect on biodiversity. | noted, moaterials removed |
| 4034 | 5 | 66 | 24 | | | after "IPCC 2007" add "Shindell et al. 2012, Anenberg et al. 2012" | accept, add. |
| 16944 | 5 | 66 | | | | Its very good to have this section on the complexities of using co-benefits. However, two points not fully recognised here: (i) the idea of “separating” policies to deal with each issue individually makes apparent sense economically but not if either solutions may be integrated, or policy responses involve new investment (as is often the case) in which case integrated investment to deliver multiple benefits is often the most cost-effective response. (ii) it is entirely possible that “higher domain” concerns (like climate change) can help to motivate welfare-improving policies at lower domain levels, which would otherwise not be tackled (subsidy reduction may be a classic case). This theme is developed in the concluding chapter (12) of Grubb, Hourcade and Neuhoff. Grubb, Hourcade and Neuhoff, Planetary Economics and the three domains of sustainable energy development, Taylor and Francis (forthcoming), Chapters 1 (submitted), 6 and 12 (drafts available from authors). | noted, will incorporate |
| 4187 | 5 | 67 | | | | I would point out two; first this table says that the outcome of mitigation is global, long-term and uncertain while cost and benefits are near and clear. Second, the term "development benefit" is unclear. I don't think this table is needed in this report. | accept, delete |
| 15932 | 5 | 67 | | 67 | | I am not sure - what prompts the authors to classify 'Mitigation Benefits' as 'Uncertain' / the para above the table also just mentions and excerpt from the original paper without any clear explanations. | deleted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 5796 | 5 | 67 | 6 | 67 | 10 | I disagree. Mitigation benefits are not global only. WG II has chapters on local impacts which could be mitigated by emission reduction measures, so instead of "global" you have indirect effects. In some regions, mitigation can have adaptation (or: reduced need for adaptation) as opportunity costs, while in other regions benefits from an CC may dominate. Only here you have ex situ - effects. | accept, change |
| 17465 | 5 | 67 | 7 | 67 | 8 | Meaning not clear to me | accept, clarify |
| 17919 | 5 | 67 | 28 | 67 | 31 | This rather general statements should be replaced by a cross-reference to Chapter 8 and 11 that explicitly deal with these issues on the basis of a comprehensive literature assessment. | accept, materials removed |
| 17920 | 5 | 67 | 36 | 67 | 37 | If you want to use the example of LPG here, please supply a reference and examples for the "negative co-benefits" (please use other term instead; see my comment on Section 5.10.2) of production and transport of LPG. Preferrably, examples of the distributive implications of aggregate co-benefits/co-costs results should be taken from the sector chapter assessment. | accept, table removed and changes made |
| 5797 | 5 | 68 | 1 | 70 | 23 | Please shorten this section. You can delete everything used to explain the Kaya-Identity, for example. Just give the results. I also suggest to give within-chapter references. Without any reference this section appears to be of little scientific quality. | Accepted: The section is being revised. |
| 10438 | 5 | 68 | | | | Rewrite the entire section in terms of negative and positive externalities | Accepted: The section is being revised. |
| 9064 | 5 | 68 | 1 | 71 | 26 | 5.11. The system perspective: linking sectors, technologies and consumption patterns can be deleted to limitations on the nos of pages | Rejectes: Section 5.11 ca not be deleted. It is being revised and shorten. |
| 9258 | 5 | 69 | 24 | 69 | 26 | Key to this are social perceptions and their tipping points, and that's probably related more to extreme climate events (ECVs) than background climate change, as well as the use of social media. ECVs aremore likely during sunspot peaks, so 2025-ish could be significant. | Noted |
| 5300 | 5 | 69 | 43 | 70 | 48 | Take out, other chapters cover this | Rejected: Chapter 5 has to deal with this, although the text is being revised |
| 3046 | 5 | 69 | 5 | | 12 | The third term of the Kaya Identity is dependent on so many things--factor prices, factor substitution elasticities, factor technology gains--that it makes a poor tool for projection purposes, even while it allows interesting and useful historical comparisons. The problems in using this measure for projections are at least four:<br>- a minimum degree of further disaggregation is needed, to permit distinctions between industrialized and developing countries, and between productive and end-use energy consumption (which have differing microeconomic optimizations driving them: profit-maximization vs. consumer utility maximization); further disaggregation is required to comprehend sectoral shifts;<br>- real output, Y, is more directly related to energy use than GDP (the real output of an economy is greater than its GDP); real output is a better measure of (energy-using) economic activity; GDP is a value-added measure;<br>- output, or GDP, is not independent of the E/GDP ratio: both terms are driven by common drivers such as multi-factor technology gains; the terms of the identity are not independent and so cannot be independently forecast;<br>- the multiplicity of drivers means intensity is fundamentally difficult to project, and can give counterintuitive results such as that intensity can go down even while total energy use is increased (a backfire situation with declining intensity) | Accepted: The section is being revised. |
| 16903 | 5 | 7 | | 8 | | The story you seem to tell here is one of austerity -- Do we intend to suggest people should stop consuming? No consumption, no production, no job. No paycheck leads to no policy action. Decarbonizing our energy system and being more efficient does not mean austerity. Please emphasis that the least cost and most desirable lever to pull is new techs that need what appears in all modeling to be relatively affordable incentive of a CO2 price. | Rejected: we don't suggest austerity as solution. |
| 12292 | 5 | 7 | 12 | 7 | 13 | Please consider to include this key finding in the SPM | Accepted: The SPM is being written. |

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| 13764 | 5 | 7 | 12 | 7 | 16 | This must be incorrect. Where do you find a rising carbon intensity? Not in any of the regions depicted in Fig. 5.2.5! However, as I know the story, the increase in global average carbon intensity is due to the disproportionate rise in the energy consumption of emerging economies,e specially China, which have a much higher carbon intensity to start out with. | Accepted. This is clearly a mistake – not even global energy intensity is increasing (nor that of China). |
| 15978 | 5 | 7 | 12 | 7 | 16 | however, when looking at the period from 1970 - today, coal has been a major driver of carbonization; while nuclear energy has been a driver of decarbonization ... see steckel et al. (2011) | Accepted. Coal has been indeed the major driver of carbonization, or rather a barrier toward faster decarbonization worldwide. Nuclear and other zero-carbon options such as new renewables |
| 15977 | 5 | 7 | 2 | 7 | 2 | regarding China: which has however shown an increasing EI after 2000; also results hinge critically on whether to look at GDP in MER or GDP | Rejected. This cannot be correct. The rate of energy intensity decline in China has slowed down from historical records of some 4 percent per year during the |
| 16902 | 5 | 7 | 20 | | 21 | But mass changes in behavior without incentives? A few lines later (bet'n 26 - 28) if people change behaviors in fairly large way, but we are still stuck with the same energy system techs, we are still stuck. | Noted |
| 7846 | 5 | 7 | 20 | 7 | 21 | This sentence only makes real sense if "future" is inserted before "emissions" at the end of the sentence. | Accepted (insert word "future" before |
| 7644 | 5 | 7 | 30 | 7 | 30 | Besides behaviour, there are other social forces that act as barriers. For example, the inertia of institutions. | Noted |
| 14387 | 5 | 7 | 35 | | | I disagree that the literature calls for a reduction in consumption, not the mainstream climate economics literature. That is all premised on continued increases in consumption, and indeed rising consumption is implicit in the use of positive discount rates. | Rejected (literature exists to support this view) |
| 4764 | 5 | 7 | 36 | 7 | 43 | I fullt support this statement regarding the "rebund effect". It is not always the final product that becomes cheaper, but rather the cost of the total quantity that is cheaper (for instance, thaks to energy efficiency measure, you will decrease your energy consumption, the unitary energy price is the same, so your global purchase decreases ... wil may lead to extra-consumption ...) | Noted |
| 12535 | 5 | 7 | 42 | | | A summary of the recent literature suggests the rebound effect is at the lower end of the 10-30% range for the power sector and passenger vehicles, and that the effect has likely been declining over decades. Stephen Nadel, 2012. "The Rebound Effect: Large or Small," American Council for an Energy Efficient Economy, http://aceee.org/files/pdf/white-paper/rebound-large-and-small.pdf | Taken into account - additional references have been added from the comprehensive review to date of rebound effect, namely Sorrell (2009). |
| 14386 | 5 | 7 | 9 | | | Not very helpful except as background to talk about declining coal since 1880; rise of China /coal in last couple of decades. Memo: for major-country decomposition of Kaya equation in last couple of decades, see Cline (2011), pp. 10-11. | Rejected. Historically, coal has declined since the peak of its global energy share in 1920. The share has been increasing during the past decade particularly |
| 5348 | 5 | 7 | 20 | 7 | 21 | Why not say that there is "high confidence" that behavior is an important aspect of anthorprogenic emissions? I can't imagine there being much serious debate about whether behavior is important or not. | Accepted (can be changed in Executive summary) |
| 10909 | 5 | 70 | | | | I do not know who came up with that FAQ, but that is hard to answer. The first sentence, whilst perhaps true, is a rather significant assumption. History did not tell us much about the 2009 financial crisis. If countries take positive mitigation measures, then history may fast become irrelevant. Future emissions are about choices we make today, and if we make no choices, then history may repeat. | Accepted: Sentence reworded so it poses the question in a way that can be answered from the information in the chapter |
| 13558 | 5 | 70 | | | | I like the FAQ, a nice way of condensing the key messages of the chapter. | Noted |
| 8959 | 5 | 70 | 1 | | | Conclusion could start here since the immediate preceding pages are repetitive. | Accepted: The section is being revised. |
| 11743 | 5 | 70 | 21 | 70 | 22 | Existing low carbon technologies are important as mentioned in No.22. This sentence should be amended to [In view of this assessment, technological change and individual behavior with accelerating the decarbonaization by using low carbon technologies becomes key aspects for future efforts on climate change mitigation.]. | Accepted: The section is being revised. |

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| 4035 | 5 | 70 | 43 | 70 | 44 | delete "and economies in transition". In fact the population of these countries is decreasing. See the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat for statistics. | Accepted: The section is being revised. |
| 4987 | 5 | 71 | 15 | 71 | 16 | Sentence: Agriculture accounts for 11.5% of global GHG 15 emissions. This should not be Agriculture only but should be FOLU ( See same chapter page 52, Line 18 -19) | Accepted: Sentence changed as proposed. |
| 13517 | 5 | 71 | 15 | 71 | 16 | Sentence: Agriculture accounts for 11.5% of global GHG 15 emissions. This should not be Agriculture only but should be FOLU ( See same chapter page 52, Line 18 -19) | Accepted - duplicate comment |
| 17419 | 5 | 71 | 16 | | | "Technology has some scope to reduce the carbon footprint of food production, and substantial scope to reduce the carbon footprint of food distribution, however, consumer choice will play a large role in taking advantage of these food-related opportunities." This is a large and important topic, with a large and growing literature, that should be developed much more robustly in the document. | Noted |
| 8817 | 5 | 71 | 24 | 71 | 24 | The use of the term 'wise' is welcome and points to a virtue epistemology which incorporates the predictive elements of 'scienctistic' epistemology but also incorporates more humble elements such as precaution. | Noted |
| 5302 | 5 | 71 | 31 | 72 | 8 | Take out, other chapters cover this | Rejected: Chapter 5 has to deal with this, although the text is being revised |
| 10390 | 5 | 71 | 6 | 71 | 7 | [section7 5.6.1 and 5.6.2 still not available] should be substituted by the real content | Accepted: The sections missing when the FAQ was prepared have since become available and the figures were |
| 5301 | 5 | 71 | 9 | | 16 | Take out, other chapters cover this | Rejected: Chapter 5 has to present the overall picture with regard to drivers, trends and mitigation, setting the stage |
| 6534 | 5 | 71 | 9 | | 10 | Replace "not dependent on fossil fuels" with "less dependent on fossil fuels", to be more reasonable. | Accepted: sentence revised as proposed |
| 12865 | 5 | 75 | 37 | 75 | 40 | Delete one of the duplicate references to Ehrlich and Holdren (1971) and change citations in the text to read "1971" (rather than "1971a" or "1971b.") | Editorial |
| 13561 | 5 | 78 | 31 | | | Hertwich and Peters referenced twice | Editorial |
| 11838 | 5 | 8 | 10 | | | From my reading of other parts of this report and of WG2, I had the feeling that co-benefits are usually perceived as being positive and if negative are rather termed trade-offs. Here it is unclear what are trade-offs then, if co-benefits can also be negative. Later in the text (section 5.10) this is clarified but to me it seems more intuitive to talk about co-benefits with a positive and about trade-offs with a negative connotation (although of course the authors rightly point out that positive co-benefits for one persone/group maybe negative for another ("winners and loosers") | Accepted: A definition of co-benefits was agreed in Vigo for the whole WGIII and what Chapter 5 should do about it was also defined. |
| 4158 | 5 | 8 | 17 | 8 | 19 | I agree that "many" cobenefits are short-term, but the promotion of renewable energy sources would contribute to the long-term sustainability. This sentence sounds that long-term co-benefits have only minor effects. | Accepted: A definition of co-benefits was agreed in Vigo for the whole WGIII and what Chapter 5 should do about it was |
| 4765 | 5 | 8 | 20 | 8 | 25 | Is it possible to have qualitative values for this statement? % or numbers associated? | Accepted: The texts are being revised. |
| 12294 | 5 | 8 | 20 | 8 | 23 | Please consider to include this key finding in the SPM | Accepted: The SPM is being written. |
| 16204 | 5 | 8 | 20 | | | decreasing trend in efficiency' is misleading; there is a decrease in the RATIO used to embody efficiency, however, efficiency itself is improving (see point up above on 1.17.27) | Accepted: The texts are being revised. |
| 6518 | 5 | 8 | 20 | | | Replace "the decreasing trend in energy efficiency" either with "the increasing trend in energy efficiency" or "the decreasing trend in energy intensity". | Accepted: The texts are being revised. |
| 5296 | 5 | 8 | 27 | 8 | 37 | Take out part on other chapters, summarise what 5 does and no mention of what the other chapters do not do | Accepted: The texts are being revised and coodinated with other Chapters |
| 8942 | 5 | 8 | 31 | | 36 | Use of imperatives must and we have to seems overly directive. | Accepted: The texts are being revised. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11199 | 5 | 8 | 32 | 8 | 42 | The summarised conclusion of the assessment does not mention the vital need to combat emissions through governance, land tenure and rule of law measures that are essential for tackling land use changes related to direct and indirect drivers. Improved governance and equitable tenure regimes in line with international obligations are needed to stem unregulated land acquisitions and conversion of habitats by agricultural, forestry, infrastructure and energy sector developments (biofuels, foods, fibres, veg oils, mining, oil and gas, roads, dams, forced displacement, expropriation and fragmentation of communal lands and destruction of community-based sustainable land use systems). In other words, tackling emissions is not just about individual behaviour, technological change, trade and consumption patterns (though these are also key), but also about upholding the rights of indigenous peoples and other customary resource owners and users to own and control their lands and resources and thus stem uncontrolled land use change | Rejected: Chapter 5 does not deal with mitigation options. Please refer to sectoral as well as policy chapters in WGIII for detail assessment of mitigation options. |
| 13213 | 5 | 8 | 35 | 8 | 36 | This is a major conclusion which should be highlighted. However, to be not policy prescriptive, the second sentence should be rewritten, e.g. in the followind way: " Such a shift implies to reduce energy per output, or to decarbonise energy supply, or both | Accepted: The texts are being revised. |
| 7645 | 5 | 8 | 36 | 8 | 36 | Probably better to avoid 'we'. 'We' can mean different things and is not well defined. | Accepted: The texts are being revised. |
| 12293 | 5 | 8 | 41 | 8 | 42 | If possible please include what role leadership has in order to mitigate emissions. | Rejected: Chapter 5 does not deal with mitigation options. Please refer to sectoral as well as policy chapters in |
| 16904 | 5 | 8 | 41 | | 42 | But the question then is how do we change behavior and technology? Education campaigns, shaming? Or create an incentive that points producer and consumer behavior in the same direction (consumers prefer techs that have lower emissions and producers move fast to create and produce). | Noted |
| 4159 | 5 | 8 | 42 | 8 | 42 | becomes -> become | Editorial |
| 4028 | 5 | 8 | 9 | 8 | 10 | Suggested wording: "Co-benefits and other trade-offs have also influenced the implementation of mitigation policies and measures and, therefore, the GHG emissions. Side effects of implementation of mitigation policies can be positive or negative." | Editorial - text has changed |
| 15979 | 5 | 8 | 9 | | 14 | it's not immediately obvious to me why co-benefits need to be discussed in a chapter on drivers and trends | Accepted: A definition of co-benefits was agreed in Vigo for the whole WGIII and what Chapter 5 should do about it was |
| 5299 | 5 | 86 | 21 | | | ADD: A recent socioeconomic study undertaken by CEPS indicates that domestic users in different countries demonstrate notable different preferences for the characteristics ascribed to the reliability of electricity supply. For example, respondents in France are willing to pay for the certainty of knowing the seasons during which a power cut would take place and to avoid power cuts occurring in the evening. But French respondents are not willing to pay to reduce the frequency or the duration of power cuts. By contrast, respondents in the UK and Italy are willing to pay to reduce the number of power cuts and their average duration. UK households are willing to pay to avoid a cut during the daytime whilst those in France are willing to pay to avoid a cut in the evening. Respondents in Italy, however, prefer knowing in which season a blackout would occur, whilst the time of day at which it occurs is not important. There are thus national differences that seem to be in part explainable by the national energy structure (France's energy is based on nuclear and is thus very stable throughout the seasons. Gas supply stability and prices do raise issues in individuals' perceptions on their willingness to pay and when they prefer a power cuts to occur or how long it would be. But on these points, there are also national differences which are yet to explore. C. Wan-Jung, A. Hunt, A. Markandya, A. Bigano, R. Pierfederici, S. La Branche. Consumer Valuation of Energy Supply Security: an analysis of Survey results in three EU countries, Centre for European Policy Studies Policy Brief. 2010. | Noted |

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| 15556 | 5 | 9 | 1 | 11 | 11 | The whole Introduction seems to adress GHGs only, not other minor substances, in particular aerosols of quite different origin, composition, and substantial contribution to radiative forcing, in particular to cooling via their clouds effects. This causes a bias in the whole Chapter, which (almost, except in 5.2.2) ) neglects the particles in the atmosphere. | Rejected - the introduction cannot be comprehensive. |
| 5764 | 5 | 9 | 1 | 11 | 11 | This section is too long. If written in a more concise, less prosaic manner it could be shortened down to about one page length. | Taken into account - revised and shortened. |
| 15057 | 5 | 9 | 10 | | | what is the unit of gross world product, Monetary or physical value? Need specify for non-expoert | Noted: text is rewritten |
| 8943 | 5 | 9 | 13 | | | Overreliance on Kaya Identity which is crude at best. Similar to Drake Equation in astronomy, with no predictive, dynamic power | Noted. SOD is clearer on use of decomposition. |
| 14459 | 5 | 9 | 13 | | | In mathematical terms this is indeed an identity, not explaining anything. It might confuse mathematician and physicist and other scientists.<br><br>A better representation would represent (G/P), (E/G) and (CO2/E) as parameters rather than as quotients. For many scientists it could help if all of these were explicitly shown as dependent on time.<br><br>In my view the Kaya identity as presented here seems to be a bit naive and simplistic, probably too close to economic modelling. A birt more mathematical rigidity could help to make the reasoning in the chapter better understandable and better describing causes and effects. | Noted. SOD is clearer on use of decomposition. |
| 4160 | 5 | 9 | 14 | 10 | 9 | These sentences could be reduced, if we seriously have to squeeze pages. | Taken into account - Section rewritten. |
| 14460 | 5 | 9 | 14 | | 16 | If the (G/P) etc are represented as parameters, the identity is no longer so obvious, and the equation will better represent the different influences on the emissions.<br><br>Actually, this is done in the equations (1) and (2). | Noted. SOD is clearer on use of decomposition. |
| 12295 | 5 | 9 | 2 | 9 | 6 | It seems like the WGIII is doing the analysis themselves, and not referring to published material, please consider rephrasing. | Taken into account - rephrased to make clear we assess the literature |
| 2253 | 5 | 9 | 2 | 71 | 26 | Trends in 40 years since1970s are a good way of concealing what is actually happening, before, during and after these years | Taken into account - we explain our time frame |
| 13765 | 5 | 9 | 2 | 9 | 29 | I think it should be pointed out already here that the identity can be expressed in terms of production (we are really talking about value added in a country) and consumption. The two perspectives are complementary but offer different interpretations. | Taken into account - we explicitly mention production and consumption in the introduction, but don't want to |
| 15980 | 5 | 9 | 2 | | | the ipcc might want to think about how appropriate it is to work with trends until the late 2000s when it's released in 2014. i'm aware that literature today uses data until 2008 or 2009 but many analyses in the chapter can be easily replicated with newer data (thinking e.g. at the Raupach paper) ... maybe it would be possible to do some analyses that includes latest data in a later process of the AR5, maybe also collaborating with e.g. the IEA in order to get access to the most recent trends | Taken into account - data are updated to 2010. |
| 14461 | 5 | 9 | 24 | | 28 | Further on the above comments: this could read that this chapter tries to identify and understand the underlying causes for the time dependence of the variable and parameters of the equation. | Noted. SOD is clearer on use of decomposition. |
| 14462 | 5 | 9 | 30 | | 33 | This indeed implies that the chapter is trying to find ex-post explanations of why the emissions of greenhouse gases have changed over time, rather than trying to find the reasons why emissions change as a consequence of general and specific changes in the major variable (population) while at the same time the wealth and energy intensity of the society and the production processes changes as a result of many other variables. And whether or not these changes explain the (observed) changes in emissions.<br><br>I feel that this is a consequence of the choice to start from a mathematical identity, rather than from a (causal) relation between changes in the society and economy worldwide and the resulting global emissions. | Noted. SOD is clearer on use of decomposition. |
| 11840 | 5 | 9 | 30 | 11 | 11 | This (very topical) part of the report could be shortened | Taken into account - Section rewritten. |

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| 15981 | 5 | 9 | 30 | | | I agree it's a good structure, but it might be a little misleading: for example thinking of energy intensity, it comprises both, energy efficiency improvements and structural changes ... maybe it makes sense to explain this somewhere .. | Noted - lack of space does not allow for extensive explanation of all elements. |
| 14463 | 5 | 9 | 41 | | 42 | "Attributed to" is quite similar to "causality", isn't it?<br><br>Throughout the chapter there seems to be some confo=licting use of terms like "causality", which is sometimes said not to be looked for and the use of the term "driver". A "driver" drives something and therefore would have some causality implicitly in it. Actually, the analyses seem to look for correlations, be it in a rather confusing way. | Taken into account - we pay more attention to explaining what we mean by 'drivers', and its relation to causality and correlation. |
| 14464 | 5 | 9 | 43 | | 45 | What probably is meant here that the chapter merely wants to look at correlations. But, are production and consumption not correlated. If so, the two approaches are not independent, but again correlated! | Noted. Not clear what the referee is after. |
| 12854 | 5 | 9 | 6 | 9 | 6 | Because this chapter relies so prominently on the Kaya identity, it should provide a citation here to a peer-reviewed reference. The reference list, however, does not give a peer-reviewed reference. | Taken into account - reference provided in Section 5.3 |
| 12855 | 5 | 9 | 6 | 9 | 6 | Becase this is the first methion of the IPAT identity in the main text, cite here the peer-reviewed reference (Ehrlich and Holdren 1971). | Taken into account - reference provided in Section 5.3 |
| 13766 | 5 | 9 | 6 | 9 | 11 | The way I have learned about IPAT - from John Holdren - A was already expressed at GDP, and further decompositons were possible. | Taken into account - Section 5.3 will provide the literature reference. |
| 18140 | 5 | 9 | 2 | 9 | 3 | Justification required as to why 1970 has been chosen as the start point of this historical analysis. For example, would the start of the industrialisation period (1850s) not be a better choice? | Taken into account - we explain our time frame |
| 12621 | 6 | | | | | I am concerned by the heavy reliance of BECCS in teh overshoot scenarios without any analysis of the availability of such significant amounts of sustainable biomass. | Accepted. We intend to better highlight the role of BECCS and associated |
| 12664 | 6 | | | | | I am concerned by the heavy reliance of BECCS in teh overshoot scenarios without any analysis of the availability of such significant amounts of sustainable biomass. | Accepted. We intend to better highlight the role of BECCS and associated |
| 6401 | 6 | | | | | In my version, this figure is really screwed up. Regardless, I'm not sure how much this shows. The x-axis is "degree of international cooperation" but it appears to really only show two locations on the x-axis that are close to each other. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 6394 | 6 | | | | | Is the CO2 budget in GT? | The figure shows total radiative forcing from all agents (CO2, other gases, non-gas agents such as aerosols) in Watts |
| 6404 | 6 | | | | | I really like this figure. But I think it needs more description. | The author team is working on ways to clarify the description of this graphic. |
| 6405 | 6 | | | | | It is not clear what Low30 and High30 refer to. | The author team is working on ways to |
| 6406 | 6 | | | | | The figure is screwed up. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 17277 | 6 | | | | | The way of presenting the ranges has become more or less the standard in IPCC report. It provides median results with a band-with that looks like an uncertainty bandwith. However, it hides that all these are individual modelling results that show great variety. In the text, more attention should be paid to explaining the differences in outcomes between the various models. | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies becoming available. This includes a revision of figure formats that more adequately represent the fact that a large number of studies are included in such summary figures. Also pointing out |
| 17278 | 6 | | | | | Next to presenting ultimate emissions, it would be also useful to present emission reduction efforts compared to a reference development. | Comment is noted and will be considered as the text is adjusted for the |

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| 2421 | 6 | | | | | I found the discussion of SRM and CDR, although necessary, to be piecemeal. It is not clear for instance why SRM is discussed in two different places. My suggestion would be to discuss negative emissions and BECCS in section 6.3 because these are already considered in some of the existing stabilisation scenarios but defer the discussion of SRM to section 6.9. This separate section on geoengineering should rely much more on the assessments already made in WGI (chapter 7) and WGII and focus on aspects that are directly relevant to WGIII. What is the potential for CDR (beyond BECCS) and SRM to modify the existing framework of stabilisation scenarios? The comment on cost-benefit vs risk-benefit is interesting, but can nothing more be said in that respect? Can we / should we differentiate temporal scales when discussing SRM (ie a few decades vs a century vs several centuries)? The termination issue needs to be discussed in the context of stabilisation scenarios. | Noted. Although it might be valuable to split the discussion of CDR and SRM into two subsections, the outline for the section has already been approved and it would be difficult to change at this time. The SOD will discuss CDR and SRM implications for emisisons pathways in 6.3 and then discuss technologies in 6.9. |
| 2182 | 6 | | | | | Thetitle of the Emissions level relative to 2005 should give units (%). | Editorial |
| 13761 | 6 | | | | | What is % NPV? You mean NPV as % of GDP? The etire following discussion of this aspect is confusing | Taken into account. The text and figure |
| 13135 | 6 | | | | | This is over 400 scenarios, how many models have been used for creating these? Are all models approximately similarly represented, or are some models strongly overrepresented? Elaborate here or elsewhere (section 6.2.5?), so that the intra vs inter model differences become clearer. Would be good to have statistics on models vs targets (i.e. a matrix that shows climate categories on one axis and model names in another, then populate with numbers of targets run by given models), I think this would be very important for understanding the sources of variation. | We will add a statistics on model. Overrepresentation of certain models is indeed an issue. |
| 13148 | 6 | | | | | What explains the below one index for cat 1 mitigation costs for the partial equlibrium models? Is it because most (in comparsion to the cat 3 scenarios) of their costs occur post-2050? | Taken into account. Figure revised. |
| 13155 | 6 | | | | | Figure not readable. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 13158 | 6 | | | | | See previous comment, I suggest the figure is removed. | Figure 6.24 has been replaced by a figure that relates climate targets to the use of fossil fuels to link the discussion |
| 13160 | 6 | | | | | See the previous comment, I suggest the figure is removed and replaced with a short explanation. More detailed results on low carbon technologies follow in any case. If it seems absolutely necessary to include a figure, I'd rather see a single figure showing (for 2050) the low carbon share (or absolute numbers, if this otherwise get too close to the figures that follow later) on one panel and total primary energy in another. | Figure 6.25 is kept in the section to illustrate that the absolute level of low-carbon energy deployment is not fully determined by the climate target. A |
| 13161 | 6 | | | | | This figure, while very nice in theory, is not readable in its current form. The letters, especially, are nearly impossible to read, make the figure very messy and I would therefore strongly recommend removing them (it's also impossible to read any colours for the letters). An option might be to just indicate the base year and final year of each transition path (with climate target dependent markers?), so that the time element could be kept in the figure. | Figure will be reworked. |
| 13162 | 6 | | | | | As with the previous figure, the letters are not visible and make the figure messy. I don't think they're really necessary either, as it doesn't seem that important to know which model has produced a certain path. Finally, might be worthwhile to consider some alternative division of fuels as currently most of the figure is empty (because solids having such low shares on the end use level). | Figure will be reworked. |
| 13163 | 6 | | | | | Also here I would suggest removing the letters and replacing them with simple markers. Especially if it's expected that more scenarios will be included for the SOD. | Figure will be reworked. |
| 13165 | 6 | | | | | The definitions for the technology variation scenarios need to be explained already here. Currently they are included in the following figure (6.30) | Figure 6.29 has been removed due to space constraints. However, an explanation of the numbers at the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13168 | 6 | | | | | This figure is mostly empty space and therefore mainly communicates that there are a couple of outlier scenarios in which land use related CO2 mitigation is especially strong. If this is not the only message that the reader should get from this figure (especially the left panel), I would recommend altering the figure. | Figure revisited. |
| 13169 | 6 | | | | | I don't think it's necessary to show explicitly the results for individual models; the figure gets very messy and difficult to read. Show specific ranges instead, for the three milestones years and for the two scenarios. | Figure revisited. |
| 13171 | 6 | | | | | This figure doesn't seem very necessary: The logic of the emission trajectories doesn't differ significantly from those of delayed participation scenarios (which are included in the previous figure), even if they are produced differently (and may have more/less optimal emissions in the short term). Add also these scenarios to figure 6.34, or alternatively create two figures, one with full where and when flexibility and one with non-optimal mid term emissions (delayed participation, myopic, stochastic etc scenarios) | The author team is working on ways to improve this graphic and better distinguish it from the previous figure. |
| 13173 | 6 | | | | | Figure not readable. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 13185 | 6 | | | | | Figure not readable. | Accepted. Replaced with other figure. |
| 13189 | 6 | | | | | Cross reference this with what's said on page 45, lines 19-22 (and shown in figure 6.26?). Presumably the difference could be explained by the different time horizons (2100 vs 2050) and/or by significant differences in total final energy use between the climate categories? Please clarify, in any case. | A better integration of Section 6.2.7.2 (in SOD 6.3.4.2) and Section 6.8 is planned, including cross-referencing |
| 13138 | 6 | | | | | How do you explain the wide range of cat 4 cumulative emissions for 2000 to 2100? The range, in terms of forcing, should be only 1 W/m2 for this category (4-5 W/m2), but the cumulative emissions can almost triple and climate consequences would still be consistent with cat 4? Surely non-CO2 gases alone can't explain this and the significant overlap with cat 5? Please elaborate. | Differences in carbon cycle representation of models; timing; etc. We will elaborate the overlaps for sure. |
| 11246 | 6 | | | | | · I am missing something like “no regret options”. This could be an interesting framing, e.g. no matter which delay we face, no matter which stabilization target should be achieved, technology X is always important and is required at a deployment level of Y. | Noted. We have not decided whether to use the notion of "no-regrets" options as part of the framing of the story in the chapter. We are considering alternnative framings for explaining the sorts of |
| 11260 | 6 | | | | | Fig. 6.10 is one of the key figures for me, this should come in the executive summary, because it shows the effect of CCS and Bio+CCS availability on the emission profiles. If a figure with the new model results can be provided where one can see from one model the differences of “w CCS”, “w/o CCS” and “w or w/o bio-CCS” this would be extremely interesting | We will try to do so. |
| 11266 | 6 | | | | | Fig. 6.13: I cannot agree to the message that “the costs are highly dependent on the level of stabilization”. From Fig. 6.13 I can only see that there is a slight, but mainly linear increase. Only CGEs are differnt, this should be explained. The x-axis is probably misleading with equidistant part between the categories | Noted. Now the figure provides separate bars for different cost metrics and the text is adjusted. |
| 16690 | 6 | | | | | When discussing "transformation pathways" are we talking about transformation of the energy system technologies, or transformation of the emissions trajectory over time? This is sometimes unclear. | Noted. The next version will at least introduce the notion of a transformation |
| 9066 | 6 | | | | | premature to comment as results are still preliminary | Noted |
| 10970 | 6 | | | | | This is the best of the four chapters that I have read. | Noted. |
| 17476 | 6 | | | | | what do the diagonal lines represent? | The lines have no meaning and were not part of the original document. There seems to have been a conversion error |
| 17477 | 6 | | | | | what do the diagonal lines represent? | The lines have no meaning and were not part of the original document. There seems to have been a conversion error |
| 17807 | 6 | | | | | The transformation pathways does not take into account an indepth social and political analysis - linkages with chapter 3 are missing and societal issues that could be dealing as drivers | Noted. Efforts will be made to reference Chapter 3 as appropriate. |
| 17808 | 6 | | | | | are not described. | Nonsensical |

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| 13737 | 6 | | | | | Figure 6.12 should differentiate solar radiation management (SRM) and carbon dioxide removal (CDR) rather than putting the umbrella term Geoengineering twice in the chart, which confuses the reader even more as one needs to figure out what type of technology is meant. In Addition 'sequestration technologies' is inacurate here: If it said carbon dioxide removal (CDR) it were more clearly differentiated from both CCS (which belongs in the Mitigation technologies category then) and from SRM (which interferes in the link denominated C in the graph). | Taken into account--figure and text deleted |
| 8100 | 6 | | | | | This figure contains a very strange choice of percentile ranges for which no argumentation is provided. Suggestion: use 90% range (5 to 95 percentile), interquartile range (25 to 75 percentile), and median | We will harmonize this in the chapter |
| 3047 | 6 | | | | | The model comments below may apply to some or all of the models listed in Table 6.1, but the model list differs from that in Table 1.8 and documentation for the new models listed in Table 6.1 is apparently not available for this review cycle. Accordingly, comments are listed as being attached to Chapter 1. | Noted |
| 2981 | 6 | | | | | As far as I know, Message is a partial equilibrium model (instead of a GE model). In addition, the issue of dealing o intertemporal optimization is quite complex in it. Please see Ilkka Keppo and Manfred Strubegger (2010). Short term decisions for long term problems – The effect of foresight on model based energy systems analysis. Energy 35, 2033-2042 . Actually, as precisely discussed in this paper, one major challenge behind optimization models simulation is to incorporate uncertainty and asymmetric information to their run. As Keppo and Strubegger said, “While the traditional optimization framework provides the globally optimal decisions for the modeled problem, the framework presented here may offer a better description of the decision environment, under which decision makers must operate… the operation of the model is demonstrated using a moving window of foresight, with which decisions are taken for the next 30 years, but can be reconsidered later, when more information becomes available. We find that the results demonstrate some of the pitfalls of short term planning, e.g. lagging investments during earlier periods lead to higher requirements later during the century. Furthermore, the energy system remains more reliant on fossil based energy carriers, leading to higher greenhouse gas emissions…”. | Noted |
| 2989 | 6 | | | | | Why does deployment in 2010 present a range of values, being it a data and not a forecast? Figures for oil, nuclear, coal cannot show this range of uncertainty for 2010. | Noted. The ranges shows the model spread in this year. |
| 2985 | 6 | | | | | It is not clear | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 2987 | 6 | | | | | It is not clear | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 2988 | 6 | | | | | It is not clear | Accepted. Replaced with other figure. |
| 14449 | 6 | | | | | Overall Chapter 6 is well organized and clearly written. | Noted |
| 14450 | 6 | | | | | Overall Chapter 6 figures and tables are well formatted. | Noted |
| 10398 | 6 | | | | | The categories about the characteristic of IAM are very good but it loses some important items such as whether climate feedback to economy exits and how the technology progresses, ect.The table 6.1 mainly contains models of gerneral equilibrium models. Gerneral equilibrium models such as CGE models have a great advantage to show deitals in sectors and regions, however, it is difficult to reflect the innovation of technology progress and difficult to combine with the carbon circle system and as said in this section, CGE models lack of foresight of the level of investment in the long run. As the problems listed above exist, macroeconomic models as RICE2007,DICE2010,MRICE(Wang, Zhang, Wu, 2012) have great advantages in dealing with those problems.I recommend to biuld another table incorporating these important models to make the categories better. | Taken into account--section revised and details eliminated. Table deleted due to space constraints |

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| 15427 | 6 | | | | | This figure is confusing. First, the graphic has the effect of suggesting that geoengineering IS a climate change response strategy on par with mitigation and adaptation. It is fundamentally flawed and unethical to treat adaptation on par with geoengineering vis-a-vis mitigation and in the overall policy landscape -- i.e., to play down real, on-the-ground adaptation strategies. Adaptation is the only option for many developing and least-developed countries, and geoengineering has a highly debatable role in the overall climate policy anywhere. Though one point of the graphic seems to be that geoengineering would compete with R&D and investment resources, the "competition" aspect is not apparent in the graphic, as is -- it appears as if the point of the graphic (and the accompanying text) is to elevate geoengineering to the level of mitigation and adaptation -- which would be a radical and controversial position for the IPCC to take. | Taken into account--figure and text deleted |
| 9957 | 6 | | | | | Please specify the units for items in Table6.2. | Will be added |
| 9959 | 6 | | | | | Units are missing. And please introduce the economic and technological projects in each model, so that readers can understand well what the role of radiative forcing play in emission pathway. | Will be added |
| 9954 | 6 | | | | | Unlike Figure 6.7 there is a range for emission in different RCP scenarios, the emission is definite in this figure, so based on which model you get the trajectory or just an average number based on models AR5 adopted. | The data shown in the figure is from the published RCP results (Van Vuuren et al, 2011). This reference will be clarified |
| 9961 | 6 | | | | | When compare the pathway without BECCS in Figure 6.10 with pathway of category 1 in Figure 6.7, it can be found that negative emissions don't occur in Figure 6.10. Does it mean that there are BECCS for emissions reduction in pathway in Figure 6.7? So maybe it's necessary to make it clear which reduction measures are taken for pathways in Figure 6.7. | We will clarrify this. |
| 9956 | 6 | | | | | The target stabilization level is not demonstrated in Figure 6.2. | The data shown in the figure is from the published RCP results (Van Vuuren et al, 2011). This reference and the figure |
| 9958 | 6 | | | | | This figure is intersting to show emission pathway in different categories, but since emission reduction measures, which are implict to reach such pathways, are unknown. It is believed that any IAM can produce such pathways, but the feasibility must be focused on otherwise those pathways just don't make any sense. | There is a discussion on the word feasability in the context of models in the tekst. The technologies are discussed |
| 12607 | 6 | | | | | Would be good to write on the text the concept of transformation pathway | Noted. The next version will at least introduce the notion of a transformation |
| 8101 | 6 | | | | | The description of the scenario ensemble used in the assessment is lacking (as also indicated by the Authors). Because much of the transformation pathway discussion, and in particular sections 6.3.2 and 6.4, will depend strongly on how scenarios were selected and constructed, it is critical that the scenario ensemble is clearly described and its limiations highlighted in sections 6.3.2 and 6.4 | Accepted. The scenario ensemble will be described early in the chapter. |
| 13191 | 6 | | | | | Considering the enormous uncertainties of such an economy wide, decades long transitions, I would think there's more "gap" than what we do know for certain. This isn't really a "proper" gap, of course, as it is not possible to acquire information or data that would be able to fully fill this gap. I still think it's important to make this clear, i.e. what is currently listed here are gaps for incrementally improving the modelling of the scenarios, but they will in no way remove the enormous uncertainties that make specific and concrete modelling based, non-obvious recommendations difficult. | Noted. |

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| 3376 | 6 | | | | | This is at the core of the AR5 report and should be expanded to allow a more careful interpretation of chapter 6's results. For example, the two following studies detail the limitations of integrated assessment studies with respect to dealing with the uncertainties of future development:<br>A) Ackerman, F., DeCanio, S. J., Howarth, R. B. & Sheeran, K. Limitations of integrated assessment models of climate change. Climatic Change 95, 297–315 (2009).<br>B) Cullenward, D., Schipper, L., Sudarshan, A. & Howarth, R. Psychohistory revisited: fundamental issues in forecasting climate futures. Climatic Change 104, 457–472 (2011).<br>Epistemological challenges related to scenario analysis and uncertainty should not be ignored. Scenario analysis does not follow the scientific gold standard of falsification and there is risk of systematic bias, e.g. due to herd crowding, in e.g. integrated assessments. Discussion of this point seems to be absolutely crucial. One important study on this issue is: "Betz, G. (2009),Underdetermination,Model-ensemble,andSurprises | Rejected--space constraints |
| 10392 | 6 | | | | | Because the uncertainty has a clear definition in science, it is not properly to explian the uncertainty by different results across the IAM models. | Noted |
| 5326 | 6 | | | | | This section does a poor job in explaining how an integrated assessment model differs from a normal CGE-model. According to my understanding, an important issue of an IAM is that it tries to model, explain and calculate the losses and damages caused by human action via the channel of global warming endogenously. | Taken into account--we have added text on cost-benefit analysis which tries to make this distinction |
| 8102 | 6 | | | | | On the one hand this section states that there is no unique definition of greenhouse gas concentrations, on the other hand it doesn't provide yet insight in how the radiative forcing in Table 6.2 was determined. In absence of a unique definition of greenhouse gas concentrations, an explicit definition of what is included in the radiative forcing is crucial. Linking the budgets, concentrations and radiative forcing estimates to the WGI assessment n this issue would make this table much stronger. | Correct. Will be added |
| 8110 | 6 | | | | | Also the issues with regard to the time scales of the reversibility of possible temperature overshoots might be interesting to highlight. For example based on: Lowe, J. A. et al. How difficult is it to recover from dangerous levels of global warming? Environmental Research Letters 4, 014012 (2009). | Good point. We will add this. |
| 9963 | 6 | | | | | If possible, please give some temperature stabilization pathways as those shown in former sections. | A new section on climate will be written |
| 12542 | 6 | | | | | The discussion of SRM is bound to be controversial. This portion in particular is problematic: “Absent SRM, near term decisions may be strongly contingent on the low-probability high-consequence “tail” of the probabilistic distribution of climate sensitivity and climate impacts. Because SRM can be implemented quickly (decades) whereas reduction in concentrations takes place on century-timescales it might, in principle, be implemented after uncertainty is partially resolved. This attribute of SRM makes it valuable in managing climate risk even if the costs and damages of SRM were comparable to the costs of mitigation and the damages climate change.” There is no evidence, only conjectiure, on what time scales SRM can be implemented. It is not logical to claim that an attribute of SRM “makes it valuable in managing climate risk,” since value must relate to evidence-based and not conjectural performance. There may be conceivable pathways toward testing SRM and other geoengineering approaches and evaluating them for deployment without making specific claims as above based on present knowledge. Please stick with those assessments. | Several papers address timescale for implementing SRM. |
| 9965 | 6 | | | | | Since carbon cycle and climate is so important that we have to spend more words on introducing more about the details and characteristics of carbon cycle model in IAM. For examples, how many carbon reserviors are included in carbon cycle model in each IAM that AR5 concerned. For your reference, the paper named 'the benefits of climate change mitigation in integrated assessment model: the role of the carbon cycle and climate component'(Hof, 2012) is really good about this issue. I will submit it to the TSU. | We agree and discuss the climate part in greater detail |
| 10397 | 6 | | | | | Although consumption is very important to anlysis the economy cost in the view of welfare, GDP is also an important index for economy cost which cannot be ignored because of its strong relationship with employment and its reflection of nations' economy which is the mian concern of most governments. | Taken into acount. Cost figures now show both consumption and GDP changes where appropriate. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11256 | 6 | | | | | Evaluation of the costs: there is so much said on the costs in chp. 6.3.4.2. But then comes the surprise in chp. 6.3.7.3 telling us that "mitigation costs are heavily influenced by the nature of the available mitigation technologies". If this is the case, what is the reason to overstress the cost figures e.g. in Fig 6.13. It should be contrasted directly. By the way, on my option the spread of the costs in Fig. 6.29 is rather low. Only the "no CCS" case is a bit different, but I would not interpret this figure as if the technology choice had large influence. Model differences seem to be much larger. | Noted and will be considered as we adjust the text in the next draft. |
| 2982 | 6 | | | | | The section minimizes the uncertainty of crude oil price as one major source for the uncertainties in mitigation scenarios and its costs. The same is valid for the different assumptions found in the scientific literature for supporting the choices of discount rate. | Noted. The role of discount rate is addressed explicitly now. |
| 2983 | 6 | | | | | The effect of the learning curve on the evolution of the abatement costs of mitigation options and even on the choice of the least cost path should be highlighted in the document. Please see: Blyth, W., Bunn, D., Kettunen, J., Wilson, T., 2009. Policy interactions, risk and price formation in carbon markets. Energy Policy 37 (12), 5192-5207.Broek, M., Hoefnagels, R., Rubin, E., Turkenburg, W., Faaij, A., 2009. Effects of technological learning on future cost and performance of power plants with CO2 capture. Progress in Energy and Combustion Science 35 (6), 457-480. Rochedo, P., Szklo, A., 2012. Minimum Work of Separation and Learning Curves for Carbon Capture based on Chemical Absorption. To be presented at 7th Conference on Sustainable Development of Energy, Water and Environment Systems, Ohrid, Macedonia. | Noted and will be considered as we adjust the text in the next draft. |
| 2984 | 6 | | | | | As I proposed for Section 6.3.4.2 to include the analysis of the effects of learning curves (innovation) on the least cost abatement paths, I suggest including in section 6.3.5. policies oriented toward anticipating investment in abatement options with higher learning rates (i.e. those with experience curves that justify the previous incentivized investment). | The issues related to innovation are considered in other sections. |
| 17284 | 6 | | | | | The RECIPE project (Luderer et al., 2012; Jakob et al., 2012) analyzed the implications of delayed and fragmented climate policy. Their results should be included in this discussion. | We are aware of this study and will take into account, though it is already |
| 11255 | 6 | | | | | The sectoral analysis is not shown in a consistent way, it is spread over different subsections in the chapter. Chp 6.3.7. should say something on sectors, but I do not see what chp 6.3.7.3. contributes to this. | The discussion of sectoral developments at a disaggregate level will be taken care of in Section 6.8 while Section 6.3.7 (in SOD 6.3.4) will address the interdependence between energy supply and demand at a more aggregate level |
| 13172 | 6 | | | | | Stochastic scenarios, with uncertain long term targets, should also be mentioned, as they explicitly investigate the relationship between mid and (uncertain) long term targets. Already the TIAM family of models alone has published at least 3 papers on such scenarios and there must be other models that have been used in similar fashion (refereces to the TIAM papers: Syri, Lehtilä, Ekholm, Savolainen, Holttinen and Peltola. Global energy and emissions scenarios for effective climate change mitigation—Deterministic and stochastic scenarios with the TIAM model, International Journal of Greenhouse Gas Control, 2(2), 2008, pp 274-285, ISSN 1750-5836, 10.1016/j.ijggc.2008.01.001. ; Loulou, Labriet and Kanudia. Deterministic and stochastic analysis of alternative climate targets under differentiated cooperation regimes, Energy Economics, 31 (Supp 2), 2009, pp S131-S143, ISSN 0140-9883, 10.1016/j.eneco.2009.06.012. ; Keppo and van der Zwaan. The Impact of Uncertainty in Climate Targets and CO2 Storage Availability on Long-Term Emissions Abatement, Environmental Modeling and Assessment, 17(1-2), 2012, pp. 177-191, DOI: 10.1007/s10666-011-9283-1 ) | The author team will work on adding references to studies explicitly examining stochastic control and will incorporate the notion into the introduction section. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3629 | 6 | | | | | Delete or massively reduce to save space as overlaps with chapters 4.1.3.2, 4.6.1, 4.6.2. | The structure of the chapter is being revised to best cover the material within the prescribed outline. However, we likely need to keep some or most of the material in this section. Every effort will |
| 2986 | 6 | | | | | For most of the technologies I do agree with the idea presented in this section, which expresses that “the benefit of beginning to create and improve technologies today and to develop institutional capacity is that it creates opportunities to make early and mid-course corrections.” However for some options, usually the least mature ones, the choice of a technology route may cause lock in problems. The case of CCS is emblematic. See Markusson, N., Haszeldine, S., ‘Capture readiness’–lock-in problems for CCS governance, Greenhouse Gas Control Technologies, Vol. 1, Issue 1, pp 4625-4632, 2009 | We address different types of lock-in but can add a reference here to the specific issue mentioned. |
| 17234 | 6 | | | | | The study below is useful in the context because it shows that short-term technology policy helps to overcome the time of delayed carbon pricing. The study shows that short-term investments help to moderate future CO2 prices in achieving a given atmospheric stabilization target. Bauer N, Baumstark L, Leimbach M (2012): The REMIND-R model: the role of renewables in the low-carbon transformation—first-best vs. second-best worlds. Climatic Change, online first. DOI 10.1007/s10584-011-0129-2 | We will include the reference. |
| 3630 | 6 | | | | | Delete or massively reduce to save space as overlaps with chapter 4.3.4. | We have written this section more concisely, but there was broad agreement in the author team that this section should be kept in this place; |
| 6411 | 6 | | | | | I really like sustainable development and I think it is extremely important. But this section seems to not fit the rest of the chapter. The rest of the chapter tends to focus on IAMs and quantitative results. This section seems more qualitative or "fluffy" in comparison. Again, I'm nit saying that this is not important, but it seems as though the content isn't as quantitatively rigorous as the rest of the chapter. | Rejected. The first level headings have been decided by the IPCC plenary and need to be adhered to by the author team. |
| 3377 | 6 | | | | | This section is very interesting. It powerfully argues for taking sustainable development scenarios as benchmark for assessment. The scenarios discussed before look at "climate change mitigation only". Conceptually, 6.6. should not appear as an add-on to the other sections, but rather as a benchmark for overall evaluation. Of course, the main challenge is that only very few scenarios so far explicitly address SD. But one could frame the importance of SD scenarios as benchmarks in the introduction of chapter 6. | Noted. The relation of SD to IAMs is discussed in the new version, but otherwise this section is conceptualized as being complementary to the other sections focussing on IAMs linking to / |
| 16252 | 6 | | | | | It is important to be more specific about aspects or indicators of sustainable development included in the assessment of the transformation pathways, and which ones are omitted, particularly since several aspects (such as materials (resource depletion) or stocks (standard of living) are not just additions, but may change the nature of the results due to feedbacks or delays). In addition, it might be useful to point out critical gaps in the modeling approach in order to better capture essential links with sustainable development. | Noted. This is in parts covered in Section 6.2.1 (Key characteristics of integrated assessment models) and Chapter 3. Further, also this section is used to link IAMs to SD. |
| 11679 | 6 | | | | | As shown in the text, transformation patyways can have a strong impact on broader societal policy objectives relating to sustainable development, such as energy security, food security and water security. When describing sustainable development and climate stabilization, the trade-offs and synergies between two issues should be reviewed as well. For example, Akimoto et al. (forthcoming) conduct a complehensive assessment on these trade-offs and synergies. Reference: K. Akimoto et al., "Consistent assessments of pathways toward sustainable development and climate stabilization", Natural Resource Forum (forthcoming). | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17921 | 6 | | | | | Although the section relates to a large part to SD, SD concepts and SD goals, I have found no cross-reference to Chapter 4 although Chapter 4 is supposed to provide the framing for any SD discussion in the WGIII AR5. For this Section, this is particularly relevant, since SD and the related concepts are not sufficiently explicated. The same applies to the discussion of co-benefits/co-costs and the respective framing in chapters 3 and 4 (which has been nascent in the FOD). Please liaise with the relevant chapters in the cross-cutting meeting to determine a viable labor division and synthesis of results with respect to the co-benefits/co-cost assessment and the relation to SD across chapters. | Accepted. Reference to Ch.4 have been added in the new draft. |
| 3631 | 6 | | | | | Delete or massively reduce to save space as overlaps with chapter 4.5. | Accepted. Section 6.4 has been significantly restructured with the new |
| 3632 | 6 | | | | | Delete or massively reduce to save space as overlaps with chapters 4.2.1 and 4.5. | Accepted. Section 6.4 has been significantly restructured with the new |
| 3633 | 6 | | | | | Delete or massively reduce to save space as overlaps with chapter 4.2. | Accepted. Section 6.4 has been significantly restructured with the new |
| 17925 | 6 | | | | | Please consider to incorporate more results from the IAM community (e.g. IMAGE and MESSAGE) - particularly from Chapter 17 of the Global Energy Assessment (CLA Keywan Riahi). This could also prove to be useful for a more in-depth analysis of "regional considerations and differences". At the moment, however, the first four paragraphs of the sub-section rather describe political implications which I would personally place in the policy chapters (e.g. 15.7.1). Please liaise with Navroz Dubash. | Noted. |
| 9259 | 6 | | | | | An additional risk comes from inferred migration patterns, as these may alter societies and energy etc use considerably over decades. I'm not sure how well that could be modelled though. I think this whole chapter provides a wide-ranging and balanced view of things - well done (for this draft anyway!). | Migration patterns due to mitigation policies has not been covered in the mitigation scenario literature, and therefore will not be taken up as a risk |
| 17928 | 6 | | | | | In order to facilitate coordination between section 6.7 and the sector chapter discussions on technical risks (see agreements reached in Wellington, p. 36), the classification of different types of risks provided by this section would be very helpful (apart from the framing of environmental side-effects as risks, see my next comment). Please liaise with the relevant chapters in the cross-cutting meeting to determine a viable labor division and synthesis of results with respect to the co-benefits/co-cost assessment and the relation to different types of risks across chapters. | This was done at LAM3 (see Responses to Comments 933 and 953) |
| 17931 | 6 | | | | | The topics discussed here are not framed as risks elsewhere in the report but rather as additional policy objectives to which co-benefits/co-costs might accure. While the examples given might be redundant to existing text in other chapters (land-use change in chapter 11, institutional capacityfor and distributional consequences of mitigation policies in chapter 4 and the policy chapters), the section does not discuss the societal risks due to the speed of transformation as advertised in the beginning of the section. | The discussion of potential adverse side-effects has been moved to Section 6.6 Sustainable Development where it will be discussed together with co-benefits. This will include the discussion of societal risks due to the speed of |
| 13190 | 6 | | | | | This section is currently rather generic, but still rather long. In light of the fact that the authors suggest there will be a number of additions for the SOD, I would suggest cutting down text that overlaps strongly with other chapters (or even sections within this chapter, e.g. some of energy conversion, land use related text). | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies |
| 13188 | 6 | | | | | Most of this section discusses AR4 approach to sectoral analysis, which doesn't seem necessary, especially to the extent that it's currently done (i.e. over a page) AND taking into account the length of the current draft. | Discussion of comparison between sectoral and integrated studies in AR4 will be shortened. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17475 | 6 | | | | | good synthesis of the sectoral analyses but some sub-sections lack comparison with transformation pathways. Specifically "Energy Conversion", "Transport" and "Human Settlements" sub-sections | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies |
| 14336 | 6 | | | | | The chapter should build on more recent comprehensive studies such as Williamson, P., Watson, R.T., Mace, G., Artaxo, P., Bodle, R., Galaz, V., Parker, A., Santillo, D., Vivian, C., Cooper, D., Webbe, J., Cung, A. and E. Woods (2012). Impacts of Climate-Related Geoengineering on Biological Diversity. Part I of: Geoengineering in Relation to the Convention on Biological Diversity: Technical and Regulatory Matters. Secretariat of the Convention on Biological Diversity. Montreal, Technical Series No. 66.<br>The results of the 2004 EIFEX experiment were recently published as: Victor Smetacek, Christine Klaas et al. (2012): Deep carbon export from a Southern Ocean iron-fertilized diatom bloom. Nature doi:10.1038/nature11229. According to a press release, "Unlike the LOHAFEX experiment carried out in 2009, EIFEX has shown that a substantial proportion of carbon from the induced algal bloom sank to the deep sea floor" (see http://www.awi.de/en/news/press_releases/detail/item/current_study_in_the_scientific_journal_nature_researchers_publish_results_of_an_iron_fertilisation/?cHash=1886c469c164291f685e617fe741c704) | Agree that the Williamson et al reference should be included. |
| 9242 | 6 | | | | | Please refer 'IPCC expert meeting on geoengineering - meeting report' (2012) for the definition of geo-engineering. It discusses the difference between CDR and mitigation in terms of total storage potential and the impact beyond atmospheric CO2 reduction. | Question: I would assume that IPCC's guidelines suggest that we should cite peer-reviewed literature before reports |
| 9245 | 6 | | | | | Please mention that cost range of CDR and SRM is uncertain in general. | It's not clear we have room to discuss costs here, if we do we will certainly |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15438 | 6 | | | | | This section fails to convey the speculative nature of SRM -- the current draft exaggerates the state of scientific (and public) understanding, which, in fact, is very poor. We propose that THIS SECTION BE DELETED, OR EDITED to more accurately reflect the state of knowledge. We propose the following edits, which retain much of the information in the current draft, but better convey the speculative nature of SRM, so that the section reads:<br>SRM's possible role in climate policy is shaped by two working assumptions. First, SRM is expected to produce effects soon after deployment, i.e., on a timescale less than a decade (Shepherd et al. 2009); (Keith, 2000; Swart and Marinova, 2010). A further assumption is that SRM could temporarily but imperfectly mask the effects of climate change that arise from the accumulation of long-lived greenhouse gases such as CO2 (though only the reduction in long lived GHGs can reduce the long-run climate risk).<br>Interest in SRM is growing (Shepherd et al. 2009); (Mercer et al., 2011). The notion that SRM could reduce the impacts of anthropogenic climate change dates back to the 1960s (Keith, 2000), but little scientific research has been done. There are now several government-sponsored research programs related to SRM as well as a formal project to systematically compare climate model responses to SRM (Kravitz et al. 2011).<br>Any potential effectiveness of SRM in counteracting anthropogenic climate change is inherently limited by the fact that the radiative forcing produced by SRM techniques (insofar as they exist in theory) is substantially different from the radiative forcing from GHGs (Govindasamy and Caldeira, 2000; Robock et al., 2008). It is therefore impossible for SRM to produce a climate response that precisely compensates for the climate response due to GHGs. Thus while a level of SRM could, in theory, compensate for some of the effect of GHGs on a single climate variable, such as the globally averaged surface temperature, it cannot do so on all variables at once. For example, if SRM is employed in an attempt to halt the increase in globally averaged surface temperature over some period during which GHG concentrations rise, then the global hydrological cycle as measured by average evaporation and precipitation rates will decrease (with potentially significant effects in some regions that will see changes in weather patterns and reduced rainfall).<br>Few studies have attempted to quantitatively evaluate the extent to which SRM could counteract the effects of anthropogenic climate change on a regional basis. The first study to do so concluded that SRM would do a poor job reducing climate damages, and that that damages from SRM might be significant (Robock et al., 2008). More recent studies also assert that (a) SRM cannot accurately reverse GHG driven climate change and that (b) the divergence is larger at regional scales that it is on a global means basis (Ricke et al., 2010), but (c) one study of the potential effectiveness of geoengineering in compensating for temperature or precipitation changes on a regional basis suggests that SRM could compensate for increased GHGs even at a regional level. Using analyses of 22 regions Moreno-Cruz et al concluded that a single (optimal) choice of SRM forcing could reduce the population-weighted mean squared deviation in temperature by 99% and in precipitation by 85% but both cannot be achieved simultaneously (Moreno-Cruz et al., 2012).<br>All modeling studies to date have focused on compensation as measured by a climate variable such as temperature and precipitation; understanding of the effectiveness—or lack thereof—of SRM in reducing climate damages would require understanding of the interactions among the climate variables.<br>Ozone depletion as a consequence of the introduction of geoengineering aerosol into the stratosphere is by far the best studied risk. For sulphate aerosols the primary mechanism of action is that additional aerosol reduces NOx | It is not clear exactly what edits are being proposed here |
| 8960 | 6 | | | | | Please avoid the temptation to present geoengineering as a real option for policy makers, since the testing of scenarios is only being done on very limited GCMs and the technology is not just not ready to deploy, but it is dangerous in ways detailed in my work. | Answer: there is no question that SRM is dangerous; however there seems little doubt that some forms could be deployed within a decade or two. This is not a statement that deployment would be wise; rather, it is simply a statement of technical capability. The job of the IPCC is to present a thorough analysis of physically possible options to decision-makers. We are happy to respond to |

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| 11259 | 6 | | | | | Fig. 6.10 is one of the key figures for me, this should come in the executive summary, because it shows the effect of CCS and Bio+CCS availability on the emission profiles. If a figure with the new model results can be provided where one can see from one model the differences of “w CCS”, “w/o CCS” and “w or w/o bio-CCS” this would be extremely interesting | Noted. |
| 11253 | 6 | | | | | Concerning the technologies: there is a discrepancy concerning the evaluation of single technologies. In the Executive Summary it is said that “there is no single dominant technology” whereas in the FAQ at the end the importance of Bio-CCS is highlighted. But this importance is not clearly carved out in the chapter. | Accepted. The notion of the importance of a portfolio needs to be made more clearly differentiated from the importance |
| 9949 | 6 | | | | | The executive summary is too long to get the most important points of this chapter. Please make it conciser. Maybe tables and figures can be removed from ES. | Accepted. The ES will be shortened. |
| 8899 | 6 | 0 | | | | When it comes to economic impacts the study concentrates on outputs GCE and partial equilibrium models that often include only one economic sector. I could not find a section that explains the shortcomings of these model types and how the outcomes are impacted by the theoretical underpinnings of these models nor giving a reasoning why these types of models should be preferred. And there is no explanation of why other model types were excluded. In one place the chapter concentrates on describing the results of only one most recent study and omits all others. This all is hardly justified and makes the chapter look biased and open to critisism. The employment effects of the transition pathways are also ignored. | Noted. We are revising the section on the modeling tools used in this analysis. At the same time, space constraints prevent a thorough treatment of model strengths and weaknesses. Readers are encouraged to read the supporting papers. |
| 6393 | 6 | 0 | | | | This chapter clearly needs further editing in many ways, with plenty of places stating that the SOD will contain new text or new results of analyses. That's fine, but I think the text could be decreased by about 5% by making the writing more direct. In a lot of places there are extra and unnecessary words. For example, page 20 line 33 could be reduced from "A crucial question with respect to long-term emission reductions is the timing of emission reductions," to "The timing of emission reductions is important for long-term reductions." Or line 8 on page 28, "There is a limited number of studies that..." could be "A limited number of studies..." Or line 34 on page 30, "It is valuable in that it leads to..."could be "it leads to...". Or lne 1, page 31, "A first observation is that there is..." could be "There is..." Or Line 28, page 31, "A further observation is that..." could be, "Further, the costs..." Or page 33, line 31 and 32, "It has been shown that the impact..." could be "The impact..." or page 46, line 6, "The other important role of end use sectors in climate mitigation is to reduce energy demand..." could be, "End use sectors are also important because they reduce..." And so on, throughout the chapter. | Noted. We are working to be more efficient. |
| 6395 | 6 | 0 | | | | There are references to "the literature" in a number of places without referring to or citing the relevant literature (e.g., p. 40, line 30; p. 60, line 7; p. 60, line 23) Is this an intentional decision? References as such without specific citations seem vague and nonspecific, as if the author(s) are saying, "trust us, the literature says this." | Noted. We will continue to expand our citations of the literature. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16945 | 6 | 0 | | | | It is some time since I look at the “Stabilisation Scenarios” literature and will confine my comments to the following general points.<br>Though it is carefully worded, Chapter 1 comes close to saying that 2 deg.C is now almost impossible: does Chapter 6 analysis support this? Consistency is important.<br>It would be great – albeit difficult – if Chapter 6 could make more connection between the sectoral chapter studies and the global scenarios. Does bottom-up meet top-down? I have suggested in my general AR5 comments that there might be various “meso-level” ways into this; one obvious one would be in relation to the Urbanisation chapter (12), given the enormous influence of urban carbon footprints; and / or the regional chapter (14), which gives a finer-grained understanding of regional trends and possibilities.<br>I’d also like to suggest a third “meso-scale” way of illuminating this challenge. Is it possible to give any indications of how the scenarios might break down in terms of different domain processes, and associated estimates of potentials? Eg. the bottom-up evidence is that First Domain processes (analytically closely tied to the System 1 framing of the FOD Chapter 2) are sizeable in Buildings and maybe Transport efficiency; how much emission reduction might these deliver by mid Century? Does the analysis of “Domain 1” processes shed much light on how much would be taken up in BaU trends, versus requiring policy action? How does this compare to reference scenarios?<br>Similarly, Section 6.5 would be the natural place to integrate the significance of Third Domain potentials – innovation, infrastructure etc - and associated issues (Third Domain effects are only very weakly affected by carbon prices, depending more on strategically motivated investment). Sectoral transformation studies could be other inputs to this. This could be useful as it may help to suggest how much stabilisation scenarios would in practice depend on the different pillars of policy - regulation and 'engagement'; pricing and market structures; or strategic investment for innovation and infrastructure.<br>For clarifications, see Grubb, Hourcade and Neuhoff, Planetary Economics: the Three Domains of Sustainable Development. Chapter 2 (submitted to the Secretariat) clarifies the key distinguishing features of the different domains, Chapter 3 outlines how the main structural components of energy systems seem to relate to each domain, Chapters 4 & 5 detail the evidence and theory around First Domain issues, and Chapters 9-11 explore Third Domain effects; Chapter 11 seeking to offer some integrating insights between meso-sectors and global.<br>The interpretation of information on future scenarios is notoriously subject to “framing” effects. I think it important that IPCC considers the lessons on the importance of these effects and presentation (see eg Mizuno and Klinsky, 2012). This chapter in fact seems extremely good in presenting the physical material in transparent accessible forms. However this is much less so for the economic data (from section 6.3 onwards). Once they have established “baselines”, the modelling community almost entirely thinks in terms of changes from these baselines (or NPV loss). Normal people think in terms of absolute changes: are we going to get richer / poorer etc. Somehow it should be made clear that the aggregate economic difference between most mitigation scenarios and baseline is so small as to be hard to see on a graph. Another way of looking at this is the simple exercise of plotting absolute GDP (eg. in 2050) against emission levels: as a “thought experiment” we do this for the entire EMF-22 database in Grubb, Hourcade and Neuhoff (Chapter 11); there is almost no discernible relationship.<br>A final remark: I would guess I am not the only one to find the “negative emission” scenarios with BECCS to be a modelling fantasy which is very hard to relate to the real world. Progress on CCS has been anaemic compared to | Noted. Treatment of the following issues are being revisited in the SOD: linkage to temperature goal such as 2 degrees C; linkages to sectoral chapters; economic results; and negative emissions scenarios. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9819 | 6 | 0 | | | | In order to enhance the readibility of chapter 6, and, moreover, to reduce its length by at least some of the needed 20 pages by eliminating repetition, we would like to suggest the following reorganization of the arguments:<br>1. Background relating to AR 4: especially the terms "forecasts" and "scenarios", and their underlying methodological concepts and relevance to AR5, should be differentiated. In order to help the readers to link the two reports (AR4 and AR5), the methodological development of AR5 should be described in somewhat more detail than the current draft does. Thus, the new RCP methodology should be described in this section.<br>2. Model structure and the underlying theoretical framework for each type of model: in order to enhance readibility the basic model structures could be explained in terms of input variables, assumptions, calculational approach, and linkages between sub-modules.<br>3. Input assumptions: as the underlying assumptions are crucial for the getting the results, and because different assumptions will lead to different results, the major types of assumptions should be made transparent, and perhaps some numerical values should be given for key variables for different RCP scenarios. Also, the need for different types of input assumptions depending on model structure should be discussed. Following the example of scholarly journals, which often allow the reader to upload supplementary materials, a list of all the major assumptions could be made available for the readers in an electronic appendix.<br>4. Results: in this section, the broad scope of results could be presented in as neutral and objective way, as possible, with little commentary. For example, don't say things like "consumption is good".<br>5. Discussion: Separated from the results section, the subjective evaluation of the results could follow, with emphasis on comparing results only between comparable models and scenarios. In order not to oversell results, qualify all results as appropriate.<br>6. Conclusions for decision/policy makers: Following the results and discussion sections (4 and 5), government and NGO policy makers, and corporate representatives, should be provided conceptual guidance as to how to understand the various kinds of policy implications of the scenarios run thusfar, and how to develop relevant scenarios for their own use.<br>For example, one problem with the current version of Chapter 6 is that there is fairly detailed discussion of some results first, without the proper preparation for the reader, and then some other results are discussed again later, and there is some repetition. Also, consider reducing or eliminating the geo-engineering material which was not really incorporated into existing transformation pathways. | 1. Accepted. We will attempt to link to the RCPs. 2. Rejected. We simply do not have sufficient space to go into the details of every model. Readers will be encouraged to look at the underlying literature. In addition, the scenarios database will include informatiion on key drivers such as GDP growth and population growth. 3. Rejected. Readers will be encouraged to look at the underlying literature to find input assumptions. It is beyond the task of this exercise to collect all the input assumptions for every model.In addition, the scenarios database will include informatiion on key drivers such as GDP growth and population growth.4. Noted. 5. Noted. 6. Noted. We continue to refine the storyline for Chapter 6 and will attempt to make it more transparent in the SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9820 | 6 | 0 | | | | 1. Many of the results need further qualification stating more transparently under what assumptions the stated conclusion is valid, or not. Two important examples for many conclusions are: "given the limits on the amount of incremental energy efficiency modelled…." , or " given that oil prices were assumed to remain under $100 per barrel forever, the cost results are.....". 2. The types of parameters and their numerical values which are input to the various IA models for different scenarios is, basically, never discussed. This is a major omission. The transparency of scientific research requires that key input assumptions be provided in parallel with all results. This is particularly important for the kinds of scenarios cited in this chapter, because many of the differences between results from model to model are not due to structural differences in the models, but are due to DIFFERENCES IN THE VALUES OF THE SAME INPUT PARAMETERS. 3. Again, the constraints on energy efficiency improvements on the demand side over time input to each IAM must be cited in the text, since the improvement of energy efficiency on the demand side is one of the key technology options to mitigate climate change. Even conceptually, the issue is barely discussed, another omission. 4. The fact that fossil fuel prices are either endogenously computed or exogeneously input to every model is not discussed in any detail. Yet the resulting prices for fossil fuels in any given future year in each scenario might be the single most important factor determining most results. These price assumptions must be presented and discussed in the context of the "peak oil", "peak natural gas", and "peak coal" theories. Fortunately, the peak oil hypothesis is mentioned in the early chapters of this report, but it must be further elaborated relative to its impact on the scenario results presented in Chapter 6. 5. The fact that most if not all the IAMs assume that almost infinite supplies of liquid fuels from "backup" technologies will be available must be discussed and justified, since it is a highly controversial assumption. | 1, 2., 3. Rejected. It is not possible to provide all the assumptions associated with every scenario reviewed in this chapter. Readers will be encouraged to explore the scenarios database, which will include information on key drivers such as population and GDP and to review the underlying literature. 4. Noted. All the models include resources for fossil fuels and calculate the associated prices and influence on the nature of the energy system. This information manifests itself in the baseline scenarios and the mitigation scenarios. 5. Noted. The chapter will note the needs for these fuels to meet particular goals. Sectoral chapters will address the technical details of developing these fuel sources. |
| 9821 | 6 | 0 | | | | The chapter talks about the "costs" of mitigation, by which "net costs" seems to be meant. But no hint is given that depending on the input assumptions there could be "net benefits" for some scenarios in the long run. By thinking and calculating longterm life cycle costs can reveal positive benefits of shortterm costs. For example, this could happen if the long run prices for fossil-fuels were much higher in the reference cases than in the RCP 2.6 cases, where the demand for fossil=fuels would be much lower than in the reference cases. Thus, the wording which seems to imply that the net costs of mitigation would always be positive must be revised and qualified to allow for the possibility of net negative costs. The bottom-line, of course, is that pursuing strong climate mitigation as in the RCP 2.6 type of scenarios might improve other aspects of the economy and consumption, if, indeed consumption is always good. | Accepted. We will mention the issue of negative costs. At the same time, the literature we are reviewing overwhelmingly indicates that there will be positive costs. |
| 9822 | 6 | 0 | | | | As hinted at in the above comments, the whole scenario "infeasibility" discussion, which repeats itself too often, forgets to mention that one major cause of apparent infeasibility for some scenarios for some models is probably the overly limited level of end-use energy efficiency improvements. IAMs and their outputs aside, the RCP2.6 greenhouse gas trajectories required are not infeasible given existing energy efficiency technologies and given renewable supply technologies, even with CCS and nuclear power. This must be made clear to the reader. Again, this is another situation where the results are not properly qualified based on model limitations or input assumptions made. Moreover the reader should be aware, that assumption can be changed by decision-makers. | Noted. We are refining the discussion of situations in which models are unable to produce particular scenarios. |
| 9823 | 6 | 0 | | | | For decision makers a conversion of the RCPs to degrees Celsius could be valuable: Rogelj, J; Meinshausen, M.; Knutti, R. (2012) Global warming under old and new scenarios using IPCC climate sensitivity range estimates. In: Nature Climate Change, DOI: 10.1038/NCLIMATE1385) | Accepted. A section is being added that will provide a crosswalk between concentration and temperature goals. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9404 | 6 | 0 | | | | When discussing transformation/transition pathways, it is also important to discuss and focus on shor-term/mid-term targets for reducing GHG emissions as well as long-term GHG emission projections. These following papers can provide useful information on GHG emissions by region (e.g. Japan, China, India, All Asia, USA, EU27, Russia, Annex I , Non Annex I and world) and by technological mitigation cost (e.g. 0, 25, 50, 75, 100, 125, 150, 175, 200 US$/tCO2) in the year 2020 and 2030, based on bottom-up analyses. Hanaoka, et al, 2012 also provides technological mitigation potentials by region, by cost and by sector in the year 2020 and 2030. These discussions may be fit into section 6.4, but these papers are missing in this chapter. Dr. Hanaoka can help providing data for this chapter.<br>1) Hanaoka, T., Kainuma, M. (2012) Low-Carbon Transitions in the World Regions: Comparisons of Technological Mitigation Potentials and Costs in 2020 and 2030 by bottom-up analyses. Sustainability Science, 7(2):117-137, DOI:10.1007/s11625-012-0172-6<br>2) Akashi, O., Hanaoka, T. (2012) Technological feasibility and costs of achieving a 50 % reduction of global GHG emissions by 2050: Mid- and long-term perspectives. Sustainability Science, 7(2):139-156, DOI: 10.1007/s11625-012-0166-4<br>3) Wagner, F., et al (2012) Sectoral marginal abatement cost curves: implications for mitigation pledges and air pollution co-benefits for Annex I countries, Sustainability Science, 7(2):169-184. DOI:10.1007/s11625-012-0167-3<br>4) Akimoto, K. et al (2012) Comparison of marginal abatement cost curves for 2020 and 2030: longer perspectives for effective global GHG emission reductions, Sustainability Science, 7(2):157-168, DOI:10.1007/s11625-012-0165-5 | Noted. We appreciate the reviewer offering additional literature for citation. We will use if appropriate. |
| 9405 | 6 | 0 | | | | Main discussions in this chapter are features of CO2 emissions that are of course important. However, in discussions on transformation pathways, it is also important to take into account non-CO2 GHG emissions, not only Kyoto gases but also air pollutants such as BC, OC (short-lived gases) and Montreal gases such as CFCs and HCFCs (long-lived gases). As for CFCs and HCFCs, these are long-lived gases with very high global warming potentials that the policy makers were aware of and there will be still large amount of emissions in CO2 equivalent in the next 10 -20 years which are difficult to be reduced even regulated under the Montreal Protocol. Thus, it is also important to be mentioned when discussing the short-/mid-term emissions pathways. The following papers are just examples which provide new findings after the IPCC AR4, and authors can review various other papers and reports by UNEP, WMO etc.<br>1) Velders, Guus J.M., Stephen O. Andersen, John S. Daniel, David W. Fahey, and Mack McFarland. 2007. The importance of the Montreal Protocol in protecting climate, PNAS 104(12): 4814–4819.<br>2) Velders, Guus J.M., David W. Fahey, John S. Daniel, Mack McFarland, and Stephen O. Andersen. 2009. The large contribution of projected HFC emissions to future climate forcing. PNAS 106(27):10949–10954.<br>3)Wan, Dan, Jianhua Xu, Jianbo Zhang, Xuanchang Tong, and Jianxin Hu. 2009. Historical and projected emissions of major halocarbons in China. Atmospheric Environment 43: 5822–5829 | Accepted. We will include more discussion on short-lived species in the SOD. |
| 16909 | 6 | 0 | | | | There needs to be more synergy and consideration of cross-cutting issues between the chapters. For example, chapter 4 has a constructive discussion about the need to distinguish subsistance emissions, development emissions and luxury emissions. Yet in the all scenario studies in chapter 6, there is no indication that any one of the scenario projections make the distinction between survival emissions vs. Luxury emissions. | Noted. |
| 13147 | 6 | 0 | | | | It's a bit unfortunately that the dataset, and therefore most of the analysis, was not finalized for the FOD. There are findings across the chapter that would in their current form require some clarifications/explanations, but it doesn't seem useful to ask for such at the moment, when there is always a caveat close by, suggesting that the analysis so far shouldn't be taken too seriously. | Noted. |
| 13156 | 6 | 0 | | | | More references should be added, throughout the chapter, to results that are currently referenced using a project name (e.g. EMFXX, RECIPE etc) only. | Accepted. We will continue to add references as the process proceeds. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13166 | 6 | 0 | | | | The scenario ensemble used for the chapter appears to somewhat dominate the discussion, especially in some sections. This is also demonstrated by the fact that in certain sections a proper literature review is almost completely missing and the references mostly focus on the few large studies that also feed in to the database (and in which a number of the authors have been involved). While this is a useful approach in terms of giving detailed information about a large set of scenarios, it also creates an impression that nothing else has been done within this field during the past years. I would recommend that the database related results are balanced with literature reviews, so that it's ensured that the large model comparison studies are not represented as the only forum in which research has been done (and if it turns out there actually are few relevant studies beyond the comparison projects, so be it, at least it can then be stated as a justification for the approach taken). Also, small, individual studies may well bring in additional, alternative approaches that could enrich the scenario space (i.e. relying on model comparison studies (e.g. 10 models run 5 different scenarios) provides useful information about differences across the models, but less information about the heterogenuity of the possible scenario space (compared to 50 different scenarios, each run by 1 model alone)). | Accepted. We will continue to add references to a broader swath of literature as the process proceeds. |
| 11242 | 6 | 0 | | | | The chapter is full of very interesting details, but it has no clear message. Is there a story of decarbonization? Is every model telling its own story? | Noted.We are continuing to refine the story of the chapter heading into the |
| 11245 | 6 | 0 | | | | In the headings of the sections 6.3.4. and 6.3.4.2 the “idealzed context” is mentioned, but there is no chapter that is called “non-idealized context”. On my opinion these two viewpoints “idealized vs. non-idealized” have to be contrasted. It is somewhere hidden in the text, but it is not told and sold as a story. I think that this could give a framing for the whole chapter. | Accepted. We will explain the distinction more clearly in the SOD. |
| 11247 | 6 | 0 | | | | I am missing something like “no regret options”. This could be an interesting framing, e.g. no matter which delay we face, no matter which stabilization target should be achieved, technology X is always important and is required at a deployment level of Y. | Noted. We have not decided whether to use the notion of "no-regrets" options as part of the framing of the story in the chapter. We are considering alternnative framings for explaining the sorts of |
| 11248 | 6 | 0 | | | | Will there anywhere in the report be a translation of the RCP forcings to temperatures? If it is in WG1, it should be repeated here just for information. | Accepted. Yup. We're working on that for the SOD. |
| 11249 | 6 | 0 | | | | There is no reference to the 2Deg target and also the discussion of 1.5 vs. 2Deg is missing. But this has been requested by the UNFCCC. It would be important to come up with some messages on this issue. | Accepted. While the chapter will focus on stabiliization of greenhouse gases, consistent with Article 2, we will include a linkage between those goals and |
| 11251 | 6 | 0 | | | | There is a clear bias in the whole chapter to overstate the importance of nuclear. Often it is mentioned “technologies such as CCS and nuclear”. There is no single indication that nuclear is as important as CCS from this chapter. Quite the contrary, Figs e.g. 6.29, 6.30 etc clearly show that CCS has a big effect on the cost, but not nuclear. It is quite striking that in the whole chapter there is nearly no reference to the individual technology “nuclear” but it is only mentioned in one breath with coal+CCS. A standard sentence in chp. 6 is “….particular technologies such as nuclear power or fossil energy with CCS”. But your cost figures clearly indicate that there is a huge difference between the importance of CCS and nuclear. This is not stressed at all. | Noted. We will be adjusting the text of the chapter and will continue to refine the discussion of different technologies. |
| 11252 | 6 | 0 | | | | Something similar to Figure 13.3. (FOD, chp. 13) would be extremely useful in the Executive Summary. On the x-axis should be e.g. the technology setting is given, indicating the interplay between technology choice and emissions. You have the figure for the costs, but the according figure for emissions would be helpful. | Noted. |
| 11254 | 6 | 0 | | | | I miss a discussion on energy efficiency. This is one of the most important options, already in the basline in some of the models (and coming as a free lunch) but it is not discussed as an important option. | Noted. We have a discussion on end use efficiency. We expect to refine that discussion in the SOD. In addition, a more refined discussion in the section on |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11262 | 6 | 0 | | | | There should be some assumptions given on the CCS use. What do the models assume when CCS is available? What is the assumed storage capacity? Leakage rate etc. The same for biomass? Is there a limit on biomass use? This is important for interpreting the results. | Rejected. This synthesis does not have the space to consider all the assumptions of all the scenarios used in the analysis. Readers will be encouraged |
| 11267 | 6 | 0 | | | | Are the carbon prices shown? If not – why? | Noted. We have included carbon prices in one parrt of the chapter only. We are considering whether to include them in other parts as well or whether to remove them entirely given space constraints. |
| 11015 | 6 | 0 | | | | The Chapter explores the implications of stabilizing atmospheric GHG concentrations. An effort to implement such a goal, were it ever to be attempted, would constitute global social engineering on a completely unprecedented scale. There is little evidence that such an effort will be made.<br>Indeed, on page 26, the Chapter notes "…no cost-benefit study finds an optimal level of mitigation that stabilizes atmospheric concentrations within the modeling period." While one should be mindful of the optimization models' limitations, surely the point represents a significant caveat to the analysis. Giving the point more prominence in the Chapter would seem, therefore, to be appropriate.<br>The caveat seems especially apposite in that IAMs ignore institutional constraints on the choice and implementation of mitigation policies. Based on current experience with global mitigation efforts, institutional constraints deter many countries from acting on mitigation and induce others to use policies with poor cost-effectiveness. The inference seems to support the conjecture that the scenarios described in the Chapter would diminish global welfare.<br>Many governments, however, have at least formally embraced some version of stabilization goal. Thus, a discussion of its implications is may be useful. In this regard, the chapter makes many welcome points. It is particularly welcome that the Chapter notes that a capacity for solar radiation management (SRM) might be an important tool in coping with low probability high impact events. Previous IPCC reports have slighted the potential importance of SRM, and in this regard, Chapter 6 makes a valuable new contribution. The Chapter discusses the subject in a fair and balanced manner. | (1) The discussion of cost-benefit analysis is being moved to a distinct box. We do not intend to treat such analysis at length in this chapter and instead will focus on stabilization, consistent with Article 2 of the UNFCCC. (2) We agree with the reviewer about institutional constraints. However, the purpose of this chapter is to highlight what would need to happen to meet particular goals, with later chapters assessing how hard or easy it might be to make that happen given institutional and other constraints. (3) Comments on SRM noted. |
| 16349 | 6 | 0 | | | | Please consider using the following paper in your assessment:<br>The world at a crossroads: Financial scenarios for sustainability<br>Jofre Carnicer and Josep Peñuelas<br>Energy Policy 48, 2012p 611-617 | Noted. |
| 16351 | 6 | 0 | | | | The structure of this chapter may benefit from a revision:<br>The current section 6.3 is very long and includes a lot of different issues. It discusses costs of mitigation before sustainable development and transformation pathways (6.6.) - if this remains in that order, efforts are needed to avoid treating costs without sufficiently taking into account their context (baselines, including level of sustainable development, may strongly influence costs). | Noted. Unfortunately, the outline handed down by the plenary places an enormous amount of material in one section (6.3) with an absurdly long title. At this point, the strategy is simply to |
| 15717 | 6 | 0 | | | | A general point. The RCPs assume a considerable phasing out of aerosol emissions by the end of the century. These are 'best guesses' but the radiative forcing of aerosols contain large uncertainties. Particularly in the high-end RCPs, that could lead to an under-estimation of the aerosol cooling from SOx, NOx , sulphates and nitrates and hence an overestimation of the increase in temperature by 2100, which would make IPCC an easy target for critism. Of course there are uncertainties both ways ( black carbon and troposperic ozone have a positive forcing). However, as the RCPs are the source for climate model projections I recommend to take this issue up with WG I and see if such critisim can be prevented ( nb aerosols are addressed in 8.2.2 but not in the context of RCPs) | Noted. Additional dicussion of aerosols and their relationship to transformation pathways will be included in Chapter 6. |
| 18624 | 6 | 0 | | | | Results are preliminary and the chapter is far from complete | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18627 | 6 | 0 | | | | A failure to include land use change emissions into the mitigationregime could dramatically increase the difficulty of meeting long term goals, and it could potentially lead to dramatic changes in the global land surface.<br><br>The ability to store CO2 using bioenergy with CCS or other CDR technologies facilitates overshoot pathways…. | Noted. Both of these points are in the chapter. |
| 18628 | 6 | 0 | | | | The pathway discussion lacks a clear subject, a pathway to whom? It also suffers from a more general knowledge gap; we don't know what innovation and tech will bring. | (1) Noted. The pathways are leading to stabilization of GHG concentrations or RF. (2) Noted. The chapter addresses |
| 18629 | 6 | 0 | | | | I lack a more "philosophical" discussion on how to approach the future, how do we get from here to there. The approach is rather mechanical. At the same time we know that we don't have or can gain full knowledge. Even more important, choices made will have a crucial effect on how different options develop (keeping everything open isn't hardly a real option. | Noted. The framing chapters are intended to address these broader issues. |
| 18630 | 6 | 0 | | | | Our knowledge about the future is and will be limited. Different approaches possible. Predict, "calculate" or choose directions. It is unclear what the ambition really is but for time perspectives over decades it can't be correct to look into parts and assume that all other things are equal. Wouldn't it be more interesting to compare different directions and where they will lead in terms of capabilities that will develop? | Noted. The chapter includes a discussion of the relationship between sort-term actions and long-term goals. This discussion will be refined in the |
| 18631 | 6 | 0 | | | | Decarbonisation is a learning process (for society), different platforms should be compared. | Noted. |
| 18636 | 6 | 0 | | | | Transformation to atmospheric stabilization is best understood as a process of sequential decision-making and learing. | Noted. The chapter includes a discussion of sequential decision- |
| 18637 | 6 | 0 | | | | Near-term emissions need not necessarily be in the optimal range for a long-term goal to be met. | Noted. The chapter makes this point. |
| 18638 | 6 | 0 | | | | While it is clear that some mitigtion effort in the near-term is crucial to preserve the option of achieving low stabilization targets, whether these targets are met in the long-run depends to a greater extent on the potential for deep emissions reductions several decades from now. Thus efforts to begin the transformtion toward stabilization must also be directed toward developing the technologies and institutions that will enable deep future emissions cuts rather than exclusively on meeting particular near-term targets…. The benefit of beginning to create and improve technologies today and to develop institutional capacity is that it creates opportunities to make early and mid-course corrections. | Noted. The chapter includes a discussion of this issue. |
| 18639 | 6 | 0 | | | | Flexible market-based policies with maximal sectoral and geographic coverage are most likely to deliver emissions reductions at the lowest economic cost. Although the added cost of inefficient policies in the near-term may be smaller than in the long-term when mitigation requirements wil be much larger, their implementation now may lead to "institutional lock-in" if policy reform proves difficult. Thus a near-term focus on developing institutions such as domestic and international emissions trading markets (as in the European Union's ETS), as well as political structures to manage the large capital flows associated with carbon pricing, could provie substantial dividends in he coming decades when mitigation efforts reach their ful proportions. | Noted. The discussion policy regimes and institutional lock-in is left to the policy chapters. This chapter makes clear that costs are lowest under idealized, price-based policies. |
| 9029 | 6 | 0 | | | | 1. The Chapter is a work in progress. Its approach of classifying the results of different models into six categories is useful for summarizing the variety of approaches and results. 2. The draft has clearly marked loose ends, where it points to simulations that are not yet completed. 3. The chapter should be commended for surwewing the literature on sustainable development (6.6). Unlike standard economics approaches this approach recognizes the developmental gaps (in incomes, employment, and technology) that characterizes developing countries. In contrast, Chapter 3 which surveys economic analysis frameworks leaves to Chapter 4 the consideration of sustainable development. | 1. Noted. 2. Noted. 3. Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9030 | 6 | 0 | | | | Chapter authors mights consider being more accurate and circumspect about statements to the effect that developing countries will bear greater mitigation costs. Assessment models do reflect the fact that the future mitigation potential will be greater in developing countries because BAU assumptions assume that development will occur (despite the variety of assumptions on per capita income, energy intensity, China and India prospects - see lines 9-10 p. 18). Mitigation potential is different from the bearing of mitigation costs. There are two things that must be taken into account. First, the Framework Convention provides that the incremental costs of mitigation wil be provided by the developed countries. Secondly, development might not occur for many reasons, including perhaps due to the fact that developing countries are unable to achieve the presumed investment, trade, growth regimes because of the climate regime or the international economic regime in general. | Noted. The chapter will make clear that a requirement for the assertion of higher costs in the developing regions is continued growth in those regions. In addition, a section on burden-sharing is being added to the chapter. |
| 9033 | 6 | 0 | | | | A fundamental weakness of the chapter is in presenting scenarios is that it does not start with a differentiation of mitigation potential and emission flows in developing countries. Achieving the mitigation potential in developing countries will require the availability of means of implementation. | Noted. |
| 9034 | 6 | 0 | | | | A fundamental weakness of the chapter is in presenting scenarios is that it does not start with a differentiation of mitigation potential and emission flows in developing countries. Achieving the mitigation potential in developing countries will require the availability of means of implementation. | Noted. |
| 9035 | 6 | 0 | | | | An important fundamental inaccuracy in the chapter is that it estimates cost of climate policies but these costs are not netted against the economic costs of climate change itself. The scenarios appear not to incorporate the net costs of climate change. | Rejected. This chapter is not addressing the benefits of mitigation. The chapter will recognize the lack of inclusion of climate impacts into stabilization |
| 9036 | 6 | 0 | | | | The scenarios presented in the Chapter include the possible impact of incomplete or late participation in climate change policies. However, these simulations appear to only have developing countries as lagging participants. There should be scenarios in which the impact of incomplete, delayed or non-participtiption by developed countries, notably the United States, are reported. | Noted. This chapter is synthesizing whatever literature is available. The available literature focuses on full global delays or delays by developing regions. The basic insights can be extrapolated to scenarios in which the developed |
| 9037 | 6 | 0 | | | | The scenarios chosen for presentation in the Chapter are incomplete and do not reflect or straddle the full range of possibilities, including the potential for a serious implementation of sustainable development framework. Among the scenarios that appear to be “missing” are the following: (1) (1) a scenario based on improving distribution of income through time, and its impact through changing lifestyle, reduced consumption in the rich countries; (2) a scenario showing the impact of no or inadequate climate financing for developing countries against a scenario of adequate financing for climate change ; (3) the current scenarios assume that carbon taxes are the only source of climate finance; there should simulations which assume other sources for financing for climate change. | Noted. Such scenarios will be included if they can be found in the peer-revieiwed literature. |
| 9038 | 6 | 0 | | | | Many, if not the overwhelming majority of the scenarios, assume negative emissions in the out years. What are the implications of these global numbers for burden sharing across countries? What are the implicit assumptions or implications of these scenarios about financing and technology transfer of negative emissions scenarios? | Noted. This chapter will highlight the needs for technologies. A later chapter will explore financing issues. |

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| 8604 | 6 | 0 | | | | 1. Many of the results need further qualification stating more transparently under what assumptions the stated conclusion is valid, or not. Two important examples for many conclusions are: "given the limits on the amount of incremental energy efficiency modelled…." , or " given that oil prices were assumed to remain under $100 per barrel forever, the cost results are.....". 2. The types of parameters and their numerical values which are input to the various IA models for different scenarios is, basically, never discussed. This is a major omission. The transparency of scientific research requires that key input assumptions be provided in parallel with all results. This is particularly important for the kinds of scenarios cited in this chapter, because many of the differences between results from model to model are not due to structural differences in the models, but are due to DIFFERENCES IN THE VALUES OF THE SAME INPUT PARAMETERS. 3. Again, the constraints on energy efficiency improvements on the demand side over time input to each IAM must be cited in the text, since the improvement of energy efficiency on the demand side is one of the key technology options to mitigate climate change. Even conceptually, the issue is barely discussed, another omission. 4. The fact that fossil fuel prices are either endogenously computed or exogeneously input to every model is not discussed in any detail. Yet the resulting prices for fossil fuels in any given future year in each scenario might be the single most important factor determining most results. These price assumptions must be presented and discussed in the context of the "peak oil", "peak natural gas", and "peak coal" theories. Fortunately, the peak oil hypothesis is mentioned in the early chapters of this report, but it must be further elaborated relative to its impact on the scenario results presented in Chapter 6. 5. The fact that most if not all the IAMs assume that almost infinite supplies of liquid fuels from "backup" technologies will be available must be discussed and justified, since it is a highly controversial assumption. | Please see the response to comment 9820, which appears to be a duplicate of this comment, despite being submitted by another reviewer. |
| 8605 | 6 | 0 | | | | The labels on each figure and table need to be made more clearly understandable in many cases. | Accepted. |
| 8606 | 6 | 0 | | | | The chapter on talks about the "costs" of mitigation, by which "net costs" seems to be meant. But no hint is given that depending on the input assumptions there could be "net benefits" for some scenarios in the long run. For example, this could happen i | Noted. It is made clear in the section on tools of analysis that input assumptions and model structure can have an |
| 8607 | 6 | 0 | | | | The discussion of the net cost results from each model run for scenarios is fairly weak because while there is some discussion of the aggregate type of costs produced by different types of models (e.g. GDP vs. other aggregates), the discussion does not state what function kinds of costs are included in each model, e.g. investment costs, operating costs, O&M costs, capital additions. Similarly, the reader is not told if, for the energy system, the incremental costs of energy efficiency are included (I think not), or transaction costs, or infra-structure costs, etc. | Noted. The discussion of cost metrics and their pros and cons is being moved to the metrics annex. To the degree possible, the chapter will highlight the use of different metrics. |
| 8608 | 6 | 0 | | | | The chapter on talks about the "costs" of mitigation, by which "net costs" seems to be meant. But no hint is given that depending on the input assumptions there could be "net benefits" for some scenarios in the long run. For example, this could happen if the long run prices for fossil-fuels were much higher in the reference cases than in the RCP 2.6 cases, where the demand for fossil=fuels would be much lower than in the reference cases. Thus, the wording which seems to imply that the net costs of mitigation would always be positive must be revised and qualified to allow for the possibility of net negative costs. The bottom-line, of course, is that pursuing strong climate mitigation as in the RCP 2.6 type of scenarios might improve other aspects of the economy and consumption, if, indeed consumption is always good. | Please see the response to comment 9821, which appears to be a duplicate of this comment, despite being submitted by another reviewer. |
| 8609 | 6 | 0 | | | | As hinted at in the above comments, the whole scenario "infeasibility" discussion, which repeats itself too often, forgets to mention that one major cause of apparent infeasibility for some scenarios for some models is probably the overly limited level of end-use energy efficiency improvements. IAMs and their outputs aside, the RCP2.6 greenhouse gas trajectories required are not infeasible given existing energy efficiency technologies and given renewable supply technologies, even with CCS and nuclear power. This must be made clear to the reader. Again, this is another situation where the results are not properly qualified based on model limitations or input assumptions made. | Please see the response to comment 9822, which appears to be a duplicate of this comment, despite being submitted by another reviewer. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8610 | 6 | 0 | | | | The chapter could be organized more logically. I suggest the following order: introduction with discussion of scenarios vs. forecasts; model structure; input assumptions; neutral presentation of results; discussion of results and overall conclusions regarding transformation pathways; policy issues that arise and policy implications of the results. | Noted. |
| 5427 | 6 | 0 | | | | The Chapter focusses on scenarios and models created by or for vested interests, and proceeds to make the usual error of looking at the area with most dense scenario forecasts. This is false, because the data employed are all in this "dont rock the boat" category. The more extreme scenarios are few because of the way scenario data were collected, but may well hold the most interesting suggestions for policy implementation. | Noted. We might note to the reviewer that the scenarios required to meet 450 ppmv CO2 appear to include some rather dramatic changes from historical trends. |
| 3145 | 6 | 0 | | | | chapter 1 needs an iconic figure from chapter 6 that would help us illustrate the cost (and infeasibility) of some emission pathways and goals. Can the Chapter 6 team advise us on that—we need to replace figure 1.8, which is an old EMF chart and does not illustrate the key point.) ONe option would be to move figure 6.11 plus a figure that shows infeasibilty/costs into chapter 1. TSU PLEASE HELP ADVISE.<br><br>BECCS plays a huge role in the IAMs that can meet goals like 2 degrees. Given that, why not use BECCS as a case study/box in chapter 3 since that would help tie together the issues discussed there with the large role that is assumed for BECCS in some scenarios.<br><br>As a general matter, this chapter has lots of terrific material and almost no connection to the rest of WG3. Discussions of financial transfers have no bearing on chapter 16 (which is on finance). (Chapter 16, itself, is a mess.) Discussion of LUCF seems disconnected from the land use chapter and from WG1. The TSU needs to help figure out which connections are most important, and if the transition work discussed in this chapter is pivotal (it is really mainly EMF work) then the TSU might want to help move a few figures from here to other chapters to tie the WG3 together to a greater extent. (one of the notable exceptions to the above comment is chapter 9.9.1, which uses info from chapter 6 to discuss the size of the mitigation challenge in the buildings sector.) | 1. Noted. We're working on it. 2. That is an issue for Chapter 3 to consider, but it seems like a good idea. 3. Agreed on connections. Efforts will be made to brinng in more connections in the SOD. |
| 18459 | 6 | 0 | | | | This is a fine draft by an excellent author team. My concern is that, by very largely limiting the chapter's scope to issues that have been incorporated in Integrated Assessment Modeling (IAM) scenarios, they open themselves up to criticisms that there are other knowledge bases related to transition pathways that are being overlooked. One example would be literatures related to the HOW of transition pathways, as distinguished from the WHAT: i.e., institutional implications and requirements. The chapter has a bit of this (e.g., pp. 53-54, 64, and sections 6.7 and 6.8.3), but these discussions generally just note the issues but then back off from discussing them because they are not embedded in IAM scenarios. I would suggest adding a couple of experts on institutional aspects of transition pathways, at least as contributing authors, in order to fill this kind of (possible?) gap. Regarding chapter length, it is clear that the problem is section 6.3, which runs nearly 40 pages. A good deal of this might be summarized from the available literature, referring readers to the original reports if they want more detail. | Rejected. We agree with the reviewer about the need to think about the challenges in making the sorts of transformations diiscussed in this chapter. But those discussions are not intended in this chapter, but are rather the purview of later chapters, such as Chapter 15 on national and sub?national policies and institutions and Chapter 13 on international policies policies and institutions. We will, however, provide more linkages to these other chapters |
| 6504 | 6 | 0 | | | | Both US$ and $ should be unified.<br>Because they are used thoroughout Chapter 6. | Editorial. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18993 | 6 | 0 | | | | Main comment: The chapter needs to clearly communicate the feasibility of the 2° target and outline possible pathways to reach it and the costs and consequences associated with it. Likewise the chapter also needs to cover "enhancing mitigation options" (UNFCCC), i.e. mitigation targets more stringent than 2°, also including costs and consequences. This will require a clearer discussion about peaking, not-to-exceed and overshoots. Also trade-offs between different pathways should be discussed. | Noted. The chapter will now do a better job of linking the RF stabilization scenarios to temperature goals. |
| 18994 | 6 | 0 | | | | Main comment: The chapter needs to focus on the exploration of different transformation pathways and their institutional requirements. Carving out different characteristic classes of pathways will require a deeper analysis and clustering of the scenarios. | Noted. |
| 18995 | 6 | 0 | | | | Main comment: The chapter needs to communicate clearer that different scenarios/pathways are not representing a wide range of statistical uncertainty but are rather demonstrating different technological, energy efficiency, etc. options/strategies and structural uncertainty (represented through differences in models and their assumptions). | Noted. Text to this effect was included in the FOD, but it will be refined for the SOD. |
| 18996 | 6 | 0 | | | | Main comment: The chapter should aim to inform policy makers about no-regret options, crucial technologies and robust strategies. | Noted. The chapter will continue to be refined to bring out the major insights about actions needed to meet various |
| 18997 | 6 | 0 | | | | Main comment: The chapter mentions in the ES that dramatic changes are needed, but does not convey in the chapter why the presented options/pathways are dramatic and what their implications are. This has to be communicated in a manner understandable for policy makers. | Noted. More effort will be made to communicate the scale of changes required to meet different goals. |
| 18998 | 6 | 0 | | | | The chapter should give stabilization targets (in degrees) rather than (or in addition to) forcing targets | Rejected. There is too much uncertainty in the relationship betwee RF and temperature to use temperature as the defining characteristic of different pathways. Instead, the chapter will now |
| 18999 | 6 | 0 | | | | The discussion of technologies required for certain pathways also needs to cover technology risks. Possible these issues could be covered by the respective sectoral chapters and referenced from Chapter 6. | Noted. Risks will be covered in the sectoral chapters and summarized in |
| 19000 | 6 | 0 | | | | The possible renaissance of coal should in our view be centrally discussed in the chapter. | Rejected. A possible "renaissance of coal" as well as a range of other key drivers are embodied in the baseline scenarios section. With limited space, this section will address the overarching |
| 19001 | 6 | 0 | | | | The chapter should cover the historic context, i.e. transformation pathways in AR4 and SRREN and focus on what is new in recent scenarios (e.g. BECCS) | Accepted. The chapter will now be framed more in the context of what is |
| 19002 | 6 | 0 | | | | The chapter should highlight the role of energy efficiency and how it is (implicitly) covered in IAMs. | Accepted. More effort will be made to clarify the role of end uses in mitigation. |
| 19003 | 6 | 0 | | | | The chapter should further pursue the process of linking scenario data ("top-down") with sectoral data ("bottom-up"). | Accepted. The SOD will include a more extensive treatment of the linkage between top-down and bottom-up |
| 19004 | 6 | 0 | | | | Figures on deployment of technologies are needed, as this is of great interest to policy makers. Consider Chapter 6 summarizing this from the sectoral chapters. | Noted. Figures on total deployment will be found in this chapter, but deploymetn of individual supply technologies will be |
| 9031 | 6 | 0 | | | | The bases and the implications of model infeasibility is one of areas where the chapter is incomplete in terms of analysis and simulations. There are references to sections 6.2.5, 6.2.7 that are not in the first draft. One of the key issues the drafters seem to require a clear agreement on is the treatment of technologies that make possible negative emissions. An analytical approach and clearer view of the role of these technologies is important because of its potential role in creasing development space and the greater responsibility that developed countries could bear in the use of these technologies. | Rejected--space constraints |
| 9032 | 6 | 0 | | | | The chapter confines its survey to integrated assessment models. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18635 | 6 | 0 | | | | Section 6.4 contains an interesting reasoning on how to integrate different time perspectives (relates to some of the issues that I have raised above). | OK. |
| 9192 | 6 | 1 | | | | ch6 needs coordination with "service industry" sectin of ch9 (building) | Rejected. This is beyond the scope of |
| 9193 | 6 | 1 | | | | the risk management perspective of mitigation, adaptation, and geoengineering should be described here with coordination with ch 1& 2 | Accepted in part. Chapter 6 will not be addressing adaptation. However, it will include discussion of how to think about |
| 9191 | 6 | 1 | | | | footnote should be added that says the frequency (number of scenarios ) is not probability. | Footnote has been added |
| 14030 | 6 | 1 | | 99 | | As the theme of transformation is receiving increased attention both in scientific and policy discourses, we see that the concept takes on multiple meanings and uses. In the SREX report of the IPCC (2012) transformation is defined as “The altering of fundamental attributes of a system (including value systems; regulatory, legislative, or bureaucratic regimes; financial institutions; and technological or biological systems.” And it chapter 8 of the SREX report the personal, cultural, institutional and systems levels changes are discussed in more detail.<br>Ch 6 looks at transformation of the energy system, both on production and demand. It discusses what stabilization levels are possible, how we can get to these stabilization levels and how decisions today will influence future stabilization paths. In this chapter, transformational change is limited to the goal of stabilization of greenhouse gas concentrations, and it is very much focused on the energy systems, using large-scale integrated models to capture the interaction between different processes and systems. Even though the chapter points to the larger social context, it does not discuss what personal, cultural, institutional, and systems transformations are needed in the face of climate change. It does not say anything about what a well-adapted global society would look like, or the transformations that are needed to address vulnerability or adapt to inevitable impacts associated with different stabilization pathways. In fact it actually sees little role of adaptation in a transformative pathway.<br>There is a broad literature that argue that climate change responses require far more than technical solutions, they also call for transformations in the systems and structures, at different scales, and in different contexts and settings, that currently promote undesirable outcomes. These may include transformation in energy systems as covered in this chapter, but it also call for transformation in agricultural systems, financial systems, governance and development paradigms, power and gender relations, production and consumption patterns and lifestyles, knowledge production systems, or values and worlds views.<br>My worry is that the reader of AR5 will be left confused of what transformation actually means for society and the environment, given its multiple meanings and uses in this report. Chapter 6 is about stabilization pathways, and I’m curious why this term is not used instead of transformational pathways. This would be an important clarification to be made upfront together with a definition of transformation. | Accepted. The SOD will include more references to later chapters that address these elements of the transformation. Chapter 6 will focus most heavily on the nature of the physical transformations. |
| 13560 | 6 | 1 | | | | There seems a significant overlap between chapter 5 and 6 in terms of driver analysis, trends, emission reduction options…. | Noted. |
| 10399 | 6 | 1 | | 99 | | The parameters about the discount rates are not so clear. And functions are lacked for the technology progress. As the greater and greater role the technology plays in the abatment of carbon and the new technology achieved these years, it cannot be ignored for the medium and long run models. Maybe there is a few papars talked about this issue, but papars on this issue indeed exist,such as Zwaan,Gerlagh,et al(2002),Buonanno, carraro, Galeotti(2003),Wu, Zhu, Wang(2012),Wang,li, Wu(2010). | Noted. More discussion of discounting assumptions are needed. Readers will be directed to Chapter 3 for a more extensive discussion of discounting issues. |

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| 5853 | 6 | 1 | 1 | 99 | 40 | At several places in the text you refer to "carbon-free" or "zero-carbon electricity sources". These do not exist. Nuclear power installations cause emissions during construction, maintenance, operation, intermediate and / or final waste storage, fossil energy with CCS just reduces efficiency to capture and store C which "is still there" (and this source also has emissions from construction, operation and maintenance), and "renewables", especially biomass-based, of course also have C emissions! Low or "zero" emissions during the "electricity generating phase" have to be related to the life-cycle emissions of the "electricity generating device" to get the complete assessment. Speaking of "carbon-free sources" just promotes "emit now, save later", or in case of nuclear waste: "emit now, save a little later, emit for generations to come" and thus I strongly suggest to avoid the use of terms like "zero carbon" or "carbon-free". | Noted. It may be wise to move to a nomenclature on low-carbon technologies. |
| 14036 | 6 | 10 | | | | Would it also be appropriate to say that the model only covers limited criterias for transformation, as non-market factors are not considered. Raskin and collegues (2002) for example find that critical events/disasters define what decisions are made and what pathway society gets on (Raskin, P. et al. 2002. Great Transition: The Promise and Lure of the Times Ahead. SEI,Tellus Institute). | Noted. |
| 13129 | 6 | 10 | 13 | 10 | 15 | This contradicts what was said previously about feasibility being subjective (beyond the biogeophysical constraints). If it's truly subjective, how could this chapter provide information about near term actions that prevent certain long term goals (except for the near term actions that break the long term goals already in the near term, of course)? And to follow the logic of the previous paragraph, does this chapter discuss perceptions of feasibility, rather than actual feasibility? | Noted. The manner in which near-term actions interact with options to meet long-term goals will be revisite in the SOD. |
| 4193 | 6 | 10 | 44 | 11 | 10 | Tradeoff between "detailed formulation" and "intutive understanding" or "flexibility to represent uncertainties" would be also touched upon. | Noted |
| 16689 | 6 | 10 | 7 | | 15 | Very important point -- suggest this be moved forward in the document. | Noted. |
| 4192 | 6 | 10 | 32 | | | Progress of model development since TAR or AR4 should be touched upon. In my view, the role of CGE has increased and contributed to the assessment of near to middle term impacs of climate measures. | Rejected--space constraints |
| 10983 | 6 | 10 | 44 | 10 | 44 | The term of "IAMs" is not defined. | Accepted |
| 9838 | 6 | 11 | 11 | 11 | 15 | Chapter 6.2.2 talks about the uncertainties. This is a limitation that should be discussed later, the same argument holds as mentionned for feasibility. I am not sure the word "prediction" should be used here unless it is made clear that the modeling efforts described do not involve making predictions or forecasts. The text is just discussing scenarios. Therefore, I don't think that the discussion of uncertainty in this sub-section 6.2.2 is really needed or relevant if one is not discussing forecasting. It certainly can be shortened. | Taken into account--we have added a footnote explaining differences in connotations between scenarios, projections, predictions, and forecasts and have added a citation that discusses |
| 4194 | 6 | 11 | 11 | 11 | 35 | The interpretation of the model emsemble in this chapter should be compared with those in WG-I, the case of GCMs. The latter represents the ranges of parameterization of climate science based on the similar theoretical formulations while the former often includes the variety of social context as well as the uncertainties in technological assessment. | Rejected--space constraints |
| 8624 | 6 | 11 | 15 | | | I am not sure the word "prediction" should be used here unless it is made clear that the modeling efforts described do not involve making predictions or forecasts. The text is just discussing scenarios. Therefore, I don't think that the discussion of uncertainty in this sub-section 6.2.2 is really needed or relevant if one is not discussing forecasting. It certainly can be shortened. | Taken into account--we have added a footnote explaining differences in connotations between scenarios, projections, predictions, and forecasts |

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| 13130 | 6 | 11 | 26 | 11 | 35 | This is extremely vague and not convincing. Using two scenarios instead of one would "contain information" about uncertainty , a truism, but would tell little about what uncertainties the differences between these two scenarios reflect, how complete is the coverage of uncertainties, how the differences can be interpreted and what interpretation are clearly out of reach. Or in other words, if there is full, formal information about uncertainty in one end of a range and no information at all in the other end, this statement only says that we are not in the "no information at all" part of the range, without suggesting what that means for using the scenario ensemble to represent uncertainties (in some form). Also, nothing guarantees that the distribution of scenarios has anything to do with "actual" distributions of uncertainties. On the contrary, most modelling teams are likely to aim at "best guess" parameter values, suggesting that tails of parameter distributions are likely to be under represented (the huge amount of possible parameter combinations guarantees heterogeneity for results even in this case). I suggest that any uncertainty related conclusions that are drawn from the scenario ensemble are worded extremely carefully throughout the chapter. | Taken into account--we have added a footnote and citation that discusses this point (Morgan and Keith, 2008) |
| 7671 | 6 | 11 | 3 | 11 | 4 | The text says "[…] these models typically assume market behavior […]". Perhaps a remark should be made that markets are virtually always assumed to be efficient. IAM's take rarely (if at all) e.g. information asymmetry, search frictions or market power into account. | accepted--text revised |
| 9839 | 6 | 11 | 36 | | | Here we return to discussing model "infeasibility" again - it is repetitious and over-emphasized as an issue. | taken into account--infeability discussions in other sections have been |
| 8625 | 6 | 11 | 36 | | | Here we return to discussing model "infeasibility" again - it is repetitious and over-emphasized as an issue. | taken into account--infeability discussions in other sections have been |
| 16691 | 6 | 11 | 4 | | | Make explicit that the market behavior, with the policy cases frequently employing a price on GHG emissions as the incentive. | Rejected--we make this point later in the section |
| 9840 | 6 | 11 | 46 | | | Again, the discussion of model infeasibility should NOT be allowed to "arise repeatedly". And it has very limited, not important, implications for "our understanding of real world feasibility." For example, one reason why some modeling groups stress scenario infeasibility for the RCP 2.6 scenario is because they limit the rate of efficiency improvements far too strongly on the demand-side; I think to less than 1.5% per year. If 3-4% per year efficiency improvements were allowed, then no scenario might have been infeasible..... | taken into account--infeability discussions in other sections have been shortened and blended into this section |
| 8626 | 6 | 11 | 46 | | | Again, the discussion of model infeasibility should NOT be allowed to "arise repeatedly". And it has very limited, not important, implications for "our understanding of real world feasibility." For example, one reason why some modeling groups should scenario infeasibility for the RCP 2.6 scenario is because they limit the rate of efficiency improvements far too strongly on the demand-side; I think to less than 1.5% per year. If 3-4% per year efficiency improvements were allowed, then no scenario might have been infeasible..... | taken into account--infeability discussions in other sections have been shortened and blended into this section |
| 10984 | 6 | 11 | 6 | 11 | 8 | In this sentence, the year 2020 is illustrated as a turning point from the medium-term to the long-term. Why is the year 2020 considered as such a turning point? It should be clarified. | Accepted--2020 deleted from sentence. |
| 7672 | 6 | 11 | 11 | | | On interpreting scenario ensembles, the risk for systematic bias should be also noted. Many IAM's share the same theoretical backgrounds and solution concepts. If a real-life feature (market inefficiency, non-market factors, uncertainty/limited foresight etc.) is not captured by the models, the whole ensemble is biased to some extent. (This is actually mentioned briefly in the end of section 2.3.6.2.) | Taken into account--model shortcomings discussed in section 6.2.1 |
| 16692 | 6 | 12 | | | | Can model descriptions be moved to an appendix? Does the policymaker need this? It is interesting and important, but a bit of detail that most will gloss over. | Accepted--section condensed |
| 16693 | 6 | 12 | | 13 | | Have you answered the following questions clearly enough: 1) Are models "valid"? 2) Do the results make sense? 3) How do the model results compare to our understanding or experience of the real world? | Taken into account--we try to address these, but due to space constraints are perhaps unable to elaborate to the |
| 9842 | 6 | 12 | 11 | | | This sub-section should be moved forward so that the structures of the models are discussed before results. | Taken into account--this section does come before the results in section 6.3 but comes after the executive summary |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13131 | 6 | 12 | 11 | 14 | 4 | As the chapter is currently some 20 pages longer than it should be, I suggest this section on the tools is cut down considerably. The descriptions on the trade, foresight etc dimensions of the models should be summarized much more concisely and more references could be given instead. I don't see why it would be necessary to give this much detail when the results are anyway analysed mostly on the level of the full scenario ensemble. I also suggest removing table 6.1. completely - similar information could be given together with the concise descriptions, naming model examples and giving references. Finally, if the authors insist on keeping the table in, it needs to be clarified and made consistent. For example, for two models there is trade in "primary energy, secondary energy and energy goods". How are energy goods defined, if they don't fall under primary or secondary energy? The different options for model flexibility are also unclear, potentially also to the authors as different interpretations appear to exist (i.e. models that are rather similar, and should include the same flexibility options, don't). This also applies to cost measures. | Agreed--section condensed |
| 8628 | 6 | 12 | 11 | | | This sub-section should be moved forward so that the structures of the models are discussed before results. | Taken into account--this section does come before the results in section 6.3 but after the executive summary which |
| 9843 | 6 | 12 | 20 | | | One implication of their being two kinds of models with two very different kinds of macro-economic outputs seems to me to be that economic results can not be compared validly at all between the two types of models. Yet, I believe at many points later in the chapter, cost results from these two different types of models are compared and even placed in the same figures. Furthermore, to the extent that different model runs assume different discount rates, it is a simple conceptual point that these results can not be compared either. Please check if different discount rates were ever used in the results that you lump together. | Noted--we agree that the model ensembles from which we take these scenarios involve very different models, but it is outside of the chapter's scope to conduct a comprehensive comparison across all the models included in these |
| 8629 | 6 | 12 | 20 | | | One implication of their being two kinds of models with two very different kinds of macro-economic outputs seems to me to be that economic results can not be compared validly at all between the two types of models. Yet, I believe at many points later in the chapter, cost results from these two different types of models are compared and even placed in the same figures. Furthermore, to the extent that different model runs assume different discount rates, it is a simple conceptual point that these results can not be compared either. Please check if different discount rates were ever used in the results that you lump together. | Noted--we agree that the model ensembles from which we take these scenarios involve very different models, but it is outside of the chapter's scope to conduct a comprehensive comparison across all the models included in these |
| 9844 | 6 | 12 | 31 | | | The concept of "the area under the marginal abatement cost function" needs to be explained for a general reader. But, in addition, marginal costs would not seem relevant to calculating the average cost of abatement, which is what is needed. (Average cost per unit of abatement times total abatement equals total cost of abatement, correct?) What should be the additional value of the use of a marginal cost function be justified in this type of cost comparison? | Taken into account--section condensed and details eliminated |
| 8630 | 6 | 12 | 31 | | | The concept of "the area under the marginal abatement cost function" needs to be explained for a general reader. But, in addition, marginal costs would not seem relevant to calculating the average cost of abatement, which is what is needed. (Average cost per unit of abatement times total abatement equals total cost of abatement, correct?) How can the use of a marginal cost function be justified in this type of cost comparison? | Taken into account--section condensed and details eliminated |
| 7673 | 6 | 12 | 33 | 12 | 34 | The text contrasts "feedbacks to the full economy" and "more possibilities for substitution" in GE models. These are not contrasting things, as the substitution possibility is one kind of a feedback effect. The two clauses ("On one hand […]" and "On the other hand [...]") should be reformulated. Are there examples and references for the negative feedback effects? | Noted |
| 9950 | 6 | 12 | 40 | | 41 | Whether models with perfect foresight will lower the economic costs depends on the value of discounting rate. A lower discounting rate will result in a increasing costs. So please pay attention to the statement. | Taken into account--section condensed and details eliminated |
| 7674 | 6 | 12 | 41 | 12 | 41 | The text says "[…] a model with perfect foresight will have lower economic costs […]". Perhaps this should be interpreted as that a perfect foresicht model gives a lower bound for costs, because perfect foresight is not possible in reality. | Noted |

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| 7675 | 6 | 12 | 41 | 12 | 41 | Why a carbon tax is mentioned specifically? The same observation holds for a quantitative emission limit, a forcing or a temperature target (although these might need some sort of foresight, at least in form of expectations). | Accepted--"tax" changed to "policy" |
| 9845 | 6 | 12 | 46 | | | With respect to the statement that the level of investment is determined by a fixed savings rate, how is this rate determined? Can a low savings rate constrain the amount of investment per year in renewable energy, for example, below what is needed to meet a given climate target? Could a low savings rate contribute to "infeasibility" as discussed earlier in the chapter? If not, why not? This seems like another very important assumption, the level of the savings rate, therefore more discussion of its role in different kinds of macro-economic modules within IAMs appears necessary. | Taken into account--section condensed and details eliminated |
| 8631 | 6 | 12 | 46 | | | With respect to the statement that the level of investment is determined by a fixed savings rate, how is this rate determined? Can a low savings rate constrain the amount of investment per year in renewable energy, for example, below what is needed to meet a given climate target? Could a low savings rate contribute to "infeasibility" as discussed earlier in the chapter? If not, why not? This seems like another very important assumption, the level of the savings rate, therefore more discussion of its role in different kinds of macro-economic modules within IAMs appears necessary. | Taken into account--section condensed and details eliminated |
| 9846 | 6 | 12 | 47 | | | How is the marginal propensity to invest and consume calculated in models that use those parameters? What is the implication of those methodologies on the mitigation scenarios? | Taken into account--section condensed and details eliminated |
| 8632 | 6 | 12 | 47 | | | How is the marginal propensity to invest and consume calculated in models that use those parameters? What is the implication of those methodologies on the mitigation scenarios? | Taken into account--section condensed and details eliminated |
| 9841 | 6 | 12 | 9 | | | Good - finally the dependence of scenario infeasibility on input assumptions is mentioned, but not explained in sufficient detail. Clearly, the entire discussion of infeasibility should be put after most important results about feasible scenarios are presented, and it should be reorganized and shortened. Let's talk about what is feasible first. | Noted |
| 8627 | 6 | 12 | 9 | | | Good - finally the dependence of scenario infeasibility on input assumptions is mentioned, but not explained in sufficient detail. Clearly, the entire discussion of infeasibility should be put after most important results about feasible scenarios are presented, and it should be reorganized and shortened. Let's talk about what is feasible first. | Noted |
| 9847 | 6 | 13 | 1 | | | Perhaps a simple figure showing this comparison in investment trajectories between these two different types of models would give the reader a better feel for how big the difference might be. Otherwise, it will be hard even for experienced modelers to get a sense of the differences between the two different models, and how different the mitigation trajectories might be. I.e. what difference would it make for policy makers which kind of model is used? | Taken into account--section condensed and details eliminated |
| 8633 | 6 | 13 | 1 | | | Perhaps a simple figure showing this comparison in investment trajectories between these two different types of models would give the reader a better feel for how big the difference might be. Otherwise, it will be hard even for experienced modelers to get a sense of the differences between the two different models, and how different the mitigation trajectories might be. I.e. what difference would it make for policy makers which kind of model is used? | Taken into account--section condensed and details eliminated |
| 9951 | 6 | 13 | 14 | | 44 | In IAM models, technological change is one of the most important factors determining the emission project. The change rate of technology influences future emission substaintially. But in these two paragraphs, issues mentioned are mainly concerned about CGE models, factors in IAMs, which ae not CGE-based, are fosuced on little. | Taken into account--section condensed and details eliminated |
| 9848 | 6 | 13 | 15 | | | The sentence beginning here does not have two different kinds of models explicitly mentioned. Please re-write. | Taken into account--section condensed and details eliminated |
| 8634 | 6 | 13 | 15 | | | The sentence beginning here does not have two different kinds of models explicitly mentioned. Please re-write. | Taken into account--section condensed and details eliminated |
| 9849 | 6 | 13 | 18 | | | "nested CES structure" is not explained. In general, this parts needs to be expanded so that the economic modeling approaches can be explained better, or eliminated. | Taken into account--section condensed and details eliminated |

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| 8635 | 6 | 13 | 18 | | | "nested CES structure" is not explained. In general, either is page or two needs to be expanded so that the economic modeling approaches can be explained better, or eliminated. No one but an economist will be able to understand this section entitled "model flexibility". In fact, I am not sure it would be clear to anyone, especially the last few sentences. At the very least, please re-write - I don't know what is saying about fossil fuel constraints and their impact. | Taken into account--section condensed and details eliminated |
| 9090 | 6 | 13 | 20 | | | Why "uranium in the case of nuclear" is cited as example in this context ? And what is the specific meaning of "in the case of nuclear" ? Detailed explanation is required. | Taken into account--section condensed and details eliminated |
| 9567 | 6 | 13 | 26 | | | Please, delete the before how. | editorial |
| 9850 | 6 | 13 | 28 | | | First of all, the first sentence as stated in economist's terminology obscures the huge importance of this assumption in some models - that the entire economy (presumably net of the energy sector, and others(?)) can be represented by just one or a few CES production functions. The text should make it clear that this means one can not distinguish between economic activity in the household, commercial, government, transportation, or industrial sectors, or within each sector. It is all one big aggregate "glob". Yet, the next few sentences makes is sound like a model with just one economic sector, implicitly assuming perfect substitutability across the economy, has some advantage relative to allocating factors of production. Of course, just the opposite is true. The more aggregate the economy as modeled, the more unrealistic and, therefore, inaccurate the results of calculations will be. This is particularly true for the cost of mitigation results. I believe that these highly aggregated economic models will dramatically underestimate the costs of climate change mitigation for the same reasons the text cites. If I am right, this weakness of these models must be honestly described. In their defense you might also mention the problems with running models with more highly disaggregated economic sectors. The same is true for lack of sufficient regional disaggregation. The related point that should be mentioned is that not having sufficient end-use or demand-side detail means that the degree of possible substitutability between many demand-side technologies will be greatly overestimated (implicitly). Also, more aggregation raises very serious issues about how to project changes in the economy into the future relative to possible changes in culture and lifestyles. | Taken into account--section condensed and details eliminated |
| 8636 | 6 | 13 | 28 | | | First of all, the first sentence as stated in economist's terminology obscures the huge importance of this assumption in some models - that the entire economy (presumably net of the energy sector, and others(?)) can be represented by just one or a few CES production functions. The text should make it clear that this means one can not distinguish between economic activity in the household, commercial, government, transportation, or industrial sectors, or within each sector. It is all one big aggregate "glob". Yet, the next few sentences makes is sound like a model with just one economic sector, implicitly assuming perfect substitutability across the economy, has some advantage relative to allocating factors of production. Of course, just the opposite is true. The more aggregate the economy as modeled, the more unrealistic and, therefore, inaccurate the results of calculations will be. This is particularly true for the cost of mitigation results. I believe that these highly aggregated economic models will dramatically underestimate the costs of climate change mitigation for the same reasons the text cites. If I am right, this weakness of these models must be honestly described. In their defense you might also mentioned the problems with running models with more highly disaggregated economic sectors. The same is true for lack of sufficient regional disaggregation. The related point that should be mentioned is that not having sufficient end-use or demand-side detail means that the degree of possible substitutability between many demand-side technologies will be greatly overestimated (implicitly). Also, more aggregation raises very serious issues about how to project changes in the economy into the future relative to possible changes in culture and lifestyles. | Taken into account--section condensed and details eliminated |
| 9952 | 6 | 13 | 28 | | | The title for the paragraph should be "…and GHG detail". | Agreed--text revised |

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| 7676 | 6 | 13 | 3 | 13 | 44 | The text's level of technicality might be reconsidered. Discussion on coverage and foresight is relatively accessible, but the paragraphs on trade, flexibility and detail dive into how production functions are nested. Moreover, production functions and nesting are explicitly applied only in GE models. Perhaps the text should be on a more general level, and focus on how different assumptions relate to the real world and what implications the assumptions have. | Taken into account--section condensed and details eliminated |
| 12308 | 6 | 13 | 44 | 13 | 44 | Please consider to explain the column "Optimization/Simulation" similar to the other columns in Table 6.1. | This table has been removed |
| 9851 | 6 | 14 | | | | How did you select the models? Please provide search terms and information on the selection process in a footnote. Moreover regional scenario models are left out. On page 10 you mention that regional models are left out, but climate change is relevant for most of the decision makers on a regional scale only because their individual influence is restricted to a specific region, be it as a politician or a business practionner. | This table has been removed |
| 9403 | 6 | 14 | | | | As for explanation of the AIM-Enduse model, please write "6 GHGs" instead of "5 GHGs". In addition, please remove information of (energy-related) when counting sectral numbers. Anyway, this table is unclear, for example, definitions of model flexibility and how to count sectors and regions are unclear. Please carefully check information of original models in Table 6.1. | Taken into account--all model information was provided by the individual model teams in a questionaire included as part of their submission to |
| 13760 | 6 | 14 | | | | Please provide references for the different models. Why is IMAGE not included - it is explicitly included in Fig. 6.26? | Taken into account--only model results that were submitted to the AR5 data base were included in the table. This |
| 9953 | 6 | 14 | | | | Please give more details about the models including values of key parameters, such as the value for economic growth rate, so that others can follow the work. At least, papers which introduce the detailed structure of each model should be listed. Why those models are selected for scenario generation? Maybe it's better to explain the criterion for model selection. | Taken into account--all model information was provided by the individual model teams in a questionaire included as part of their submission to the AR5 data base. Due to space |
| 7677 | 6 | 14 | 1 | | | The model comparison tabe is good, but the data in the flexibility and detail-level columns can be interpreted so loosely that the information loses its meaning. From what I know of the MESSAGE and TIAM (though not of the ECN's version) models, they should have roughly the same amount of flexibility and covered sectors. From what I understand, MESSAGE is here assumed to cover one large energy sector, while TIAM differentiates between energy subsectors. (If ECN's model is heavily reformulated from the original TIAM, this comment does not necessarily apply.) | Taken into account--all model information was provided by the individual model teams in a questionaire included as part of their submission to the AR5 data base. This table has been removed. |
| 8348 | 6 | 14 | 1 | | | There are other models such as LEAP and MARKAL/TIMES model. I suggest a paper. Bhattacharyya S.C. and G.R. Timilsina, (2009). Energy Demand Models for Policy Formulation - a comparative study of energy demand models. The World Bank, pp.91-92. | Taken into account--all model information was provided by the individual model teams in a questionaire included as part of their submission to |
| 8637 | 6 | 14 | 1 | | | I don't think that Table 6.1 is filled in in a consistent way across models. For example, check the column headed "sectoral, regional…" It should be clear how many sectors are represented for the energy sector separately from the non-energy sectors in the same format. Similarly, some terms are not clear e.g. "energy system cost markups". I never saw that phrase used before. | Table has been removed |
| 16694 | 6 | 15 | | | | It would be helpful to discuss scenarios/model results that examined the OECD making aggressive reductions now while developing countries continued with BAU emissions until 2040, at which time they reduced. Do we achieve safe stabilization levels? This would be helpful for people to understand. | There are many delayed participation scenarios in the literature, which are indeed an important component of the story. These will be discussed in the chapter, but likely not in the baseline section. At this stage we are still |

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| 6906 | 6 | 15 | | | | Please check RCP discussion, especially figure content etc., to be consistent between WGs. | The data shown in the figure is from the published RCP results (Van Vuuren et al, 2011). This reference will be clarified in the chapter. Every effort will be made to ensure consistency across working |
| 9217 | 6 | 15 | 1 | 15 | 1 | It should be notd that the "concentration stabilization" is not a likely future and this has implication on the scale of emission reduction policies. In (T. Matsuno, K. Maruyama and J. Tsutsui “Stabilization of atmospheric carbon dioxide via zero emissions-----An alternative way to stable global environment”. Part 1 and 2 In Proceedings of Japan Academy Ser. B, Vol. 88, No.7 (July, 2012),p 368-395.), the authors critically examine the traditional “stabilization” concept in which the atmospheric CO2 concentration and corresponding temperature are held constant for many centuries to a millennium. They claim that such long-term constancy of concentration and temperature is not a likely future state. Instead they propose “zero-emissions stabilization” in which emissions will be diminished close to zero, and after that the concentration will decrease approaching the final equilibrium state for which the temperature rise can be made much lower to avoid the risk of sea level rise. Another advantage of the zero-emissions stabilization strategy is that emissions in the near future can be made larger compared with ordinary stabilization pathways under the same temperature rise constraint. This would be beneficial to respond to current socio-economic needs. These points are shown by simple model calculations for illustrative cases. | In the baseline section of this chapter we are summarizing what is assumed in the literature about the evolution of emissions in the absence of policy. In subsequent sections we describe stabilization scenarios. It is the mandate of the chapter and indeed of WGIII to describe the implications of stabilization as outlined in the UNFCCC in terms of concentrations / forcing. However, it is an important point that this not the only way to formulate a policy goal. A scenario in which emissions are required to be reduced to zero in the long run would indeed have different results, although it should be noted that many scenarios in the literature have negative |
| 9853 | 6 | 15 | 21 | | | The mean of RCP should be explained. Also, the text should explain how the RCP trajectories on Figure 6.1 were computed. Then I think a full paragraph is required to explain why there is such a vast range even for the set of baseline scenarios in Figure 6.1. Perhaps this could be illustrated by providing a partial or representative table showing how different many of the key input parameters are from model to model. This is where a fairly complete list of the types of input assumptions and drivers should be provided so the reader can understand why the results even for the baseline scenarios can be so different from each other. Otherwise, I find a figure like Figure 6.1 to be a fairly meaningless way of presenting results. The naive reader would say to themselves "these modeling teams can not even agree on a reasonably similar baseline scenario for comparison purposes to the mitigation scenarios. I wonder what a huge spread will be represented by mitigation scenarios". Therefore, if net costs are calculated by comparing the total cost of a baseline scenario to a type of mitigation scenarios, those differences will be "all over the map", and, therefore, may be seen as meaningless. Perhaps making comparisons between baseline and mitigation scenarios in a more disaggregated fashion would help convince the reader that the net costs that result are meaningful. | The data shown in the figure is from the published RCP results (Van Vuuren et al, 2011). This reference will be clarified in the chapter. As for the wide variation across model scenarios in the baseline emissions path, this is a key observation. The intent of Section 6.3.1 is to illustrate the drivers of the spread (as discussed in 6.3.1.3 and shown in Figure 6.5, these are per capita income growth rates and energy intensity parameters) and to emphasize that uncertainty about these two drivers, as well as other aspects of the baseline, are an important component of uncertainty |

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| 8639 | 6 | 15 | 21 | | | The mean of RCP should be explained. Also, the text should explain how the RCP trajectories on Figure 6.1 were computed. Then I think a full paragraph is required to explain why there is such a vast range even for the set of baseline scenarios in Figure 6.1. Perhaps this could be illustrated by providing a partial or representative table showing how different many of the key input parameters are from model to model. This is where a fairly complete list of the types of input assumptions and drivers should be provided so the reader can understand why the results even for the baseline scenarios can be so different from each other. Otherwise, I find a figure like Figure 6.1 to be a fairly meaningless way of presenting results. The naive reader would say to themselves "these modeling teams can not even agree on a reasonably similar baseline scenario for comparison purposes to the mitigation scenarios. I wonder what a huge spread will be represented by mitigation scenarios". Therefore, if net costs are calculated by comparing the total cost of a baseline scenario to a type of mitigation scenarios, those differences will be "all over the map", and, therefore, may be seen as meaningless. Perhaps making comparisons between baseline and mitigation scenarios in a more disaggregated fashion would help convince the reader that the net costs that result are meaningful. | The data shown in the figure is from the published RCP results (Van Vuuren et al, 2011). This reference will be clarified in the chapter. As for the wide variation across model scenarios in the baseline emissions path, this is a key observation. The intent of Section 6.3.1 is to illustrate the drivers of the spread (as discussed in 6.3.1.3 and shown in Figure 6.5, these are per capita income growth rates and energy intensity parameters) and to emphasize that uncertainty about these two drivers, as well as other aspects of the baseline, are an important component of uncertainty |
| 9955 | 6 | 15 | 25 | | 26 | It's not easy for readers to know what does RCP scenario 2.6 or 4.5 mean. Maybe a table should be added here to explain the implications of RCP scenarios. | The data shown in the figure is from the published RCP results (Van Vuuren et al, 2011). This reference will be clarified |
| 9852 | 6 | 15 | 5 | | | section 6.3.1.1 should be moved into a "results" section, but the concept of a scenario should be clarified up-front. B I think that line 19 which talks about "best-guess" pathways for key drivers is not appropriate, because it conflicts with the idea stated on line 17 above that it is not meaningful to assign probabilities to driver or emissions pathways. A best guess says something about probabilities. Please fix this to make everything consistent. A scenario is just a set of assumptions and projections, independent of their probability of occurence. I also think it would be accurate to point out that each modeling team gets to choose its own set of assumptions for their baseline and RCP-x scenarios, so there is little to no consistency in key drivers assumed or calculated between modeling teams. | This is an important point. A clearer discussion of how to interpret scenarios in the context of uncertainty about input parameters will be added to the introduction section of the chapter. |
| 8638 | 6 | 15 | 5 | | | section 6.3.1.1 should be moved into a "results" section, but the concept of a scenario should be clarified up-front. B I think that line 19 which talks about "best-guess" pathways for key drivers is not appropriate, because it conflicts with the idea stated on line 17 above that it is not meaningful to assign probabilities to driver or emissions pathways. A best guess says something about probabilities. Please fix this to make everything consistent. A scenario is just a set of assumptions and projections, independent of their probability of occurence. I also think it would be accurate to point out that each modeling team gets to choose its own set of assumptions for their baseline and RCP-x scenarios, so there is little to no consistency in key drivers assumed or calculated between modeling teams. | This is an important point. A clearer discussion of how to interpret scenarios in the context of uncertainty about input parameters will be added to the introduction section of the chapter. |
| 16346 | 6 | 15 | 8 | 15 | 8 | Please clarify: do you mean "no explicit climate policy intervention" ?<br>(see my general comment on section 6.3.1 for more information) | This is an important point. While different models may frame their baselines differently, the cleanest conceptual definition in the context of integrated assessment of climate |
| 6496 | 6 | 15 | 1 | | | Section 6.3 is divided smaller than other sections. So, this section should be significantly reduced as same volume as other sections. | The structure of the chapter is being revised to best cover the material within |
| 6505 | 6 | 15 | 1 | | | 6.3.2.6 (Solar radiation management and stabilization scenarios) and 6.9.2 (Solar radiation management) had better to be aggregated.<br>Because they are similar in the content. | The structure of the chapter is being revised to best cover the material within the prescribed outline. |

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| 16345 | 6 | 15 | 4 | | | The concept of "baseline" needs to be explained in more detail with regard to the inclusion of policies related to sustainable development. There are 2 related issues:<br>- it needs to be made clear that baselines may include policies that contribute to mitigation as long as these are not directed at climate change mitigation alone, in particular policies and measures designed in a broader context of sustainable development are included in baselines. This is not a future "with no policy intervention or with only specific policies" (as currently suggested in 6.3.1.1.); I would rather understand baselines in AR5 as a future with "no new policy addressing climate change alone". If it is not so, a clarification is even more important.<br>- The limitations of the use of baselines should also be explained. I would indeed expect that there are scenarios in which efforts to tackle climate change and its impacts are so strongly integrated with other socio-economic objectives that it is hardly possible to find an appropriate baseline - that is, to remove the climate policies and have all the other policies remain unchanged. The reasons for such an integrated thinking of sustainable development and climate change have been described in several papers, and it has even been argued that "sustainable development may offer a significantly more fruitful way to pursue climate policy goals than climate policy itself" (Robinson et al., Ambio, vol 35, pp 2-8, 2006). I think that this is not just something that can be noted in a separate chapter, but a real limitation to the "baseline + climate policy" approach. | This is an important point. While different models may frame their baselines differently, the cleanest conceptual definition in the context of integrated assessment of climate stabilization is a scenario in which the GHG externality is neither implicitly nor explicitly priced. It is true that policies with other objectives (such as reducing local air pollution or increasing energy security) will influence GHG emissions. The extent to which such non-GHG policies are incorporated into climate scenario baselines is model-specific. The author team is working on ways to better incorporate the concept of sustainable development integrated with climate policy into the discussion. |
| 16348 | 6 | 15 | 21 | | | I noticed that scenario data is preliminary, but I think that the text will need to be adapted to the additional data, especially regarding low emission baselines. The emissions currently shown are way above the lowest cases shown in IPCC SRES (B1). Would this mean that such scenarios are absent from the recent literature ? I think that the text will need more emphasis on the role of sustainable development in achieving low emissions (how these low baselines may help achieving stabilisation). | This section is focused on an objective assessment of the results in published baseline scenarios. The author team is considering whether to include the SRES scenarios on the graphic as a reference point, but in any case it is true that in the assessed literature there are no so-called "low-emissions baselines." It can be difficult to ascertain, both as an author and reader of the assessment, whether particular instances (such as indirect GHG reductions due to non-climate SD policies) don't appear in the literature because they are unlikely or because they were simply neglected. As for scenarios in which GHGs are reduced due to combined climate-SD |

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| 15219 | 6 | 16 | | | | Figures 6.1 and 6.2 are difficult to understant due to too many lines. | The author team is working on ways to optimize the visual representation of scenario data. In some cases the "spaghetti" format is the "least bad" approach: in this format, particularly with all scenarios shown in the same color, the point is not to display the characteristics of individual data series (which is indeed very difficult) but rather to display the characteristics of the ensemble as accurately as possible. In this sense it is superior to a shaded range or "box and whisker" alternatives because it conveys to the reader the true frequency of reported data. This is potentially important in the context of baseline emissions paths because the distribution is not uniform (e.g. the upper end of the range has only a few |
| 4195 | 6 | 16 | | | | Interesting for researchers in this field, but very difficult for other readers to get the information from this. Almost no relationship is observed between energy intensity and per capita income, even in USA. I think the convergence of EI of countries along the time horizon would give useful information, if it exists. | The author team is considering dropping this figure due to its limited added value to the chapter. In fact countries do not converge in EI over time: EU and Japan are much lower than USA and Canada, due to a variety of factors. A key |
| 9410 | 6 | 16 | 17 | | | Instead of drawing this figure in fossil and industrial CO2 emissions, it is recommended to draw in GHG emissions in order to keep it consistent with Figure 6.2. | The author team is considering what the best metric is for displaying emissions paths. CO2-e including Kyoto gases converted using GWPs is more inclusive (but not totally consistent with Figure 6.2 and 6.3 since the non-gas forcing agents |
| 6263 | 6 | 16 | | 16 | | Remove "ORNL" from both graphics and replace with "History" who compiled these data are not the important point to convey in this graphic. | Agreed. |
| 9411 | 6 | 17 | | | | This figure is not informative. It is too difficult to see consistency between non-OECD and OECD within the same scenario. For example, the scatter-plot figure (OECD in X-axis and non-OECD in Y-axis) in different years is much meaningful. | The author team is working on ways to improve this graphic. A scatter plot format could indeed be a good |
| 13132 | 6 | 17 | 15 | 17 | 17 | Or more precisely, there is evidence that *incremental* change may not be enough, if all the other assumptions remain in place. One can easily imagine baseline scenarios in which emissions would dip due to, for example, a revolutionary, low cost carbon free technology emerging. As the baselines are often created as a reference point for mitigation scenarios (as was pointed out earlier in the draft), such a baseline would be somewhat purpose defeating (and optimistic, of course) and it's therefore unsurprising that no such baselines have been observed in the literature. This also indicates that the lack of such baseline can't by itself be considered an indication of it being impossible (or even less likely than other baseline) - that would suggest taking the assumption of the analyst (i.e. that it's not worthwhile to create such a baseline scenario) and presenting it as a conclusion. | It is one of the key messages of this section that among published baseline scenarios, notional forcing targets are not achieved. The author team is working on ways to emphasize this point while also being clear that the range of assumptions made in published baseline scenarios likely under-represents the true range of uncertainty in key input parameters (both related to growth and technology costs). A clearer discussion |

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| 16695 | 6 | 17 | 15 | | 17 | This is very important point and should be given emphasis somehow. | It is one of the key messages of this section that among published baseline scenarios, notional forcing targets are not achieved. The author team is working on ways to emphasize this point while also being clear that the range of assumptions made in published baseline scenarios likely under-represents the true range of uncertainty in key input parameters (both related to growth and technology costs). A clearer discussion |
| 8640 | 6 | 17 | 15 | | | Again, the sentence starting "Thus there is strong evidence…" is a very important conclusion which comes out of the blue, since the kinds of technological change refered to is never described in any detail. And the term "policy intervention" on line 16 should be explained also. Finally, because the "strong evidence" refers to the wide range of baseline results in Fig. 6.1, the reader will likely be somewhat unclear as to the basis for this sweeping conclusion. (I agree with the content of the conclusion, of course.) But a reader might also ask the question, are there other reasonable input assumptions for a baseline case that would make the emissions trajectory more compatible with RCP4.5, for example, if oil prices were $500 per barrel in 2100, etc.... | It is one of the key messages of this section that among published baseline scenarios, notional forcing targets are not achieved. The author team is working on ways to emphasize this point while also being clear that the range of assumptions made in published baseline scenarios likely under-represents the true range of uncertainty in key input parameters (both related to growth and technology costs). A clearer discussion |
| 5857 | 6 | 17 | 18 | 17 | 21 | Please delete "other" preceding "developing countries" else you mean Russia, China or India to be DCs, too. | The labeling of countries in terms of categories of development, etc. will be made consistent throughout the report. |
| 8641 | 6 | 17 | 18 | | | Does the phrase "over the century" mean the cumulative amount, the annual amount, or both? | Cumulative. Text will be clarified. |
| 12610 | 6 | 17 | 18 | 17 | 27 | Into the discussion the authors present as non OECD countries only China, Russia, Brazil, India, South Africa and other countries. Which ones? . For the trayectories shown into the figure of these countries, in the future their future emission will be greater than the OECD countries. Countries like the SIS would not be included, never their future emissions would be similar to the OECD countries. | The non-OECD category includes all countries not explicitly in the OECD. While it is true that SIS emissions by themselves would likely not exceed OECD in any baseline projection, they are included in the non-OECD total in |
| 11417 | 6 | 17 | 18 | 17 | 27 | The assertion that in all baseline scenarios, the majority of emissions over the 21st century will come from non-OECD regions and countries needs to be explained more clearly in terms of what the assumptions are underlying such assertion. Absent a clear explanation of the assumptions for this assertion, such a bare assertion could be used in a non-scientific and political way in order to push specific policy agendas or approaches in the context of international policymaking discussions and negotiations on climate change that could effectively absolve developed countries of any further mitigation commitments and increase the pressure on developing countries to undertake increased mitigation actions. Furthermore, this paragraph does not fully nuance the assertion - what it seems to do is to project the current rates of population growth and economic growth of non-OECD regions in a linear fashion into the future and then concludes that because of these, non-OECD countries will therefore be the biggest contributors to future emissions. | The statement is an objective assessment of the results in published baseline scenarios. As discussed in the section, the key drivers for these projections are per capita income growth rates and energy intensity parameters. Models use a variety of methodologies for country-level baseline projections, which are in nearly every case more sophisticated than simply assuming current growth rates persist indefinitely. For example, Figure 6.5 shows how the |
| 12609 | 6 | 17 | 2 | 17 | 4 | Does x axis represent the total emissions on billions tons of CO2 or the increment on total emisssions of CO2 for OECD and non OECD countries? Please clarify. | The x axis represents time. The y axis represents total emissions. The author team is working on ways to improve this |

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| 9854 | 6 | 17 | 5 | 17 | 17 | It should be explained, why the unit the W/m2 is chosen and how it is correlated to ppm and also oC. It is not familiar to many of the potential readers. | W/m2 is the unit for radiative forcing. We can add a reference to WGI for a definition of this quantity. The targets refer to total radiative forcing from all agents (not just CO2), hence the comparison is given to concentrations of CO2-equivalent. We can also add a reference to WGI defining CO2-equivalent concentrations. Neither |
| 10391 | 6 | 17 | 8 | 17 | 8 | There is a mistake for the unit about the radiative forcing "2.6 W.m2". | Noted. |
| 16696 | 6 | 18 | | | | The graph seems to suggest that economic growth is the biggest variable or determinant of CO2 emissions -- therefore if we want to lower emissions we need to lower economic growth. This is obviously wrong but unless this is clarified, the misunderstanding will persist. Should therefore explain the graph is a baseline and if policy is enacted which creates incentive for low emitting technology this relationship (econ & emissions) can be significantly changed. We know this from experience. | In fact the graph refers to rates of change, not overall contributions to emissions. The observation is that uncertainty about economic growth is a major driver of uncertainty about baseline emissions. The graph does not suggest that carbon intensity is unimportant as a driver of emissions, only that it does not change much over time in published baseline scenarios. Still, it is an important point that mitigation chiefly involves reducing |
| 9855 | 6 | 18 | 10 | | | Note that while there is a reasonable discussion of the carbon intensity issue between models, one might think that the exception noted on lines 14-16 would be the norm. | This section is focused on an objective assessment of the results in published baseline scenarios. The author team is working on ways to clarify that the range of assumptions made in published baseline scenarios likely under-represents the true range of uncertainty in key input parameters (both related to growth and technology costs). It can be difficult to ascertain, both as an author and reader of the assessment, whether particular instances (such as very cheap renewables) don't appear in the literature because they are unlikely or because |
| 13133 | 6 | 18 | 10 | 18 | 11 | I think it's noteworthy that there is not a single documented "degrowth" baseline scenario, not even on the regional level. This is noteworthy also in terms of how well the existing baseline scenario ensemble might capture the "full", relevant baseline scenario space. | This section is focused on an objective assessment of the results in published baseline scenarios. The author team is working on ways to clarify that the range of assumptions made in published baseline scenarios likely under-represents the true range of uncertainty in key input parameters (both related to growth and technology costs). It can be difficult to ascertain, both as an author and reader of the assessment, whether particular instances (such as "degrowth") don't appear in the literature because they are unlikely or because |

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| 8643 | 6 | 18 | 10 | | | Note that while there is a reasonable discussion of the carbon intensity issue between models, one might think that the exception noted on lines 14-16 would be the norm. | This section is focused on an objective assessment of the results in published baseline scenarios. The author team is working on ways to clarify that the range of assumptions made in published baseline scenarios likely under-represents the true range of uncertainty in key input parameters (both related to growth and technology costs). It can be difficult to ascertain, both as an author and reader of the assessment, whether particular instances (such as very cheap renewables) don't appear in the literature because they are unlikely or because |
| 14396 | 6 | 18 | 17 | | | does the statement about fossil carbon intensity reflect the new situation for natural gas with the development of fracking? | Most models have taken into account the latest information about resources and extraction technology. This can be clarified here or perhaps better |
| 9412 | 6 | 18 | 19 | | | Findings between fiture 6.5 and 6.6 are overlaping. To save space, these figures can be incorporated | The author team is considering dropping Figure 6.6 due to its limited added value |
| 7678 | 6 | 18 | 20 | | | Insert an axis label. The caption might be improved: "[…] growth rates of Kaya decomposition indicators between 2010 and 2050 […]" (i.e. swap the order of indicators and years). | OK. |
| 9856 | 6 | 18 | 20 | | | Figure 6.5 shows that some models decrease in energy intensities per $ of GDP at more than 3% per year, and some at more than 4% per year. I was not aware of any team or model result in this range. Please check and document and discuss which teams do this for the full 40 year period discussed. If these numbers are accurate to what extent is this net result, as discussed on page 19, the result of end-use efficiency improvements, and to what extent are these dramatic results (compared to history) the result of "structural changes in the composition of energy demand"? Given that most IAMs can only project structural change at a very aggregate level, as you say on line 18-19, are the rates of structural change shown as outliers in figure 6.5 reasonable? You say this is discussed in section 6.7, but I don't see such a discussion there. That section discusses risks and not the relationship between top down and bottom up assessments of energy intensity. | The reported data is accurate. The results refer to "net" declines, i.e. inclusive of both autonomous and price-induced effects and both structural change and end-use efficiency improvements. Many models do project faster rates of decline in "net" energy intensity for countries such as China and India than were observed in those countries in the past. It is not the goal of the chapter to report and diagnose results at the level of individual models, and unfortunately there is not space to delve into a decomposition of the various effects (nor is there typically sufficiently |

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| 8644 | 6 | 18 | 20 | | | Figure 6.5 shows that some modeling teams (input?) decreases in energy intensities per $ of GDP at more than 3% per year, and some at more than 4% per year. I was not aware of any team or model result in this range. Please check and document and discuss which teams do this for the full 40 year period discussed. If these numbers are accurate to what extent is this net result, as discussed on page 19, the result of end-use efficiency improvements, and to what extent are these dramatic results (compared to history) the result of "structural changes in the composition of energy demand"? Given that most IAMs can only project structural change at a very aggregate level, as you say on line 18-19, are the rates of structural change shown as outliers in figure 6.5 reasonable? You say this is discussed in section 6.7, but I don't see such a discussion there. That section discusses risks and not the relationship between top down and bottom up assessments of energy intensity. | The reported data is accurate. The results refer to "net" declines, i.e. inclusive of both autonomous and price-induced effects and both structural change and end-use efficiency improvements. Many models do project faster rates of decline in "net" energy intensity for countries such as China and India than were observed in those countries in the past. It is not the goal of the chapter to report and diagnose results at the level of individual models, and unfortunately there is not space to delve into a decomposition of the various effects (nor is there typically sufficiently |
| 16347 | 6 | 18 | 21 | | | I am surprised that Africa is not included at all. As it represents a substantial part of the World population, it could be a useful addition. | Reporting of regional results is constrained to a significant extent by the regional definitions used in individual models. Unfortunately many models do not separate Africa as a single region, |
| 8642 | 6 | 18 | 3 | | | Good news - again a few key input assumptions are mentioned. But, again, this discussion should be consolidated with the previous discussion of input assumptions, and moved forward in the chapter so it appears before the results for baseline scenarios, not after. | This subsection is intended to be the place where discussion of input assumptions is consolidated. The |
| 2226 | 6 | 19 | 25 | 22 | 21 | 1) From a policy maker or a business view this is very (too?) complicated for one of the most essential questions (stabilization) (acknowledged that the topic is very complicated!). Now, would there be a possibility of linking the radiative forcing values/categories to temperature increases. Why? First, most people want to link mitigation to stated temperature increase targets like in the Copenhagen Accord. Second, a lot of people can translate temperature increases better to impacts of warming (see Stern chart on what happens at which temperature increase) | Text on the link between RF and temperature will be added. |
| 2227 | 6 | 19 | 25 | 22 | 21 | 2) Is there ANY possibility to create and use CO2e stabilization pathways? Climate change is caused by all GHGs plus other climate forcers, so in a "simple" world you want to compare BAU and mitigation target in the same unit, namely CO2e. A use of CO2e stabilization pathways would also reduce communication complexity compared to a pure CO2 stabilization pathway (where you only can refer to CO2 emissions, and consequently different values) | We will aim to show CO2e pathways. |

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| 11418 | 6 | 19 | 26 | 20 | 1 | The reference to the goal of international climate policy as defined in UNFCCC Art. 2 rewrites the treaty provision, is not complete, and therefore presents an incomplete and textually inaccurate picture of what this particular treaty provision actually provides. If reference to a treaty provision has to be done, it should be done faithfully and accurately. UNFCCC Art. 2 reads in full as follows: "The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner." Hence, the objective of the UNFCCC is not simply the stabilization of GHG concentrations at a level that would prevent dangerous anthropogenic interference with the climate system contained in the first sentence of the provision, but also that achieving such a level should be achieved in a way that also meets the objectives laid out in the second sentence of UNFCCC Art. 2. The second sentence is an important qualifier that has to be read integrally together with the first sentence in relation to how the stabilization goal is to be achieved. These two parts of UNFCCC Art. 2 cannot be separated from each other, whether conceptually or in practice. | Will consider to remove literal citation of UNFCCC. |
| 6096 | 6 | 19 | 27 | 20 | 1 | The text says "The goal of international climate policy as defined in UNFCCC art.2 is to stabilize greenhouse gas concentrations at a level that avoids dangerous anthropogenic interference of the climate system". This does not cover the whole meaning of the Article 2 of UNFCCC. Article 2 continues to say "Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner". AR4 interpretes the article as "The criterion that relates to enabling economic development to proceed in a sustainable manner is a double-edged sword. Projected anthropogenic climate change appears likely to adversely affect sustainable development, with adverse effects<br>tending to increase with higher levels of climate change and GHG concentrations. Conversely, costly mitigation measures could have adverse effects on economic development. This dilemma facing<br>policymakers results in (a varying degree of) tension that is manifested in the debate over the scale of the interventions and the balance to be adopted between climate policy and economic development" (Chapter 1, p.99). The latter part of the Article 2 have something to do with Sections 6.3.3 and 6.3.4 of Chapter 6. Therefore, when discussing the goal of climate policy, the latter aspect should be definitely touched upon. | Will consider to remove literal citation of UNFCCC. |
| 9857 | 6 | 19 | 9 | 19 | 12 | As you state, structural changes can work in both directions, representing the aggregate level problem. You should further elaborate on this topic, as this is vital for the assumption and thus for the results of the model. How did you consider this issue in the report'? | Unfortunately there is not space to delve into a decomposition of the circumstances under which stuctural change increases or decreases energy service demand per unit output (nor is |
| 6264 | 6 | 19 | | 19 | | Given that this chapter is significantly over its alloted page limit, difficult choices are going to have to be made in terms of what to keep and to delete. Figure 6.6 (while a very nice and very informative graphic) might be a candidate for deletion as the previous graphic which uses the Kaya Identity speaks to these data. The text keeps making the point that the models used in this chapter are all different and produce different points. That is important and worth saying more than once. But perhaps this point is being repeated too much,i.e., keeping both Figure 6.5 and Figure 6.6. | The author team is considering dropping Figure 6.6 due to its limited added value to the chapter. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10985 | 6 | 19 | 10 | 19 | 12 | Does this sentence mean that dispersed power sources such as PV develop while countries become wealthier and demand for energy-intensive services increase? | The example of shifts to less energy-intensive industries as countries become wealthier refers to the nature of economic activity: post-industrialized economies typically have a greater share of services (financial, legal, retail, etc.) |
| 11746 | 6 | 20 | | | | If you distinguish how the table was developed in the next draft, remark should also be added that policy makers could understand the number of scenarios wasn't a matter. | We have added a note on the meaning of the number of scenarios |
| 9413 | 6 | 20 | | | | How much did you count historical CO2 budget and non-CO2 budgets from 2000 to 2010? These amounts should be mentioned in a footnote of this table. | Will be done. |
| 13759 | 6 | 20 | | | | What are the units? | unit will be added, thanks |
| 6758 | 6 | 20 | | | | It shoud be specified that t h e number of scenarios is not important. Cautions are required that the amount of the number of scenarios does not mean feasibility. □ | We have added a note on the meaning of the number of scenarios |
| 10646 | 6 | 20 | | | | It is necessary that IPCC put some remarks so that negotiators would not be misled by the big numbers of Cat. 1 and that they understant that the number is not a matter | We have added a note on the meaning of the number of scenarios |
| 5858 | 6 | 20 | | | | Please do not forget to add units of measurement to the table and to explain what your definition of a "CO2 budget" is. | Units have been added, thanks |
| 9983 | 6 | 20 | | | | This table should include an explanation in the footnote that each scenario and its result is only calculated example and the number of scenario itself is not important for appropriateness of a scenario. Interpretation of the same type of table articulated in the AR4 has been incorrectly recognized and misused. | We have added a note on the meaning of the number of scenarios |
| 8041 | 6 | 20 | | | | When introducing the new RCP scenarios (RCP 2.6, 4.5, 6, 8.5) it is helpful for a lay reader to mention the 'rule od thumb' deviated from the climate sensitivity that a radiative forcing of 4 W/m2 leads to a 3 K warming. With that the reader can translate the abstract radiative forcing of a scenario to a temperature increase. | We have added a complete new section that links to temperature. |
| 8042 | 6 | 20 | | | | Most of the data from table 6.2 are at least as instructive that those of table 6.3 which appears in the Ex Sum. as ES.1 . I suggest to export them to the Ex Summary, e.g. expand table ES.1 | Many thanks. Will suggest to CLA |
| 13134 | 6 | 20 | 11 | 20 | 11 | I assume this is meant to say that there's no unique definition for representing concentration targets in the models? If correct please rephrase, if incorrect please explain. | We have added more text here. |
| 16355 | 6 | 20 | 27 | | | I noticed the intention to "distinguish overshoot scenarios", which could go in a very useful direction. This table is very important due to its potential to provide a high profile synthesis. However, the scenario categories are currently very close to those from AR4, which ignored the potential for "overshoot scenarios" and failed to provide a sufficiently complete view of the potential for stabilisation.<br>A lot of care will need to be taken to avoid oversimplifications that might be misleading (for example, how is it possible that there is only one value for the CO2 concentration in 2100 per category? to improve from AR4, it might be needed to take more data directly from WGI and/or from scenarios; uncertainty is another issue that needs attention) | It is very challenging to find a categorisation that captures all dimensions. We will do our best. The lack of uncertainty range to the CO2 numbers was an oversight. |
| 7391 | 6 | 20 | 32 | 24 | 28 | A key policy-relevant conclusion from these sections, currently missing, is that drivers for abatement of short- and long-lived GHGs are different. Policymakers need to understand to what extent transformation pathways are driven by physical earth-system properties, and to what extent by their own choices and more intermediate goals. Abatement of short-lived gases is driven primarily by economic efficiency and non-climate co-benefits (and perhaps a desire to limit rates of change), but is not absolutely necessary to achieve stabilisation (which currently is the only formally agreed long-term goal under the UNFCCC process). By contrast, abatement of long-lived gases to zero is an absolute must if stabilisation is to be achieved and only the pathway is driven by cost-effectiveness. Drawing this distinction out more clearly would be an important policy-relevant conclusion from these sections that affects the timing of peak emissions as well as overshoot as well as the balance of abatement between gases. | We will try to add some conclusions, without being policy descriptive. Problem is partly that there are very different views, even in science, on these issues. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7392 | 6 | 20 | 32 | 24 | 28 | The discussion of the role of GHG metrics (GWPs, GTPs, optimisation etc) in these sections is incomplete. Recent work has shown (Reisinger et al 2012, accepted for Climatic Change; contact me for pre-print) that alternative metrics affect not only the allocation of mitigation across different gases, but also the timing of CO2 emission peaks and overshoot relative to a defined long-term goal. These findings, and the (relative un-)importance of metrics in a first-best policy context, should be reflected in this section as they address a key policy interest about metrics expressed by Parties to the UNFCCC. Also earlier studies that clearly demonstrate the impact of metrics on the timing of CH4 abatement (e.g. van Vuuren et al 2006) should be cited here. We know a lot more from the current literature about the influence of metrics on transformation pathways than is apparent from the current draft. | Text has been adapted and references added. |
| 7679 | 6 | 20 | 4 | 20 | 4 | Change "stabilization of greenhouse gases" -> "stabilization of greenhouse gase concentrations"? | Wording has been corrected. |
| 7680 | 6 | 20 | 4 | 20 | 5 | Change "there are types" -> "there are other types"? | Typo has been corrected. |
| 6907 | 6 | 20 | 11 | 20 | 11 | This statement is confusing -- "GHG concentrations" is clearly defined in, e.g., the Glossaries of all three WG contributions to AR5 (and in AR4, SREX, SRREN). I assume you meant to say that indiviudal models differ in the way which and how concentrations of GHG concentrations are being prescribed. | Text has been changed. |
| 6908 | 6 | 20 | 17 | 20 | 18 | Please also refer to WGI Chapter 7 regarding aerosol statement. | Reference has been added. |
| 6909 | 6 | 20 | 22 | 20 | 25 | Note that models run with an interactive carbon cycle and assessed in WGI AR5 will be run with prescribed emissions, calculating CO2 concentrations and radiative forcing interactively. Comparison with the numbers provided in Table 6.2 might thus no longer be straightforward. We also note that carbon cycle and carbon cycle climate feedbacks will result in a range of year 2100 CO2 concentrations (and radiative forcing values) for a particular scenario depending on model, climate sensitivity, carbon cycle setup etc. A lot of this information will be presented in WGI AR5 Chapter 6 (and 12). Please refer to these Chapters of WGI AR5. | Useful remarks. We will ensure consistency. The lack of ranges for the CO2 numbers was just an oversight. |
| 6266 | 6 | 21 | | 21 | | It is clear that a decision was made to use these labels "Category 1", "Category 2"… and that decision is unlikely to change at this point in the AR5 writing process. Please consider repeating (by for example inserting a column in Table 6.3) that repeats the information that translates Category 1 into an equivalent W/m^2 or ppmv everyonce in a while. It is too much to ask readers to continue to flip back to Table 6.2 throughout the course of this long chatpter. Since Figure 6.7 and Table 6.3 are on the same page it seems that repeating this information here in the Table would take care of the "translation" for both the graphic and the figure. | We will discuss how to best do this. |
| 11419 | 6 | 21 | | | | There should be an explanation of why 2005 is selected as the emissions level base year rather than 1990, especially considering that 1990 is the base year that, up to now, has been agreed to at the multilateral policy level under the UNFCCC as the base year to which emissions levels would be compared. | We just chose the level used as base year in most model calculations to date. But we could add a footnote with some |
| 13136 | 6 | 21 | 17 | 22 | 1 | There's something wrong with the sentence starting "Cumulative…". Neither table 6.3 nor figure 6.7 shows cumulative emissions either. | Text has been changed. |
| 8105 | 6 | 21 | 18 | 22 | 1 | Be aware that both Allen et al 2009. and Meinshausen et al. 2009 are discussing peak temperature targets, and not end-of-century targets as discussed in this section. | Correct. Will improve text. |
| 8103 | 6 | 21 | 3 | 21 | 5 | Specifying that here an overshoot of forcing is meant (and not necessary temperature) would be helpful to avoid misunderstanding. | Text was strongly rewritten. |
| 14397 | 6 | 21 | 4 | | | Negative emissions through BECCS is important, and could be mentioned earlier (especially if anything like the current language on zero emissions is kept). Need to clarify: CCS is by definition zero; it is the BE part that turns it negative. Memo: here, as several other places, the analysis cries out for more information on the likely prospects of CCS. | We make sure to improve the BECCS coverage |
| 5232 | 6 | 21 | 4 | | | Two different abbreviations are used for bioenergy CCS, namely bioCCS and BECCS. Please use just one. | We will choose BECCS. |
| 8104 | 6 | 21 | 5 | 21 | 5 | Insert "net negative emissions" in the long-term. As "negative emissions" are already assumed to materialize rather soon (in the next decades) in most scenarios with BECCS in the portfolio. | Correct. We have changed this. |
| 9414 | 6 | 22 | | | | Findings are overlaping with Table6.2 and 6.3. To save space, these tables and figures can be incorporated | We are considering to merge these. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9858 | 6 | 22 | 10 | 22 | 12 | This is crucial to the whole chapter: "Models differ" and reflects the assumption issue raised earlier. Please be more specific here to give the reader an insight into the model and especially stressing the intersubjectivity of the models. | We have tried to be transparent. However, there are severe page constraints. |
| 8106 | 6 | 22 | 10 | 22 | 18 | This paragraph can benefit from a statement explaining that, unless all scenarios were constructed for the under the same protocol, the wide ranges of the scenarios also depend on which question was analysed by the modeling teams. | We have added this. |
| 9859 | 6 | 22 | 12 | | | I don't see a discussion of the economic consequences of climate policy I section 6.2.4. What do you mean? You don't mean to refer to damage costs, do you? | Noted. This section was substantially rewritten, sentence is no longer |
| 8645 | 6 | 22 | 12 | | | I don't see a discussion of the economic consequences of climate policy I section 6.2.4. What do you mean? You don't mean to refer to damage costs, do you? | Same comment as comment no 9859, see there for answer. |
| 9860 | 6 | 22 | 19 | | | The numbers for the cumulative carbon dioxide budgets allowed for Category 1 scenario at around 1400 GtCO2 (mid-range) seem too high, because that gives an average of about 28 GtCO2 per year for 2000-2005, or about today's level of emissions. Please check. | We will check - probably cause is negative emissions |
| 8646 | 6 | 22 | 19 | | | The numbers for the cumulative carbon dioxide budgets allowed for Category 1 scenario at around 1400 GtCO2 (mid-range) seem too high, because that gives an average of about 28 GtCO2 per year for 2000-2050, or about today's level of emissions. Please check. | We will check - probably cause is negative emissions |
| 14454 | 6 | 22 | 20 | | | Label graphs for clarity. | Done |
| 8107 | 6 | 22 | 22 | 23 | 3 | Another reason is that for shorter-lived forcers (like methane) the rate of emissions at the time of maximum forcing/temperature is more important than the cumulative emissions over time. See Smith, S. M. et al. Equivalence of greenhouse-gas emissions for peak temperature limits. Nature Clim. Change 2, 535-538, doi:10.1038/nclimate1496 (2012). | Reference has been added. |
| 13139 | 6 | 22 | 27 | 22 | 27 | The reference should be to figure 6.9, I believe. | We will check. |
| 13140 | 6 | 22 | 29 | 22 | 31 | There's nothing about non-CO2 gases in section 6.2.1. Correct the reference. | We will check. |
| 11420 | 6 | 22 | 3 | 22 | 3 | There should be an explanation of why 2005 is selected as the emissions level base year rather than 1990, especially considering that 1990 is the base year that, up to now, has been agreed to at the multilateral policy level under the UNFCCC as the base year to which emissions levels would be compared. | 2005 is the base year of most model runs. |
| 13137 | 6 | 22 | 7 | 22 | 9 | Does this mean that the baselines are not included in any of the categories? I would have thought that category 6, for example, would mostly have baseline scenarios in it (forcing being above 7 W/m2). | No they are discussed in the previous section. |
| 13142 | 6 | 23 | 17 | 23 | 17 | Write out GTP. | Will be done. Also reference to relevant |
| 5859 | 6 | 23 | 17 | 23 | 17 | Please explain "GTP" and include the term in the glossary. | Will be done. Also reference to relevant |
| 10753 | 6 | 23 | 18 | 23 | 24 | The possibility of a multi-gas policy that uses a multi-basket approach should be discussed (see last para of section 8.7.1.5 in WGI SOD). | We have one sentence now. Would need CA to take care of this. |
| 8108 | 6 | 23 | 18 | 23 | 24 | This paragraph would also need to acknowledge the publications that show that action short-lived pollutants might be detrimental or hamper CO2 abatement. For example see: Berntsen, T., Tanaka, K. & Fuglestvedt, J. Does black carbon abatement hamper CO 2 abatement? Climatic Change 103, 627-633, doi:10.1007/s10584-010-9941-3 (2010). AND Myhre, G., Fuglestvedt, J. S., Berntsen, T. K. & Lund, M. T. Mitigation of short-lived heating components may lead to unwanted long-term consequences. Atmospheric Environment 45, 6103-6106, doi:10.1016/j.atmosenv.2011.08.009 (2011). | We have added some text already. |
| 4036 | 6 | 23 | 21 | | | Missing reference - (UNEP and WMO, 2011). Should have been "UNEP and WMO (2001). Integarted Assessment of Black Carbon and Tropospheric Ozone. Available at http://www.unep.org/dewa/Portals/67/pdf/BlackCarbon_report.pdf | Corrected. |
| 8109 | 6 | 23 | 27 | 24 | 2 | Be aware that both papers discuss peak temperature targets, and not necessary the long-term impact. Therefore, in case negative emissions do not scale up quickly enough so that they do not significantly influence the temperature peak, the findings of the above studies would still be valid. | Thanks you are correct. |
| 9962 | 6 | 23 | 3 | | 15 | If CDR technologies and BECCS are main measures for negative emissions, maybe we have to introduce to what extent these measures should be implemented to reach negative emissions. | Text added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8967 | 6 | 23 | 40 | | 42 | SRM by muliple actors may be more confusing than it is effective. I.e. what is background, what has been modified. | Noted. There is no reference to SRM on page 23, let alone lines 40 to 42. It is not clear to us what this statement refers to. |
| 10752 | 6 | 23 | 7 | 23 | 24 | This para contains important information and could be expanded to assess what the effect would be of using a different metric than GWP. An assessment of how suitable the GWP100 is in a context of a stabilization goal would be useful (see WGI chapter 8 and references there). | No definitive conclusion is possible. But we provide some of the considerations. |
| 10971 | 6 | 23 | 7 | 23 | 24 | This paragraph covers GWPs and GTPs but does not seem to cover the point that neither of these is consistent with climate stabilisation. Shine et al 2007 is a very good paper. But an example showing that comparisons of CO2 and methane should be rather different for stabilisation is: Manning, M., and A. Reisinger, Broader perspectives for comparing different greenhouse gases Philosophical Transactions of the Royal Society A, 369, 1891-1905, 2011 - which brought Tom Wigley's Forcing Equivalence Index into the context of stabilisation. And then: Lauder, A., I.G. Enting, J.O. Carter, N. Clisby, A.L. Cowie, B.K. Henry, and M.R. Raupach, "Offsetting methane emissions --- an alternative to emission equivalence metrics", International Journal of Greenhouse Gas Control, (submitted), 2012 - have taken that further and shown that a one-off sequestration of CO2 can be a credible offset for continuous emissions of methane. | We have added some text. |
| 10751 | 6 | 23 | 9 | 23 | 9 | It should be made clear that this is GWPs for a 100 year time horizon. | Done. |
| 13141 | 6 | 23 | 9 | 23 | 9 | Write out GWP. | Done |
| 6267 | 6 | 23 | 13 | 23 | 17 | Here is another example of where there is a need for specific references to peer reviewed papers rather than an implicit reference to the database assembeled for Chapter 6 or the collective wisdom of the authors of Chapter 6 "There are also models that determine the relative reduction of different gases based on the overall cost optimization across time. If the latter approach is applied toward long-term radiative forcing goals, the emissions of short-lived gases tends to be postponed compared to models using GWPs." | Done. The text was deliberately formulated in a more generic sense. But we now added some examples. |
| 6910 | 6 | 23 | 27 | 23 | 29 | Please refer to WGI AR5 Chapter 12 which assesses the physical science basis of the emissions-CO2 concentration-radiative forcing-climate change relationship. | Done. |
| 9415 | 6 | 24 | | | | Effects of BECCS in the latter half of the century have a large impact on emissions pathways in the first half of the century. This figure is the new finding since AR4 and very informative. However, it will be more informative if authors can add information how much BECCS are considered in each scenario or a range of BECCS among scenarios. | text has been added. |
| 10393 | 6 | 24 | 10 | 24 | 11 | The author may mistake Figure 6.10 for Figure 6.9. | Corrected. |
| 9960 | 6 | 24 | 11 | | 15 | The sentence "Net negative emissions…..2050 emission reductions" is duplicated at the end of this paragraphy. | Corrected. |
| 8043 | 6 | 24 | 3 | 24 | 15 | BECCS is still highly speculative especially in the light of the negative development on CCS in many countries (see e.g. the projects the EU had planned and what is now). This should be reflected in this paragraph. | Agree. text has been added. |
| 9099 | 6 | 24 | 39 | 24 | 39 | "wastes" might be revised as "unused biomass" | text was rewritten. |
| 13758 | 6 | 24 | 43 | 24 | 45 | Does this refer to Fig. 6.11? Note that neither the figure nor the text are clear. I am confused. What do you mean? Is the objective of the climate model runs to end with a specific temperature or a specific concentration? | Paragraph was totally rewritten |
| 6396 | 6 | 24 | 5 | 24 | 5 | Bioenergy with CCS is referred to in at least three different ways in the chapter. Here it is BECS. On page 53, line 99 it is BioCCS. | We have replaced it with BECCS |
| 14398 | 6 | 24 | 5 | | | Is BECS different from BECCS? | We have replaced it with BECCS |
| 8049 | 6 | 24 | 7 | 24 | 7 | the reference should be (also) to chapter 6.9 which covers geoengineering | Yes. Reference is made. |
| 2418 | 6 | 24 | 9 | 24 | 9 | Note that SRM has not been introduced in the chapter yet at this point. | We will make sure that this is done. |
| 10986 | 6 | 24 | 24 | 24 | 28 | Fundamentally, CDR must be substantially one of the effective technologies for mitigation. Therefore, this paragraph should be deleted. | We do not agree. There is a difference in the way these technologies are covered |
| 6911 | 6 | 24 | 6 | 24 | 7 | Please refer to WGI AR5 Ch6 and 7 for the most up-to-date assessment of the physical science basis of CDR and SRM technologies. | We will do so. |

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| 6269 | 6 | 24 | 29 | 25 | 9 | This section on Temperature Stabilization Scenarios feels out of place here. Can this be made into a footnote? This seems tangential to the core of Chapter 6. | We have shortened the text. |
| 6912 | 6 | 24 | 29 | | | Please refer to WGI AR5, Chapter 12. | We will do so. |
| 4344 | 6 | 24 | 32 | 24 | 34 | Response of temperature and CO2 concentration in climate system was investigated in detail and new concept of stabilization scenarios are proposed (Matsuno, Maruyama and Tsutsui, 2012a.b.)<br>(see : https://www.jstage.jst.go.jp/browse/pjab)<br><br>Papers are ;<br>2012a : T. MATSUNO, K. MARUYAMA and J. TSUTSUI ; Stabilization of atmospheric carbon dioxide via zero emissions—An alternative way to a stable global environment. Part 1: Examination of the traditional stabilization concept, Proceedings of the Japan Academy, Series B Vol. 88 No. 7, pp.368-384<br><br>2012b : T. MATSUNO, K. MARUYAMA and J. TSUTSUI; Stabilization of atmospheric carbon dioxide via zero emissions—An alternative way to a stable global environment. Part 2: A practical zero-emissions scenario, Proceedings of the Japan Academy, Series B Vol. 88 No. 7 pp.385-395. | References have been considered for reference. |
| 10972 | 6 | 25 | 10 | 25 | 35 | You will not be able to cover this in the chapter but it is time that some of us who know about atmospheric chemistry submitted a paper showing that reduction in the incoming solar radiation would reduce the hydroxyl radical which is not only doing more to reduce radiative forcing by all the greenhouse gases than the carbon cycle does - ( as shown in Manning, M., and A. Reisinger, Broader perspectives for comparing different greenhouse gases Philosophical Transactions of the Royal Society A, 369, 1891-1905, 2011) but it is also the reason that we do not much higher levels of carbon monoxide and other toxic gases in the atmosphere. The idea sounds like a classic example of maladaptation where people focus on fixing just one problem and end up making the combination of all problems much worse. | Reviewer encouraged to submit paper. |
| 13730 | 6 | 25 | 11 | 25 | 13 | Rephrase " Another concept to affect climate variables such as temperature or precipitation is by directly altering radiative forcing (solar radiation management or SRM) for instance by adding aerosols at specific heights in the atmosphere to reflect a share of the incoming sunlight." | Thanks. |
| 6397 | 6 | 25 | 13 | 25 | 13 | I think this should reference Section 6.9, not 6.8. | Thanks. |
| 13731 | 6 | 25 | 15 | 25 | 18 | Rephrase "The predominant reason is due to the different decision rationale: SRM requiring a risk-balancing approach, whereas mitigation strategies share similar levels of risk and are thus addressed by the cost-effectiveness rationale that currently forms the focus of most IAM analysis (Barrett, 2008)." | We will consider this wording. |
| 13143 | 6 | 25 | 18 | 25 | 18 | This reference is not in the bibliography. | Will be added |
| 8111 | 6 | 25 | 20 | 25 | 22 | Although not necessarily wrong, this statement is not very relevant in view of what was written earlier in this chapter. On Page 19, line 27, which refers to article 2 of the UNFCCC. Firstly, the convention mentions concentrations to be stabilized, not necessary forcing. Secondly, it also aims at avoiding dangerous anthropogenic interference with the climate system. In line with the latest results from the earth system modelling community with regard to solar-radiation management, injection of stratospheric aerosols can in itself be considered dangerous anthropogenic interference with the climate system, and as such be ruled out as a mitigation option. See: Ricke, K. L., Morgan, M. G. & Allen, M. R. Regional climate response to solar-radiation management. Nature Geosci 3, 537-541, doi:http://www.nature.com/ngeo/journal/v3/n8/suppinfo/ngeo915_S1.html (2010). AND Schmidt, H. et al. Solar irradiance reduction to counteract radiative forcing from a quadrupling of CO2: climate responses simulated by four earth system models. Earth Syst. Dynam. 3, 63-78, doi:10.5194/esd-3-63-2012 (2012). | We will consider the article. We will obviously also ensure that the discussion on SRM is balanced. Finally, it is questionable whether the objective of UNFCCC was written in a way to rule out SRM; probably avoiding dangerous climate change is the key part of the objective. In Chapter 3 there is a more elaborate discussion on the priciples related to SRM/Geoengineering. |

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| 8112 | 6 | 25 | 20 | 25 | 22 | Although not necessarily wrong, this statement is not very relevant in view of what was written earlier in this chapter. On Page 19, line 27, which refers to article 2 of the UNFCCC. The "climate system" under the UNFCCC is defined as (see article 1, definitions) "the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions.". Currently global warming is at the core of the debate (and this could theoretically be coutnered by solar-radiation management), but other dangerous anthropogenic interferences because of rising greenhouse gas concentrations are not excluded. For example, ocean acidification (part of the hydrosphere and with strong impacts on the biosphere), will not be halted with solar-radiation management which reduces forcing but not greenhouse gas concentrations. A statement higlighting this might be useful. | We will obviously also ensure that the discussion on SRM is balanced. Finally, it is questionable whether the objective of UNFCCC was written in a way to rule out SRM; probably avoiding dangerous climate change is the key part of the objective. In Chapter 3 there is a more elaborate discussion on the priciples related to SRM/Geoengineering. |
| 13732 | 6 | 25 | 23 | 25 | 35 | Political moral hazard and lock-in need to be mentioned here! Also the inherent threat of SRM due to the impossibility to test it on significant scales other than actually deploying it! The following is an attempt to bring this consideration to the point. Rephrase line 30 "This attribute of SRM makes it attractive to the present day decision maker in managing climate risk even if the long-run costs and damages of SRM were comparable to the costs of mitigation and the damages of climate change (Moreno-Cruz and Keith, 2012). At the same time though the possibility to avoid investments in near term emission reductions create a strong incentive to deploy SRM without investing in the long-term optimal level emission reductions. This incentive structure could prevail over decades resulting in both increasing GHG levels and a need for further SRM efforts (Klepper et al., 2012)." | We agree that some mention of the risk of policy and technical lock-in is important. The statement that it is impossible to test SRM at sales short of deployment is false and not backed up by the literature. The proposed revised text assumes that optimal policy somehow should not reduce emissions in mitigation if SRM was feasible, this is not backed up by literature |
| 2420 | 6 | 25 | 26 | 25 | 26 | "Absent SRM" should read "In the absence of SRM" | The usage is correct (though |
| 8971 | 6 | 25 | 30 | | 31 | There is no attribute of SRM that is "valuable." It is a thoroughly untested prospect. | SRM may work less well than studies now suggest or may have larger risks but the statement that there is no aspect of it that is “valuable” seems hard to defend given that (to our knowledge) all |
| 8044 | 6 | 25 | 31 | 25 | 34 | The idea 'SRM cannot precisely counteract the radiative forcing from greenhouse gases' should come at the beginning and not at the end. | Yes, good suggestion. |
| 16697 | 6 | 25 | 38 | | | Define RCP. | Will be defined earlier in the chapter |
| 9861 | 6 | 25 | 40 | | | Please briefly explain the relevant differences between IAM models and the "complex climate models" refered to here. In what ways are the complex climate models better? | We will avoid the word complex models. We will refer to WG-1 model. If space |
| 8647 | 6 | 25 | 40 | | | Please briefly explain the relevant differences between IAM models and the "complex climate models" refered to here. In what ways are the complex climate models better? | We will avoid the word complex models. We will refer to WG-1 model. If space |
| 13144 | 6 | 25 | 43 | 25 | 43 | Figure 6.11, instead of 6.8 | Thanks |
| 10394 | 6 | 25 | 43 | 25 | 43 | The same problems as the fomer. It's Figure 6.11 not figure 6.8. | Thanks |
| 9964 | 6 | 25 | 43 | | | "Figure 6.8" should be "Figure 6.11". | Thanks |
| 13145 | 6 | 25 | 46 | 25 | 47 | Is there a reference for this analysis? | Noted. This section was completely rewritten in the new draft. |

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| 7681 | 6 | 25 | 8 | 25 | 9 | The section ends with "[…] temperature target needs to be expressed in terms of a probability […]". Although the cited papers might emphasize such, it is not generally true. The emission pathway doesn't have to be decided at one instant, as e.g. most IAM's assume. We can observe the temperature increase later during the century, and adjust the emission pathway recurrently so that the temperature target will be ultimately met. Scenarios with a temperature target and risk-hedging through sequential decision making include:<br>* Syri, S., Lehtilä, A., Ekholm, T., Savolainen, I., Holttinen, H. & Peltola, E. (2008), 'Global energy and emissions scenarios for effective climate change mitigation - deterministic and stochastic scenarios with the TIAM model', International Journal of Greenhouse Gas Control 2(2), 274–285.<br>* Webster, M., Jakobovits, L. & Norton, J. (2008), 'Learning about climate change and implications for near-term policy', Climatic Change 89(1-2), 67–85.<br>* Johansson, D. J. A., Persson, U. M. & Azar, C. (2008), 'Uncertainty and learning: Implications for the trade-off between short-lived and long-lived greenhouse gases', Climatic Change 88(3-4), 293–308.<br>* Ekholm, T. (submitted), Hedging the climate sensitivity risks of a temperature target. Submitted to Resource and Energy Economics in Feb. 2012. | This is to some degree correct and we will make sure that we refer better to sequential decision making literature (this is done already further in the Chapter). Nevertheless, to get an idea of the overall size of the problem NOW it matters a lot what probability we are thinking of. Moreover, inertia will always imply some interpretation. |
| 2419 | 6 | 25 | 10 | 25 | 35 | This section should cross-reference Chapter 7 of WG1 assessment, which deals specifically with the physical aspects of SRM. The reference to section 6.8 at the end of the section should be 6.9 in fact. | Yes, good suggestion. |
| 2422 | 6 | 25 | 10 | 25 | 35 | A key aspect of SRM is that it has to carry on until the concentrations of greenhouse gases have gone down (either because of natural sinks or artificial CDR) or until society can better adapt to a warmer climate. This characteristics of SRM, usually referred to as the "termination issue", ought to be discussed in the context of stabilisation scenarios. | We know of no published argument that shows why SRM "must" be continued until concentrations of greenhouse gases have gone down. It is widely understood that many climate impacts depend on the rate of change of climate. SRM could |
| 6268 | 6 | 25 | 10 | 25 | 35 | Delete Section 6.3.2.6 as a standalone section and fold any key points into the previous page's discussion of CDR. At this early point in the chapter the key points that need to be made are CDR and SRM might open up the policy space, are not represented in IAM models and will be discussed later. That can be combined into a couple of sections. This chapter is too long as it is. Here is a plce to cut back and save half a page. | Might make sense. |
| 6913 | 6 | 25 | 13 | 25 | 13 | Please refer to WGI AR5, Chapter 7. | Will be done |
| 4196 | 6 | 25 | 25 | | | Reference is insuffficient. Sprecial Report of IPCC and others should be quoted. | Will be done |
| 6270 | 6 | 25 | 38 | 25 | 47 | I do not think that "complex models" is a generaly used scientific term. If these "complex models" are General Circulation Models, please use that term. I don't think the reader is helped by creating a new term "complex models." | Agree. We change the wording. |
| 6914 | 6 | 25 | 41 | 25 | 43 | We suppose this should be turned around -- the IAMs are consistent with the results from complex climate models for, e.g., temperature etc. and not vice versa. | Agree. We change the wording. |
| 11265 | 6 | 26 | | | | if temperature profiles from WG1 could be added here this would be very useful | We will add a totally new section on |
| 18632 | 6 | 26 | | | | Page 26: No cost-benefit study finds an optimal level of mitigation that stabilizes tha atmospheric concnetrations I question if decarbonisation really is an optimisation problem | Noted |
| 6915 | 6 | 26 | | | | Please provide source of this figure. | Figure will be removed |
| 10973 | 6 | 26 | 12 | 26 | 24 | This is a good paragraph and helps to offset some of the problems in chapter 3's appearing to over-emphasise the relevance of discount rates. | Noted |
| 9862 | 6 | 26 | 15 | 26 | 16 | Climate feedbacks don`t occur on the individual company level directly, i.e. companies might have the possibility to manage their CO2-emissions, but are not impacted by climate change and vice versa. The causal link on the company level is via external effects. | Noted |

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| 14399 | 6 | 26 | 16 | 26 | 21 | But cost-benefit models do show the extra cost of stabilization at a given target level, above and beyond what their optimal level is, and there is very important information in the fact that the additional cost tends to be small. | Noted |
| 6097 | 6 | 26 | 16 | 26 | 30 | The text says because, in all cost benefit analysis, concentrations continue to rise throughout the modeling period, studies that focus on cost-benefit are not appropriate for the discussion of transformation pathways in this chapter. If this is the real reason of not taking up CBA in this chapter, then, what can be done in this chapter is to show cost and benefit for typical (given) transformation pathways. You can find this kind of CBA, for example, in many books and papers of Nordhaus where Nordhaus calculated cost and benefit for several given targets, such as limiting temperature increase by 2 degrees. As a matter of fact, the text in this chapter describes as "mitigation, impacts and adaptation are interlinked in several important ways and should be considered jointly in the context of achieving stabilization targets (page 26, lines 27-29). I am not quite sure what the relationship between this sentence and CBA. | Taken into acccount--text added and reference given to other parts of the report that discuss CBA |
| 8648 | 6 | 26 | 18 | | | The logical conclusion that one would draw from the statement that begins "no cost benefit study finds an optimal level of mitigation…" is that the damage costs used in such studies are probably too low, because it seems non-sensical to allow greenhouse gas concentrations to rise until at least 2100. If this is true, please say so. In fact, while this section does not discuss the reasonableness of the damage cost estimates used in such modeling exercises, again a naive reader might think that it is impossible to estimate the damages from climate change since the natural and human systems impacted are far too complex. Thus, I think it would reasonable to have a short critique of the reasonableness of damage cost estimates here, if you are going to introduce the topic of cost-benefit studies at all. The point that these studies are not relevant when developing stabilization scenarios as with using the RCP methodology is a good one, and should be highlighted more. | Taken into account--but due to space constraints, we are unable to add a discussion of damage function estimates. We have added references to chapters 2 and 3 which provide a larger discussion of CBA. |
| 10395 | 6 | 26 | 18 | 26 | 19 | There are some models can find an optimal level of mitigation as while as stabilizing atmospheric. Such as RICE and MRICE model etc. | Taken into account--text added |
| 6098 | 6 | 26 | 31 | 27 | 4 | It is hard to understand how climate impacts, mitigation and adaptation responses in integrated assessment are meaningfully interlinked without knowing cost of impact and adaptation. Please rewrite. | Taken into account--figure and text deleted |
| 8972 | 6 | 26 | 35 | | | Geoengineering is not a form of adaptation! It is intervention. So please delete such language. | Taken into account--figure and text |
| 8507 | 6 | 26 | 35 | 27 | 1 | It is impossible “to decouple GHG concentrations from climate variables such as temperature”. It is possible to compensate the GHG effect on temperature. | Taken into account--figure and text deleted |
| 15428 | 6 | 26 | 35 | 27 | 1 | DELETE: "(a form of adaptation)" This cannot remain in the text because there is no agreement within the IPCC that geoengineering is a form of adaptation. Further, there must be acknowledgment of the ambiguous, controversial and speculative nature of geoengineering. To include this parenthetical statement obscures and minimizes -- in fact, denies -- the ambiguity, controversy and speculation surrounding geoengineering. | Taken into account--figure and text deleted |
| 11421 | 6 | 26 | 8 | 26 | 10 | It is good that this sentence is present, recognizing that most mitigation pathway studies typically do not factor in climate impacts and adaptation. This is the reason why having a correct and accurate reflection of UNFCCC Art. 2 is important - doing so allows, and in fact would encourage, having a more holistic and scientific approach to mitigation pathway studies by requiring the integration of other factors such as climate impacts, adaptation measures, etc on human and natural systems that could have synergistic effects on various mitigation pathways and scenarios. | Noted |
| 6271 | 6 | 26 | 18 | 26 | 22 | Again, I think you need to identify these studies on cost benefit that are said to not be appropriate for the analysis in Chapter 6. Need to cite these papers. Cant just assert that these papers exist and they are not appropriate for what is discussed in this chapter. | Accepted--citations added |
| 4307 | 6 | 26 | 35 | 26 | 35 | delete „(a form of adaptation)“ because there is no consensus that geoengineering is either mitigation or adaptation. moreover, some actors (BMBF 2011) argue for a „MAG-approach“, seein geoengineering as the third leg of climate policy | Taken into account--figure and text deleted |

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| 6272 | 6 | 26 | 5 | 28 | 26 | Because of how much this chapter is already over its alloted page limit, serious consisderation should be given to radically reducing the length of section 6.3.3. The key point is that IAMs (which are the heart of what Chapter 6 is about) do not handle adaptive responses very well. That point is made over and over and over again. Figure 6.12 is not needed and there is no need to introduce the terminology about adaptive responses Type 1, Type 2 and Type 3. Just make the key points and move on. This might be important research but it doesn't need to be treated at this level of detail in an already over page lenght limit Chapter 6. | Taken into account--figure and text deleted |
| 14335 | 6 | 27 | | | | This figure and the corresponding text are not clear on how to classify geoengineering technologies, i.e. as mitigation, adaptation or something else (cf also chapter 1 page 25 line 39-40). The text should make clear that this is an unresolved issue in the geoengineering debate. The classification as mitigation, adaptation or something else can matter, in particular in a normative context such as the UNFCCC (Bodle, Ralph, “Climate and Geoengineering”, in: Hollo, Erkki, Kati Kulovesi and Michael Mehling (eds.), Climate Change and the Law: A Global Perspective, Berlin: Springer, forthcoming 2012 (submitted May 2012), section 3.5). | Taken into account--figure and text deleted. Geoengineering now discussed elsewhere (6.3.3.2) |
| 4197 | 6 | 27 | 18 | | | Ciscar et al (2011) does not appear in the reference. | Accepted--reference added |
| 9864 | 6 | 27 | 25 | | | Again, I would emphasize the point much more strongly that "there is a desperate lack of data…." In particular, as far as I know there is absolutely no empirical basis for the type of damage cost functions that models like DICE include in them. | Noted |
| 8649 | 6 | 27 | 25 | | | Again, I would emphasize the point much more strongly that "there is a desperate lack of data…." In particular, as far as I know there is absolutely no empirical basis for the type of damage cost functions that models like DICE include in them. | Noted |
| 6399 | 6 | 27 | 26 | 27 | 26 | can remove a fair amount of discussion of what does not exist. Also, "necessitates heroic efforts" is colloquial. Suggest changing to something like "requires a lot of effort" | Editorial |
| 9416 | 6 | 27 | 28 | | | This flow-chart and its explanation is not easy to understand | Taken into account--figure and text |
| 5860 | 6 | 27 | 30 | 27 | 32 | This is a careless use of the word "heroic" for a work that is - although not easy and not done within hours - business as usual for a lot of modellers: brigding gaps in data sources and correlations. Please delete. | Editorial |
| 13733 | 6 | 27 | 33 | 27 | 36 | Rephrase "As represented by the blue dashed lines in Figure 6.12, these strategies and responses compete for political attention, investment and R&D resources, leading to potential trade-offs as discussed further below. Also, as captured by the red dashed lines, physical feedbacks will affect the set of available mitigation and adaptation options, ..." | Taken into account--figure and text deleted |
| 15429 | 6 | 27 | 33 | | 34 | Again, this sentence explicitly declares (and the accompanying Figure 6.12 suggests) geoengineering to be a type (one of three types) of adaptation -- this is unjustified. Further, there was NO AGREEMENT on this point at the Joint Expert Meeting on geoengineering held in Lima in June 2011. According to the Meeting Report, SRM "does not fall within the usual definitions of mitigation and adaptation." (IPCC, IPCC Expert Meeting on Geoengineering, Meeting Report, p. 2.) | Taken into account--figure and text deleted |
| 13734 | 6 | 27 | 36 | 27 | 36 | Insert "Some geoengineering strategies (solar radiation management approaches) attempt to decouple GHG concentrations from climate variables, …" | Taken into account--figure and text deleted. Geoengineering now discussed |
| 9866 | 6 | 27 | 37 | 28 | 26 | For decision makers the conclusion of these very important paragraphs could be that finding a solution is very complex and might even lead into the wrong direction. So I would add a paragraph how these biases can be overcome. Applying scenario thinking and the scenario technique would be an appropriate tool for organizations. | Taken into account--space constraints limit our ability to elaborate on this point |
| 11422 | 6 | 27 | 37 | 28 | 26 | This paragraph should be further expanded to explain the ways in which omission of climate impacts and adaptation responses could skew and provide inaccurate projections with respect to mitigation pathways. The authors should make a greater effort to search for literature - perhaps from non-OECD countries - that could provide approaches or ways in which such factors could be reflected in mitigation projections and scenarios. | Taken into account--space constraints limit our ability to elaborate on this point |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9865 | 6 | 27 | 38 | | | I think first you should say in simple English - including climate impacts will most likely show that the state of the world will be much worse than IAMs indicate, and, therefore, even more climate mitigation will likely be required to achieve any particular stabilization goal. For example, one type of negative feedback loop you don't mention is the one where higher global temperatures melt the tundra releasing additional quantities of methane into the air. Your first point is too specific and detailed. I think there are much broader possible implications that should be mentioned even if there are no good modeling exercises supporting such implications. | Taken into account--space constraints limit our ability to elaborate on this point |
| 8650 | 6 | 27 | 38 | | | I think first you should say in simple English - including climate impacts will most likely show that the state of the world will be much worse than IAMs indicate, and, therefore, even more climate mitigation will likely be required to achieve any particular stabilization goal. For example, one type of negative feedback loop you don't mention is the one where higher global temperatures melt the tundra releasing additional quantities of methane into the air. Your first point is too specific and detailed. I think there are much broader possible implications that should be mentioned even if there are no good modeling exercises supporting such implications. | Taken into account--space constraints limit our ability to elaborate on this point |
| 11747 | 6 | 27 | 39 | 27 | 41 | If such significant water shortage is occuer, not only nuclear and hydro but also thermal powers are affected that might force industry sectors to ristrict their production. This instance is so extreme that it should be deleted. | Accepted---text revised |
| 9568 | 6 | 27 | 39 | 27 | 41 | Please, reflect the following fact; in some regions such as Japan, seawater is required for thermal cooling for nuclear power plants. | Accepted---text revised |
| 9091 | 6 | 27 | 39 | 27 | 41 | Which countries will be suffering from water shortage for cooling nuclear reactor ? Appropriate references should be shown to validate this sentence. | Taken into acccount--text revised |
| 12018 | 6 | 27 | 39 | 27 | 41 | Regional water shortage may be severe and may affect particular site of any facilities which need water for cooling. However, it is misleading to generalize the statement without quantitative analysis. Some reservois may benefit from more rains. Facilities which use sea water for cooling are unlikely to be affected much. Balanced statement should be needed. | Taken into account--text revised |
| 11748 | 6 | 27 | 41 | 27 | 42 | The words [Also,] and [anothoer] aren't needed. Refer to No.33. | Editorial |
| 13735 | 6 | 27 | 41 | 27 | 41 | Use term "low-carbon" (instead of carbon-free) | Accepted |
| 5861 | 6 | 27 | 41 | 27 | 41 | Again: "there is no free lunch" and no such thing as a "carbon-free energy source" if there have been and are C emissions during facility construction, maintenance and operation. | Accepted--text revised |
| 13736 | 6 | 27 | 42 | 27 | 42 | Use "affect" (instead of negatively impact) ... another source of low-carbon energy (instead of carbon-free). | Editorial |
| 8045 | 6 | 27 | 43 | 27 | 46 | The intelligence in 'Unfortunately, there are no published modeling studies that account for the effects of climate impacts and adaptation responses on the set of viable mitigation strategies to reach stabilization targets' is very important and is worth to be mentioned prominently in the Exec. Summary. Same for 'Therefore, there is little information by which to judge how the omission of impacts and adaptation responses would alter the results reviewed in this chapter.' | Noted |
| 9863 | 6 | 27 | 5 | 27 | 10 | Is their an empirical study that comes to this conclusion? How are the three types differentiated? | Taken into account--figure and text |
| 6398 | 6 | 27 | 9 | 27 | 9 | "further down the chain" is colloquial. Suggest changing to "that propogate through the system" or something like that. | Taken into account--figure and text deleted |
| 10987 | 6 | 27 | 38 | 27 | 41 | The sentence of "water required for thermal cooling in the case of nuclear power and stream flow required for hydroelectric power could face severe shortages as a result of climate change" seems to be a little exaggerated. It is logically leaping that mitigation option by using nuclear power or hydro would be restricted due to the assumption mentioned above. For example, nuclear power stations in countries like Japan are basically built along seaside; therefore, there are no worries about the scarcity of water. | Taken into account--text revised |

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| 4772 | 6 | 27 | 39 | 27 | 41 | The statement "For instance, water required for thermal cooling in the case of nuclear power and stream flow required for hydroelectric power could face severe shortages as a result of climate change" is true. However it could be interesting to note that storage provided by reservoirs associated to dams are very important for climate change adaptation. | Noted |
| 5862 | 6 | 28 | | | | Is there no relation of GE effects and Investment & R&D resources? Or does the figure - which lacks a legend, by the way - only show influences on and by the distribution of I & R&D-Resources? | Taken into account--figure and text deleted |
| 6099 | 6 | 28 | 1 | | | Interlinkage of the text itself (from lines 5-32, page 27 ) and Figure 6.12 is not so clear to at least ordinary readers. Much more simple way of explanation without this Figure could be possible. | Taken into account--figure and text deleted |
| 8651 | 6 | 28 | 12 | | | I would not say that the implications for transformation pathways are ambiguous. Most feedback loops due to climate change impacts are negative, as far as I know. (Are there any positive ones of significant magnitude?) Therefore, the implications for transformation pathways are highly negative. | Accepted--text revised |
| 13738 | 6 | 28 | 14 | 28 | 15 | Rephrase "Finally, mitigation strategies will need to compete with adaptation and possibly even SRM strategies for political attention, scarce investment and R&D resources. In accordance to the considerations in …" | Noted--will be considered in revision |
| 8652 | 6 | 28 | 14 | | | The paragraph that begins on line 14 I would suggest omiting. It goes too far in the direction of describing work that has never been done at all properly. | Noted--will be considered in revision |
| 10974 | 6 | 28 | 2 | | | Something that is not covered in a figure like this is the response time for the connections. Emissions affect concentrations directly, but there is a lag of decades for change in the climate variables, in many cases we find another lag of 20 years or so for development of defense to things like increasing flood risk, and at the same time there is expected to be a delay of several decades in the deployment of mitigation technologies. I think that the Fisher-Vanden report is a good one, but it admits that it is not covering everything. So if you are modifying the figure can you say something about lag times. | Taken into account--figure and text deleted |
| 14037 | 6 | 28 | 4 | | 13 | Potential conflicts between stabilization goals and adaptation goals are in fact very much the case when local plans are made. One example is the densely populated city vs a city that has a natural buffer against, for example, extreme heat or extreme rainfall. | Noted |
| 4308 | 6 | 28 | | | | Table 6.12. implies a somewhat natural order of counter measures (mitigation - geoengineering - adaptation). Other sources see geoengineering more as a third way apart from the two „traditional“ ones. (see Rickels, W.; Klepper, G.; Dovern, J.; Betz, G.; Brachatzek, N.; Cacean, S.; Güssow, K.; Heintzenberg J.; Hiller, S.; Hoose, C.; Leisner, T.; Oschlies, A.; Platt, U.; Proelß, A.; Renn, O.; Schäfer, S.; Zürn M. (2011): Gezielte Eingriffe in das Klima? Eine Bestandsaufnahme der Debatte zu Climate Engineering. Sondierungsstudie für das Bundesministerium für Bildung und Forschung. ) | Taken into account--figure and text deleted |
| 6273 | 6 | 28 | 14 | 28 | 21 | I'm not sure I am willing to agree that society's response to climate change is a strict zero sum game. This might be the way it has been modeled in the studies cited here but that does not mean that is the way this has to play out. | Noted |
| 10988 | 6 | 28 | 21 | 28 | 26 | Examples of "other expenditures" should be illustrated in order to grasp how they are important in estimating the "actual" economic cost of climate damages. Without knowing them we cannot assume the real scale of crowding out expenditures. | Noted--will be considered in revision |
| 2228 | 6 | 29 | 1 | 33 | 14 | ESSENTIAL: The IPCC should consider to contrast the sum of three cost elements to society when presenting this UNDER DIFFERENT SCENARIOS: 1) Mitigation, 2) Adaptation, 3) Damage cost. Then it will get obvious, that with more money invested in mitigation the TOTAL cost to society can actually be kept lowest. (Dentist analogy). The current representation of JUST showing cost for mitigation only, has of course the consequence that the more mitigation you are doing, the more cost you will incur. Consequently, mitigation is seen as MAIN cost to society, while the other cost elements will likely be bigger and will have much higher uncertainty. | The IPCC discusses the costs of climate impacts and adaptation in WG2 reports and the costs of climate mitigation in WG3 reports. Cost benefit analysis integrating costs and benefits of climate policy is explicitly discussed in the WG3 report, in Chapter 3 and Section 6.3.3 of Chapter 6. Section 6.3.4 focuses on mitigation costs. The introduction |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2229 | 6 | 29 | 1 | 33 | 14 | Rethink the graphs in this section (6.13, 6.14, 6.15) - very hard to understand and interpret. Are consumption losses and abatement costs additive? At minimum have a concise description in the text WHY you chose those metrics and elaborate HOW those are calculated (e.g. example), i.e. define the metrics | Taken into account - Figures revised |
| 6400 | 6 | 29 | 12 | 29 | 17 | These points seem to be reinforced earlier in the chapter. Might want to consider removing or condensing here. | The paragraph has to keep a balance between providing the necessary context for the mitigation cost results and avoiding a general discussion of cost measures provided already in Chapter 3 |
| 9870 | 6 | 29 | 12 | | | This paragraph starting on line 12 has some good discussion of other factors to consider other than costs OR BENEFITS. But I would also add that more consumption should not always be taken as a "good". It depends on what is being consumed. Consuming more military weapons, or coal-fired power plants, or doctors visits are not good, if the result is more war, climate change, or sickness. You should acknowledge, therefore, that many people are seriously questioning whether or not GDP is at all a good measure of social benefits (see for example the Sen, Stiglitz, Fitoussi Commission in France oder the UN Human Development Index). Other indicators of social progress are being proposed frequently now. These comments also apply especially to the discussion from lines 29 to 45 below. | The paragraph has to keep a balance between providing the necessary context for the mitigation cost results and avoiding a general discussion of cost measures to be provided in Chapter 3 (see Comment 515 which asks for condensing the material) |
| 8656 | 6 | 29 | 12 | | | This paragraph starting on line 12 has some good discussion of othe factors to consider other than costs OR BENEFITS. But I would also add that more consumption should not always be taken as a "good". It depends on what is being consumed. Consuming more military weapons, or coal-fired power plants, or doctors visits are not good, if the result is more war, climate change, or sickness. You should acknowledge, therefore, that many people are seriously questioning whether or not GDP is at all a good measure of social benefits. Other indicators of social progress are being proposed frequently now. These comments also apply especially to the discussion from lines 29 to 45 below. | The paragraph has to keep a balance between providing the necessary context for the mitigation cost results and avoiding a general discussion of cost measures to be provided in Chapter 3 (see Comment 515 which asks for condensing the material) |
| 16700 | 6 | 29 | 15 | | | insert after 1st word "things," the following "costs of climate change impacts" | Rejected. Costs of climate change impacts are highlighted at the end of the |
| 14038 | 6 | 29 | 15 | | | Add equity concerns | The paragraph has to keep a balance between providing the necessary context for the mitigation cost results and avoiding a general discussion of cost measures to be provided in Chapter 3 |
| 9569 | 6 | 29 | 17 | | | Please, delete examples of nuclear and CCS, or add examples of wind power and geothermal as they involve bird-strikes (wind power) and sources of mercury contamination (geothermal power). | Taken into account - Examples removed |
| 9570 | 6 | 29 | 17 | | | Please, remove coal-fired from coal-fired CCS as we need any types of CCS. | Taken into account - Removed |
| 4198 | 6 | 29 | 18 | 29 | 19 | Some ancillary benefit and that of market reform could be assessed by CGE as discussed in TAR-WG3. | Noted |
| 16701 | 6 | 29 | 22 | | 24 | The sentence "Reduced or negative mitigation costs …" I have not seen credible economic analysis that clearly shows these are very large or indeed real. Engineering potential is not economic potential is not market potential. "Negative mitigation costs" may simply not be accounting for additional costs that are all to real for investors or consumers. | Partly taken into account - The reference to negative mitigation costs is removed. Some models show a significant reduction of mitigation costs due to, e.g., revenue recycling from a carbon tax |
| 9867 | 6 | 29 | 4 | | | This is true by definition of a mitigation scenario, correct? If so, say so or omit, it sounds a lot like a tautology. | Taken into account - rephrased |
| 16698 | 6 | 29 | 4 | | 11 | It is very important to contextualize the economic impact as a slight reduction in economic growth rates from the no policy scenario -- many readers assume this is a reduction in GDP from today's level, not knowing that the model still shows continued economic growth. Perhaps one way to help the reader is to translate the "loss" or "cost" into a time lag until the same level of GDP or welfare is achieved in the no policy scenario. | Taken into accout - Presentation of costs will include this consideration |
| 8653 | 6 | 29 | 4 | | | This is true by definition of a mitigation scenario, correct? If so, say so. | Taken into account - rephrased |

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| 9871 | 6 | 29 | 46 | | | Again, it is not clear that "costs represented by the area under the margiinal abatement cost function" are at all relevant to computing the AVERAGE net costs of mitigation, which seems to me to be the needed calculation. Do you really mean "marginal" costs? Either way, please provide a graphic to illustrate this calculation. Is the other axis of the graph the amount of mitigation in tons of CO2? Explain clearly how incremental mitigation costs between two scenarios can be computed from marginal costs. This seems to be a conceptual error because marginal costs will change significantly over the range of mitigation of greenhouse gases required to go from a baseline case to an scenario like the RCP2.6 scenarios. In fact, marginal costs can be negative for at least some of the first tons of mitigation. | Rejected. The mitigation costs from partial equilibrium models reported here refer to the area under the marginal abatememt cost curve (reconstruced as a diagnostic device from the model, thus including full path dependency), and therefore are full costs. Explanation in the introduction has been clarified. Adding a figure is not possible due to |
| 8657 | 6 | 29 | 46 | | | Again, it is not clear that "costs represented by the area under the margiinal abatement cost function" are at all relevant to computing the AVERAGE net costs of mitigation, which seems to me to be the needed calculation. Do you really mean "marginal" costs? Either way, please provide a graphic to illustrate this calculation. Is the other axis of the graph the amount of mitigation in tons of CO2? Explain clearly how incremental mitigation costs between two scenarios can be computed from marginal costs. This seems to be a conceptual error because marginal costs will change significantly over the range of mitigation of greenhouse gases required to go from a baseline case to an scenario like the RCP2.6 scenarios. In fact, marginal costs can be negative for at least some of the first tons of mitigation. | Rejected. The mitigation costs from partial equilibrium models reported here refer to the area under the marginal abatememt cost curve (reconstruced as a diagnostic device from the model, thus including full path dependency), and therefore are full costs. Explanation in the introduction has been clarified. Adding a figure is not possible due to |
| 9868 | 6 | 29 | 6 | | | Again, as I stated earlier, both behavioral changes and the use of emissions mitigation technologies can lead to economic BENEFITS as well as costs to both producers and consumers. Where the net cost or benefit comes out in each year of each scenario is complicated. The text has this one-sided bias towards always talking about costs. | Rejected. Costs are put into context in the introduction, referencing the appropriate place where direct benefits from reduced climate change (WG2) |
| 16699 | 6 | 29 | 6 | | | Insert the word "gross" before "economic costs". These costs are not net of any benefits or avoided losses from mitigation. While we have not tried to quantify these benefits, it never hurts to remind policymakers or the casual reader that benefits are created -- talking costs only neglects the value gained by action -- this makes it much harder for a policymaker. | Taken into account - Inserted |
| 8654 | 6 | 29 | 6 | | | Again, as I stated earlier, both behavioral changes and the use of emissions mitigation technologies can lead to economic BENEFITS as well as costs to both producers and consumers. Where the net cost or benefit comes out in each year of each scenario is complicated. The text has this one-sided bias towards always talking about costs. | Rejected. Costs are put into context in the introduction, referencing the appropriate place where direct benefits from reduced climate change (WG2) |
| 9869 | 6 | 29 | 8 | | | It is not "common" to estimate the incremental costs of mitigation against a counterfactual base case, you must by definition of "incremental". Please clarify this sentence. | Rejected. Incremental is not used in the sentence. |
| 8655 | 6 | 29 | 8 | | | It is not only "common" to estimate the incremental costs of mitigation against a counterfactual base case, you must by definition of "incremental". Please clarify this sentence. | Rejected. Incremental is not used in the sentence. |
| 18633 | 6 | 30 | | | | Page 30: 5 % is choosen as the discount rate used to calculate the net present value. What are the consequences? (and to what extent is it relevant) | Taken into account. Information on the sensitivity of costs to choice of discount |
| 16702 | 6 | 30 | 1 | | | Insert 'but deficient' after the word "popular". | Taken into account. If sentence is retained after shortening the discussion, |
| 9873 | 6 | 30 | 20 | | | Here it says that transformation pathways have been derived under a range of discount rates. Then you say that you will consistently translate reported time aggregate costs into a total consistently using a 5% discount rate. But even if you have the annual cost results in current dollars for every scenario reported (do you?), the pathway is computed using the original discount rate, so there would be an inconsistency in reporting the results of an optimization using one discount rate in discounted dollars using a different discount rate, no? Moreover sensitivity analyses should be provided to show the impact of different discount rates on the results. | Taken into account. Yes, we have the annual cost for every scenario in the database. Information on the sensitivity of costs to choice of discount rate is now provided. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8659 | 6 | 30 | 20 | | | Here it says that transformation pathways have been derived under a range of discount rates. Then you say that you will consistently translate reported time aggregate costs into a total consistently using a 5% discount rate. But even if you have the annual cost results in current dollars for every scenario reported (do you?), the pathway is computed using the original discount rate, so there would be an inconsistency in reporting the results of an optimization using one discount rate in discounted dollars using a different discount rate, no? | Taken into account. Yes, we have the annual cost for every scenario in the database. Information on the sensitivity of costs to choice of discount rate is now provided. |
| 9966 | 6 | 30 | 22 | | | Please make a reference to Table 3.1. It's helpful to know different values on discount rate. | Taken into account. Information on the sensitivity of costs to choice of discount |
| 4199 | 6 | 30 | 23 | | | When GDP is discussed as a cost indicator, the issue about GDP in current price, GDP in constant price and GDP-PPP should be touched upon, in my view. | Rejected. GDP losses are not discussed here. If GDP losses are included in future versions, we will clarify that they |
| 6502 | 6 | 30 | 30 | 30 | 36 | This sentence should be eliminated.<br>Because supporting evidence is not clear. | Rejected. An idealized policy scenario is definition, not an empirical finding. |
| 9874 | 6 | 30 | 34 | | | Remove the word "improbable" from this sentence - these scenarios are not forecasts - we can not assign probabilities to their occurrence, since they depend on future human decision making. | Taken into account. Changed to implausible. |
| 8660 | 6 | 30 | 34 | | | Remove the word "improbable" from this sentence - these scenarios are not forecasts - we can not assign probabilities to their occurrence, since they depend on future human decision making. | Taken into account. Changed to implausible. |
| 9984 | 6 | 30 | 37 | 30 | 39 | This part should be deleted completely because it is considered that IPCC should be policy irrelevant and has not recommended any integrated carbon markets until now. | Rejected. It is a misunderstanding that the discussion of idealized implementation scenarios is an endorsement of this approach or a policy |
| 16703 | 6 | 30 | 40 | | 44 | This should be deleted -- is based on the terrible misunderstanding that a lower carbon price is a demonstration of a lower cost policy set. In fact, a policy that requires additional deployment of a more costly resource regardless of the carbon price will act to lower the carbon price only because these more costly resources remove emissions -- the market could have achieved those same emission reductions at a slightly higher carbon price, but lower overall total costs to the economy. Read the 1st paragraph on page 30. | Rejected. Some models show a significant reduction of mitigation costs due to, e.g., revenue recycling from a carbon tax (Waisman et al., 2012, Climatic Change 11(1)). The rest is a misunderstanding. We do not discuss the lowering of the carbon price, but that |
| 9872 | 6 | 30 | 5 | | | In fact, here you state clearly my point above, which is that emissions prices are not representative of total costs because they represent marginal costs. | Noted |
| 8658 | 6 | 30 | 5 | | | In fact, here you state clearly my point above, which is that emissions prices are not representative of total costs because they represent marginal costs. | Noted |
| 9417 | 6 | 30 | 33 | | | Policy makers and researchers will be also interested in discussions on mitigation costs, however it is not easy to understand Figure6.13 & 6.14 & 6.15 and their explanations. It is recommended to restructure this section. | Taken into account - Figures revised |
| 11257 | 6 | 31 | | | | I was wandering about the discretization of the x-axis in the cost figures. It is shown as equidistant, but is it equidistant in terms of forcing? In terms of CO2 budget? It is shown for the categories, but in what sense are they linear (as suggested on the x-axis)? | Noted. No linear relation of forcing between climate categories should be implied by the use of climate categories |
| 5863 | 6 | 31 | | | | It is not clear what categories you refer to. Categories are given in 6.3.2.1 and 6.3.2.2, not 6.2.2. There are also more than 4 categories given there, and the numbers given in brackets with the categories in this figure do not match any numbers given with the categories in 6.3.2.1. and 6.3.2.2. Please clarify. | Taken into account. Use of categories will be harmonized. Categories 5&6 basically summarize baseline scenarios w/o climate policy, so discussion of |
| 12019 | 6 | 31 | | | | The chozen discount rate of 5% looks a bit too high considering the current economic situation and future prospect. The costs can significantly by the value of discount rates. Higher discounts rates underestimate future costs. Therefore, sensitivity analysis of costs over discount rates should be included. | Taken into account. Information on the sensitivity of costs to choice of discount rate is now provided. |
| 10396 | 6 | 31 | | 31 | | The categories mentioned in this figure does not coincide with table 6.2. And the definition of the categories is given in section 6.3.2 not section 6.2.2. | Taken into account. Use of categories will be harmonized. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11423 | 6 | 31 | 1 | 31 | 12 | Further explanations and clarifications should be provided to ensure that the use of an idealized implementation framework for mitigation will not be taken by readers as an implicit or explicit endorsement of such framework as a policy recommendation on the part of the IPCC AR5. | Taken into account. Explanation added. |
| 13146 | 6 | 31 | 11 | 31 | 12 | it would also be important to acknowledge that cost estimates are already such a specific indicator that the large uncertainties visible in the model outcomes are probably dwarfed by the uncertainties that are unavoidable, when complex systems (e.g. global economy, innovation and technology development etc) are projected far into the future (i.e. level of knowledge concerning, not only probabilities, but also possibilities. Modelling of disruptive surprises, which are almost certainly going to take place, but the nature and timing of which is unknown). In other words, it is very unlikely that the range in model outcomes is a good representation of the actual uncertainties. At best it may show how relatively small differences in assumptions can already lead to large variations (i.e. presumably most modelling teams have tried to pick parameter values and trajectories that represent a "best guess" estimates of some kind). | Noted. Will be considered as we adjust the text in the next draft. |
| 16704 | 6 | 31 | 12 | | | you mention the uncertainty of the benefits of climate mitigation -- where do we estimate the value of the benefits? This would be a good time to point the reader to that work. | Taken into account. Reference to WGII is provided. |
| 5864 | 6 | 31 | 16 | 32 | 15 | It is not clear why you show two panels here. Why do you show two time frames? It has to be expected that longer periods of time - when included in an analysis - result in higher absolute or discounted costs. Please explain or delete one frame. In addition, figure 6.14 can be deleted as the content is included in 6.13 -the explanation in the text is sufficient. | Rejected. Information on a medium term and a long term time frame is both relevant. Figure 6.14 is not redundant, because it describes consistent cost increases between scenarios from single |
| 8662 | 6 | 31 | 16 | | | I hope these two figures do not mix the two or more kinds of cost outputs from different kinds of models together. If they do, please create separate figures for comparable types of cost calculations. | Taken into account. Different cost measures are provided explicitly now. |
| 9876 | 6 | 31 | 29 | | | Again, mitigation costs will not necessarily increase significantly with the stringency of climate stabilization. This result will depend on many assumptions, especially the costs assumed for fossil fuels as a function of the demand for such fuels. With a steep enough fossil fuel cost of supply curve, mitigation costs could decrease with greater climate change mitigation. Please make it clear that the runs done by modeling teams may have shown this result because of the cost assumptions and trajectories input to the models. Or, the statement could be modified to be "with any given set of input assumptions, the net costs of mitigation will increase (or become less negative) with the stringency of climate stabilization". Then the statement becomes a mathematical truism. Moreover life style changes and the mentionned Kaya decomposition components have to be considered, too. | Noted. It is already stated that the result of an increase in costs with stringency holds "in general". The figures and the statements are revised. |
| 8663 | 6 | 31 | 29 | | | Again, mitigation costs will not necessarily increase significantly with the stringency of climate stabilization. This result will depend on many assumptions, especially the costs assumed for fossil fuels as a function of the demand for such fuels. With a steep enough fossil fuel cost of supply curve, mitigation costs could decrease with greater climate change mitigation. Please make it clear that the runs done by modeling teams may have shown this result because of the cost assumptions and trajectories input to the models. Or, the statement could be modified to be "with any given set of input assumptions, the net costs of mitigation will increase (or become less negative) with the stringency of climate stabilization". Then the statement becomes a mathematical truism. | Noted. It is already stated that the result of an increase in costs with stringency holds "in general". The figures and the statements are revised. |
| 8664 | 6 | 31 | 33 | | | Why should any model runs be excluded from the graphical presentations as long as they use comparable costs? | Taken into account. The figures now include all models and the ranges are |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9875 | 6 | 31 | 9 | | | I believe that this is the first place that assumptions about technology cost and performance is mentioned in this chapter. (Please check.) As noted above, this topic should be discussed up front, right after model structure. Please provide a table here or there with some key technology costs as assumed by different modeling groups so the reader can get a feel for how different there cost assumptions are. My recollection is that they can be quite different. The fact that different input assumptions, especially for the cost of technologies as well as for the cost of fossil fuels, will have a significant impact on the total net incremental costs or benefits of mitigation should be strongly highlighted so that the reader understands it is not just the differences in model structures which cause differences in total costs and benefits. | Taken into account. The text is re-arranged and the implications of technology portfolios is discussed in the consecutive section. |
| 8661 | 6 | 31 | 9 | | | I believe that this is the first place that assumptions about technology cost and performance is mentioned in this chapter. (Please check.) As noted above, this topic should be discussed up front, right after model structure. Please provide a table here or there with some key technology costs as assumed by different modeling groups so the reader can get a feel for how different there cost assumptions are. My recollection is that they can be quite different. The fact that different input assumptions, especially for the cost of technologies as well as for the cost of fossil fuels, will have a significant impact on the total net incremental costs or benefits of mitigation should be strongly highlighted so that the reader understands it is not just the differences in model structures which cause differences in total costs and benefits. | Taken into account. The text is re-arranged and the implications of technology portfolios is discussed in the consecutive section. |
| 12103 | 6 | 31 | 28 | 31 | 28 | This statement "A further observation is that the costs of mitigation are highly dependent on the level of stabilization; that is, mitigation cost estimates increase significantly with stringency of climate stabilization" - is not true as shown by Figure 1 in Schneider, S. and Azar, C. (2002) 'Are the costs of stabilising the atmosphere prohibitive?', Ecological Economics, vol 42, issues 1–2, pp73–80. http://stephenschneider.stanford.edu/Publications/PDF_Papers/EconomicCostsOfStabilizingClimate.pdf They showed that there was very little actual difference in "cost" irrespective of the stabilisation target. To understand why they explain " Top–down (economic) models typically suggest that the cost of a 50% reduction of global CO2 emissions from baseline by 2050 would cost some 1–4% of global GDP, and a 75–90% reduction by 2100 would cost some 3–6%. But since these studies also assume that global income grows by 2–3% per year, this abatement cost would be overtaken after a few years of income growth. Thus, the cost of 'climate insurance' amounts to 'only' a couple of years delay in achieving very impressive growth in per capita income levels. To be ten times richer (than in 2000) in 2100 AD versus 2102 AD would hardly be noticed and would likely be politically acceptable as an insurance." . Rather, as shown in IPCC AR5 Chapter 3, page 48, the Costs of Mitigation depend completely on the assumptions made in the modelling of the costs of climate change mitigation. For instance, if you accept that there have been historically alot of barriers to implementing energy efficiency opportunities.....as outlined in other parts of this assessment, then addressing those and requiring higher 2020 targets can actually lead to greater investment in energy efficiency by 2020 rather than less. This can have significantly positive economic effects as it leads to such large demand reductions that new power plants do not need to be built. For instance the 2011 Potsdam Institute for Climate Impact Research (PIK) study shows that it is more economically efficient, not less to for the European Union to aim for a 30 percent of greenhouse gas reduction by 2020 instead of the current 20% reduction target. A new study, led by the Potsdam Institute for Climate Impact Research (PIK), shows that a shift from 20 to 30 percent of greenhouse gas reduction by 2020 would boost the European economy and create 6 million jobs. The full study is available from http://www.european-climate-forum.net/fileadmin/ecf-documents/Press/A_New_Growth_Path_for_Europe__Synthesis_Report.pdf | Noted. The models that submitted their results to IPCC database show the described increase. |
| 12105 | 6 | 31 | 4 | 31 | 6 | "This difference in costs may be traced back to a range of assumptions embedded in the structures of the individual models,." Does not have a reference - suggest also refencing this point as it is a crucial one - Weyant, J. (2000) An Introduction to the Economics of Climate Change Policy, Stanford University, Repetto, R. and Austin, D. (1997) The Costs of Climate Protection: A Guide for the Perplexed, World Resources Institute, Washington, DC. | Noted. A reader is alerted to a discussion in the consecutive text. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11258 | 6 | 32 | | | | I was wandering about the discretization of the x-axis in the cost figures. It is shown as equidistant, but is it equidistant in terms of forcing? In terms of CO2 budget? It is shown for the categories, but in what sense are they linear (as suggested on the x-axis)? | Noted. No linear relation of forcing between climate categories should be implied by the use of climate categories |
| 12020 | 6 | 32 | | | | same as above. | Noted. No linear relation of forcing between climate categories should be implied by the use of climate categories |
| 13149 | 6 | 32 | 16 | 32 | 22 | As mentioned previously, I would expect the the energy (and other) systems of 2100 to look quite different from the ones today, no matter whether a mitigation target is assumed or not. Also mentioned previously: It's hardly surprising that there's less variation when the absolute distance from the reference point (i.e. the baseline) is smaller, especially if one expects, as was suggested, the costs (as a function of the target) to increase faster than linearly.A lower variation for more stringent targets would imply significantly differently shaped implicit MAC curves for the models. Therefore, an increasing variation with more mitigation could be interpreted as "magnitude uncertainty" dominating (which seems to be the case, also based on figure 6.15) and larger variation with low targets as "shape uncertainty" dominating the variation across the models (with the previously mentioned strong caveats concerning the how complete this description of uncertainty can be expected to be). | Noted and will be considered as we adjust the text in the next draft. |
| 16705 | 6 | 32 | 21 | | 22 | Suggest replacing last sentence with this: "Stringent scenarios require a more rapid replacement of existing plant and equipment as well as the deployment of some technologies before their costs have declined through a more gradual early stage deployment." [explanation: requiring 100 MW of solar in 2002 would cost a great deal more than requiring 100 MW of solar in 2012. Trying to go very fast pushes deployment at a time when much more could be achieve at a much lower costs if we had simply waited a little while longer.] | Noted and will be considered as we adjust the text in the next draft. |
| 8666 | 6 | 32 | 31 | | | The possibility that total net abatement costs could be linear with respect to cumulative levels of abatement seems somewhat strange for any given model. It would seem to only occur if there was one basic technology at a constant unit cost that could be relied on for abatement throughout this range. If more than one technology was called on for abatement over the range cited, then one would expect an increase in the slope of the cost curve when the penetration of the first and cheaper technology was saturated, reflecting higher marginal costs for the second technology. Presumably, such a change in slope would happen many times for any given scenario. Thus, a general linear trend as displayed in figure 6.15 must be an artifact of having outputs for many different models with many different sets of assumptions, and probably has no significance. | Taken into account. The rates of increase in costs are different among different classes of the models. |
| 16706 | 6 | 32 | 33 | | | insert after 2010-2100 "delaying the achievement of the 2100 consumptions levels in the no policy case by X months." | Comment is noted and will be considered as we adjust the text in he |
| 8665 | 6 | 32 | 7 | | | I find figure 6.14 confusing if the main point is to show cost variation with increased stringency across modeling groups. Again, the cause of these variations are many fold, different model structures, and different sets of input assumptions being two key causes. It is not clear to me that it is necessarily the case that the variability of costs will always increase with stringency for any set of input assumptions. | Taken into account - Figure will be beefed up with additional information or removed. |
| 6537 | 6 | 32 | 20 | | 21 | Replace "bring greenhouse gas emissions toward zero" with e.g. "reduce greenhouse gas emissions significantly" in accordance with AR4 WG1 Report Figure 10.22, or give a reference paper. | Taken into account. The text is adjusted. |
| 6274 | 6 | 32 | 7 | 32 | 15 | Delete Figure 6.14 and the text under the graphic. Keep the text at the bottom of page 31 and top of 32 that explains the take home point from this graphic. The text is far easier to interpret and digest than this graphic and its unit of measure of "mitigation costs relative to CatIII cliamte policy." Here's the rare case where a couple of sentences are better than a graphic. This will save about half a page. | Taken into account - Figure will be beefed up with additional information or removed. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16707 | 6 | 33 | 16 | | 26 | This discussions is extremely important because of how is frequently interpreted -- it creates a barrier for negotiators. It presumes no efforts are possible to address the regional disparities through the allocation of CO2 endowments which can be used to facilitate trade. The trade in this endowment, which can be based on BAU emissions until a country achieves a level of per capita GDP, can create the financial flows and ability to buy technology needed by developing countries. See work by Bossetti and Frankel http://belfercenter.ksg.harvard.edu/files/bosetti-frankel-dp-46-final-1.pdf . | Noted and will be considered as we adjust the text in the next draft. |
| 11424 | 6 | 33 | 21 | 33 | 26 | The assertion that the majority of emissions reductions in the 21st century will be borne by because their emissions are projected to be larger than those of developed countries needs to be explained more clearly in terms of what the assumptions are underlying such assertion. Absent a clear explanation of the assumptions for this assertion, such a bare assertion could be used in a non-scientific and political way in order to push specific policy agendas or approaches in the context of international policymaking discussions and negotiations on climate change that could effectively absolve developed countries of any further mitigation commitments and increase the pressure on developing countries to undertake increased mitigation actions. Furthermore, declarative formulations such as "the majority of emissions redutions over the coming century will be borned by the currently developing countries" should be avoided in order to prevent the use of such declarative statements in a political setting, particularly since such declarative statements might be construed by eventual readers as an implicit policy recommendation on the part of IPCC AR5 with respect to how future emissions reductions responsibilities should be allocated. This would bring the IPCC AR5 conclusions into the realm of policymaking rather than science. | Noted. The statement is supported by projections from a vast majority of the models. |
| 16708 | 6 | 33 | 27 | | 35 | Very important -- highlight or move forward in document. Include ref to work by Bossetti and Frankel. | Noted and will be considered as we adjust the text in the next draft. |
| 13150 | 6 | 33 | 31 | 33 | 34 | Isn't this a bit too self evident to count as a finding? | The reference is provided to support the |
| 17233 | 6 | 33 | 34 | | | Lüken et al is not found in the reference list. The reference makes sense here, though. | Taken into account. |
| 14400 | 6 | 33 | 6 | | | Need a more complete explanation of why the red dot studies are so different. Why are they included at all (rather than just mentioned in a footnote) if they are so unrepresentative? If this is the McKibben et al model only, I'd be reluctant to feature it as much as is done here. (See the doubts in Cline, 2011, p. 50-51). I think it is mixing short-term monetary issues in with long-term climate and technology issues. | Noted. The text is already edited and will be considered for further adjustments in the next draft. |
| 4200 | 6 | 33 | 8 | | | Very interesting figure. However, the non-linearity between cummulative carbon emission and cost in NPV is not so clear. Isn't log-scale graph better? | Noted. Log-scale will compromise comprehensibility of the figure for the lay person, and is not necessary, since only |
| 9571 | 6 | 34 | | | | Please, don't cap new nuclear capacity as explicit factors in the model in the case of no new nuclear case. When it is difficult to remove cap for it, please explain models' capacity prerequisite for no nuclear case in the text. | The comment needs clarification. |
| 16709 | 6 | 34 | | | | Line 7 of description -- you mention compensation mechanisms. You should help define or explain somewhere in the report what these compensation mechanisms could be -- in particular the assignment of an allowance or CO2 endowment along a BAU pathway for developing countries. Very helpful if you could highlight this. | Taken into account. The text on burden sharing regimes and financial transfers is now in the new Section 6.3.6.6. |
| 12021 | 6 | 34 | | | | The amounts of GHG reductions by marginal costs should be given before presenting this kind of analysis. | Figure 6.16 shows total costs rather than marginal costs. There is no Table 6.16. |
| 9280 | 6 | 34 | 14 | 34 | 15 | This table is duplicative of Table 6.ES.2 (Chapter 6, page 7 line 6). | Noted. The text will be adjusted in the |
| 14401 | 6 | 34 | 2 | | | See Cline (2011) estimates, p. 84. If cuts are to equal per capita emissions, the percent cuts are greater for industrial countries. Costs are broadly similar between the two groups. | Noted and will be considered as we adjust the text in the next draft. |
| 11749 | 6 | 34 | | | | The condision of new nuclear should be described in this section or added the remark on the table 6.4. Refer to No.40. | Noted and will be considered as we adjust the text in the next draft. |
| 3146 | 6 | 35 | 1 | | | SECTION 6.3.5 on policy design overlaps with other chapters that cover similar material. TSU NEEDS TO ADVISE ON WHERE POLICY DESIGN ISSUES WILL BE HANDLED CENTRALLY. | Noted. The text is adjusted and most of the description is now in Chapter 3. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6100 | 6 | 35 | 15 | 35 | 17 | In view of the importance of technology in mitigation, effect of a policy to promote technology innovation/diffusion shoule be included as one of the criteria. However, as I know that this matter should be discussed in Chapter 3, I have already made a comment for the Chapter 3 text. | Taken into account. Policy design issues are moved to Chapter 3. |
| 6101 | 6 | 35 | 17 | 35 | 18 | The explanation of economic efficiency here seems to be the same as cost-effectiveness. Actually, economic efficiency has something to do with the concept of optimization where marginal cost equalizes to marginal benefit. | The concepts of economic effciency and cost effectiveness are different. Concept definitions are now moved to Chapter 3. |
| 8667 | 6 | 35 | 25 | | | This sentence does not require a reference since it is a simple logical truth. | Noted. |
| 7682 | 6 | 35 | 34 | 35 | 34 | The text "implications are discussed in Section 6.2.6" should probably refer to Section 6.3.6? | Taken into account. The sections are re- |
| 13278 | 6 | 35 | 35 | 35 | 37 | This sentence is unclear - the 20% reduction would lead to 0.5-2.0% of what? Presumably change in welfare; if so, please spell this out in the text | Taken into account. The reference is to welfare cost. |
| 13151 | 6 | 35 | 36 | 35 | 37 | Does "the lowest possible cost" here refer to using a single carbon price? If yes, make sure the terminology agrees with what is on page 30, lines 40-44. | Yes. The statement is qualified by adding "in the absence of other |
| 9877 | 6 | 35 | 37 | | | 0.5 - 2.0% of what? GDP? Again, this result depends on input assumptions. It could be negative with sufficiently high fossil fuel prices in the base case. | The reference here is to welfare (not GDP). The intent is to show the impacts of expanding emission trading, rather |
| 8668 | 6 | 35 | 37 | | | 0.5 - 2.0% of what? GDP? Again, this result depends on input assumptions. It could be negative with sufficiently high fossil fuel prices in the base case. | The reference here is to welfare (not GDP). The intent is to show the impacts of expanding emission trading, rather |
| 16711 | 6 | 35 | 40 | | | Insert at end of line: "These figures demonstrate the significant economic penalties that can be created as market structures deviate from the ideal or are over-engineered to satisfy other policy objectives." | Noted. The text is adjusted and some figures are deleted. |
| 16710 | 6 | 35 | 5 | | | suggest insert at end of sentence, after the word "market" the following: "participants as they operate to maximize utility." | Noted and will be considered as we adjust the text in the next draft. |
| 7686 | 6 | 35 | 6 | 35 | 12 | The introduction mentions that the subsection considers economic rents, but the word is not used in the rest of the subsection. Please ensure that the introduction is in line with the rest of the 6.3.5.x subsections. The text "[…] something that economists call a scarcity rent [...]" is too didactic for a review text. Also, the use of "we" (lines 10-12) feels inappropriate for IPCC assessment report. | Taken into account. The text is revised. |
| 7685 | 6 | 35 | 1 | | | The subsection (pp. 35-37) is very fragmented, and doesn't give a comprehensive view on different policy structures and their possible implications. The underlying problem is that the chapter is based on scenario modelling studies, and a IAM's have limited capacity to actually model different policy structures. The topics covered in the subsection are too narrow to warrant such a broad title. From the title I would e.g. expect a discussions on carbon tax vs. quantity targets, multilateral agreements and national policies, flexibility mechanisms etc. Policy agreements are covered more comprehensively in Chapter 13. Do the section's figures support the text and conclude the main findings? The section has some overlap with section 6.3.6, and also probably with various sections in Chapter 13. Perhaps this section could be merged with 6.3.6, as Chapter 6 requires shortening. | Taken into account. Policy design issues are moved to Chapter 3 and the current section is re-arranged. |
| 6275 | 6 | 35 | 35 | 36 | 6 | Consider deleting Figure 6.17 and the text under the graphic but keep the paragraph on Page 35 that starts with the bold face "Figure 6.17." That is indeeed a good example of the point being discussed in the third paragraph on page 35. The text in the short paragraph at the bottom of page 35 nicely states what the experiment was and the key results and insights. Figure 6.17 doesn't add much and in fact raises more issues that dont need to be dealt with here (e.g., what is DART, what is No. N+1, ...) | Noted and will be considered as we adjust the text in the next draft. |
| 12309 | 6 | 35 | 1 | | | In this section it is also important to look at how to handle risk sharing in a situation where there is a need for a shift in technology. There is more risk and higher cost involed for the early movers. Hence, this might create a need for other policies, especially in the transformation phase. This perspective is not necessarily taken care of by economic instruments, as the section seems to focus mainly on cap-and-trade and carbon text. It is important to convey the findings which is relevant for policy makers when developing the policy instruments. | Noted and will be considered as we adjust the text in the next draft. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13152 | 6 | 36 | 11 | 36 | 12 | Figure is missing (6.17 shows something completely different, as does 6.18) | Taken into account. The figures are re- |
| 9878 | 6 | 36 | 12 | | | The 90% increase cited must depend on very specific input assumptions. If so, I would suggest carefully qualifying the statement as it appears to undermine the idea of establishing RPSs at any regional level. | Noted and will be considered as we adjust the text in the next draft. |
| 8669 | 6 | 36 | 12 | | | The 90% increase cited must depend on very specific input assumptions. If so, I would suggest carefully qualifying the statement as it appears to undermine the idea of establishing RPSs at any regional level. | Noted and will be considered as we adjust the text in the next draft. |
| 9879 | 6 | 36 | 16 | | | Again, the sentence that starts "it underscores the potentially large costs.. " seems quite politically explosive to me, and I am quite skeptical that it is generally true. If you want to make such powerful and sweeping statements I think more research needs to be described as to under what conditions a statement like this is true or not. Even if you reveal the underlying studies, I would avoid such a term, as it is too vague. This conclusion could be cited to oppose any type of sector specific policy and decisions on the company level. Yet, sector specific policies are usually much easier to implement and much more successful than "broad policies" like a carbon tax, if that is what is meant. | Noted and will be considered as we adjust the text in the next draft. |
| 13153 | 6 | 36 | 16 | 36 | 17 | I'm not entirely sure I understand this; to me all the CAT scenarios appear to have similar costs (i.e. circle areas), no matter what is assumed for FES. Or does this conclusion refer to the size of the "non-mitigation" circle vs "mitigation" circles, in order to point out that just reducing gasline use with FES, without achieving significant emission reductions, would cost ~ quarter of what it would cost to achieve at least as significant gasoline use reductions AND more meaningful mitigation outcomes? Elaborate a bit, so that it's clear what one should conclude from the figure. | Taken into account. The figure is deleted. |
| 8670 | 6 | 36 | 16 | | | Again, the sentence that starts "it underscores the potentially large costs.. " seems quite politically explosive to me, and I am quite skeptical that it is generally true. If you want to make such powerful and sweeping statements I think more research needs to be described as to under what conditions a statement like this is true or not. This conclusion could be cited to oppose any type of sector specific policy. Yet, sector specific policies are usually much easier to implement and much more successful than "broad policies" like a carbon tax, if that is what is meant. | Noted and will be considered as we adjust the text in the next draft. |
| 5865 | 6 | 36 | 23 | 37 | 7 | Including emissions from land-use is a delicate topic because most studies I am aware of do not reflect e.g. a "bug" in the reporting guidelines, but assume their assessment scheme to be correct. Losses of C in biomass are attributed to harvest activities and would have to be paid for by e.g. farmers and foresters. They in turn would have to raise prices to be remunerated. Thus prices for agricultural crops and timber will raise and, especially with timber, uses which generate more C emission reduction by replacement / substitution may be offset because of reduced harvests. | Noted. The challenges are mentioned and discussed in the provided references. |
| 8671 | 6 | 36 | 23 | | | Addressing land-use related abatement will only reduce overall abatement costs if the marginal costs of land-use abatement measures are lower than the marginal cost of the last abatement technology that would have otherwise been relied on. This is another example of how conclusions need to be properly qualified. | Noted. There is a range of emission abatement options from land-use change. With a certain carbon price, |
| 7687 | 6 | 36 | 7 | 36 | 9 | The text statest rather blatantly that "The most economically-efficient climate policy remains cap-and-trade policy or carbon tax", with a single reference at the end of the statement. While I'm certainly not against this statement in itself, I think the tone is rather arrogant and unbalanced. I order to prove the point, it is better to cite results from studies that have compared the efficiency of market-based to other regulatory measures. | Taken into account. The statement is re-arranged and additional references to EMF studies are considered. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11750 | 6 | 36 | 7 | 36 | 9 | Disagree. Some says volantay acions are effective and C&T, tax are not necessarily effective.The sentence [The most economically-efficient ....] should be deleted.Refer to Okazaki et al.,Wakabayashi et al., Montgomery et al.<br>1.Okazaki et al.:[Accelerating the transfer and dissusion of of energy saving technologies steel sector experience], send attachment by another e-mail.<br>2.Wakabayashi et al:[Case Studies and Its Effectiveness of Environmental Taxation], http://criepi.denken.or.jp/en/serc/research_re/download/09005dp.pdf<br>3.Wakabayashi et al.:[A Review on Effectiveness of Emissions Trading Schemes: Empirical Evidences of Their Implementation], send attachment by another e-mail.<br>4.Montgomery et al.:[Price, Quantity and Technology Strategies for Climate Change Policy], http://crai.ca/uploadedFiles/RELATING_MATERIALS/Publications/Consultant_publications/files/pub_4141.pdf | Noted. Distorted implementation of carbon tax and cap-and-trade may increase costs. The qualified is added. |
| 16712 | 6 | 36 | 7 | | 17 | These points are very important and should be moved directly to the executive summary. | Noted and will be considered as we adjust the text in the next draft. |
| 10647 | 6 | 36 | 7 | 36 | 9 | There is a lot of arguments that volantary actions are more effective. Please see Okazaki et all, Wakabayashi et al and Montgomery et al. 1.Okazaki et al.:[Accelerating the transfer and dissusion of of energy saving technologies steel sector experience], send attachment by another e-mail.<br>2.Wakabayashi et al:[Case Studies and Its Effectiveness of Environmental Taxation], http://criepi.denken.or.jp/en/serc/research_re/download/09005dp.pdf<br>3.Wakabayashi et al.:[A Review on Effectiveness of Emissions Trading Schemes: Empirical Evidences of Their Implementation], send attachment by another e-mail.<br>4.Montgomery et al.:[Price, Quantity and Technology Strategies for Climate Change Policy], http://crai.ca/uploadedFiles/RELATING_MATERIALS/Publications/Consultant_publications/files/pub_4141.pdf | Noted. The literature on effectiveness of voluntary actions for stringent emission reductions is non-existent. |
| 9985 | 6 | 36 | 7 | 36 | 9 | This part should be deleted completely because there are successful examples of "voluntary target scheme" in the world. Each industry in Japan has voluntary target and the voluntary target scheme has played a big role, as described in (Yamaguchi, 2012, page35 and 154), (Manuel, 2010, page 6 and 13), and (Yamaguchi, 2010, abstract). In addition, there is also a successful example of "voluntary target scheme" in Netherlands, as shown in (Martijin, 2002, page162). These literatures are listed in the No63 line of this table.<br>On the other hand, market-based mechanism such as emission trading has several problems. Volatility of emission permit prices affects volatility of product prices as evidenced by fluctuating price developments in the EU-ETS. Therefore, the market-based policy tools of cap-and-trade cannot provide credible incentives for the technological change, as described in (Montgomery, 2005, abstract) and (Baldursson, 2009, page29). These literatures are listed in the No62 line of this table.<br>In addition, CO2 leakage caused by the implementation of the ETS happened actually through international transfer of industry , as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No50 line of this table. | Noted. The literature on effectiveness of voluntary actions for stringent emission reductions is non-existent. |
| 9365 | 6 | 36 | 7 | 36 | 9 | It should be deleted because there is a successful example of the voluntary action of the Japanese steel industry. Also carbon tax does not always seem to be effective. Wakabayashi et al showed that the difficulty to keep tax rate in reality because of the price competitiveness in industrial sector.(Wakabayashi and Sugiyama ) | Noted. The literature on effectiveness of voluntary actions for stringent emission reductions is non-existent. |
| 6498 | 6 | 36 | 7 | 36 | 9 | This sentence should be eliminated.<br>It is hard to mention that the most economical-efficient climate policy is cap-and-trade policy or carbon tax. Because the supporting evidence is not clear and the problems are pointed out in 6.3.5.2 | Noted. Distorted implementation of carbon tax and cap-and-trade may increase costs. The qualified is added. |
| 16713 | 6 | 37 | 20 | | 21 | Sentence beginning with "different allocation schemes …" is very important. These points should be moved forward and included in the executive summary. | Noted and will be considered as we adjust the text in the next draft. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16714 | 6 | 37 | 23 | | 26 | This lacks context -- how big will the changes be and what will be their impact? | Noted. We consider deleting this discussion for limited space reasons. If kept, we consider adjusting the text in |
| 8046 | 6 | 37 | 27 | 37 | 38 | a reference to chapter 6.3.6.2 is helpful | Noted and will be considered as we adjust the text in the next draft. |
| 13154 | 6 | 37 | 31 | 37 | 31 | Same effects as what? | Same fuel and emission reduction. The |
| 8672 | 6 | 37 | 31 | | | "same effects" as what??? | Same fuel and emission reduction. The |
| 9880 | 6 | 37 | 33 | | | Again, I think that the estimate of 2-10 times the cost (of what scenario? A cap and trade system?) should be very carefully justified and qualified, because otherwise it can be mis- used by opponents of almost any climate policy that is not a cap-and-trade system or carbon tax. Cost multiples at this high a magnitude are suspect to me because they are produced by economic modules that have very aggregate treatment of each economic sector. It is not clear, therefore, what kinds of sectoral-specific climate mitigation policies they could even model reasonably accurately. | The text is edited. |
| 8673 | 6 | 37 | 33 | | | Again, I think that the estimate of 2-10 times the cost (of what scenario? A cap and trade system?) should be very carefully justified and qualified, because otherwise it can be mis- used by opponents of almost any climate policy that is not a cap-and-trade system or carbon tax. Cost multiples at this high a magnitude are suspect to me because they are produced by economic modules that have very aggregate treatment of each economic sector. It is not clear, therefore, what kinds of sectoral-specific climate mitigation policies they could even model reasonably accurately. | The text is edited. |
| 11425 | 6 | 37 | 43 | 37 | 45 | The assertion that developing countries "are new responsible for the majority of greenhouse gas emissions moving forward" is similar to assertions made elsewhere in the chapter about the potential future role of developing countries as the main contributors to such emissions and hence should have the main future responsibility for reducing emissions. As with such other assertions, this assertion should also be clearly explained in terms of what the assumptions were, so as to avoid the IPCC AR5 being read or construed in this instance as providing a policy recommendation with respect to the allocation of future emission reduction commitments. | Will take this into account and rephrase in a way that it is clear that no policy reccomandation is made |
| 6103 | 6 | 37 | 45 | 37 | 45 | The word "especially" should be added before "at the international level". This situation also happen domestically. | noted |
| 6102 | 6 | 37 | 8 | 37 | 26 | Very important message that distributional impact affects feasibility of a policy instrument is missing. | Noted and will be considered as we adjust the text in the next draft. |
| 7688 | 6 | 37 | 8 | | | Distributional impacts are likely to be a huge global issue. Starting with a study on US households seems very biased. Perhaps the text could start by stating that impacts vary by policy, region and individual, with references to each. With cap-and-trade and taxes with transfers, the economic impacts can be adjusted. There is a large amount of literature on burden sharing (or effort sharing), but this is covered with merely a short note on allocation schemes. | The text of burden sharing and financial transfers is now in the new section 6.3.6.6. |
| 7689 | 6 | 37 | 27 | | | This important topic deserves much more comprehensive treatment. The whole subsection has been written from a viewpoint of an economist, althought it is more in the field of a policical scientist (not political economist). Anecdotal evidence from the US seems inappropriate. Is there any literature on e.g. the UNFCCC process and what kind of mandates the negotiators there have? | The text is re-arranged. The sub-section is removed. |
| 7690 | 6 | 37 | 39 | | | The subsection (pp. 37-42) deals mostly with scenario studies on international participation to the global climate policy, but this is a very narrow scope compared to the subsection's broad title. Policy agreements are covered more comprehensively in Chapter 13. The subsection is also quite heavy on figures relative to the amount of text. In addition, some of the figures are not referenced in the text. Are the figures representative of the literature on the covered topics, and do they conclude the main findings from scenario studies on international strategies for mitigation? Perhaps section 6.3.6 could be merged with section 6.3.5 as there is some overlap between them. | This chapter deals with modeling and the issue of international agreements is covered inso far models have addressed it in the literature. Chapter 13 does not provide quantitative estimates of the role of international participation, so there in our view value of keeping this section |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16715 | 6 | 38 | 10 | | 30 | These points are extremely important -- need greater emphasis and should be included in exec summary -- they are buried in body of report and risk being overlooked. | The chapter will be reorganized so as to give this section more visibility. |
| 9499 | 6 | 38 | 12 | 38 | 21 | good issue - All of the countries should take part in climate stabilization activities | thanks |
| 5924 | 6 | 38 | 12 | | 30 | This could be added as well. It supports the overall message given in this chapter. Ekholm T., Soimakallio S, Moltmann S., Höhne N, Syri S., 2010. Effort sharing in ambitious, global climate change mitigation scenarios. Energy Policy 38(4), 1797-1810. | noted |
| 7691 | 6 | 38 | 16 | | 20 | There is no need to elevate EMF22 above other participation studies in an IPCC assessment report ("one of the most comprehensive assessment of this issue"). Please reformulate the text so that it states the main findings of EMF22, and include also results from other participation studies that are referenced. | More studies will be added in the SOD. |
| 11426 | 6 | 38 | 20 | 38 | 24 | The bases and assumptions for why "many models were not able to produce scenarios with delayed participation of large developing countries for the more stringent long-term goals" should be further explained and clarified. Furthermore, a more balanced framing of the argument should be used. For example, instead of stressing only that "half of models found it impossible to meet the 550 Co2-e target with delayed participation", an additional phrase could be added to say to present the other side of the picture such that "on the other hand, half of the models deem it possible to meet such target with delayed participation from developing countries" (that is, if the literature would allow such an assertion to be made). | noted |
| 7692 | 6 | 38 | 26 | | 27 | Please clarify/elaborate "model cannot be solved" and the "high initial price". | We will add more information on the |
| 8674 | 6 | 38 | 29 | | | Again, the second two reasons for apparent infeasibility may also reflect the overly constrained amount of energy efficiency improvements allowed per year in these models, as well as other input constraints that are not absolutely firm. | We will add more information on the notion of infeasibility |
| 6692 | 6 | 38 | 10 | | | Good text.All nations should make efforts to control too rapid climate change. So, It is effective to construct a framework under which all nations, including developing countories, have a responsibility to reduce carbon emission. | thanks |
| 6276 | 6 | 38 | 10 | 38 | 30 | The material discussed in section 6.3.6.2 is very important and is one aspect of what is new that is in the literature that wasn't probably addressed in AR4 in detail. It is concerning to this peer reviewer that this information is 38 pages in this chapter. Serious consideration needs to be given to condensing the many pages of important caveats about what IAM models can and can not do so that insights like this are not lost. The sentence about not being able to get to 550 if large regions stay out is a potential candidate for the executive summary or an FAQ at the end of the chapter. | The chapter will be reorganized so as to give this section more visibility. |
| 15220 | 6 | 39 | | | | Figure 6.19 needs to be revised to make it clear for understanding. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 4201 | 6 | 39 | | | | hard to read! | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 6538 | 6 | 39 | | | | Complete Figure 6.19 and give a reference paper. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 5866 | 6 | 39 | | | | Rework, not legible. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 6104 | 6 | 39 | | | | Can not read. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 10793 | 6 | 39 | 1 | | | Figure is garbled and confusing. Please redesign | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14455 | 6 | 39 | 1 | | | This graph is illegible. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 3148 | 6 | 39 | 1 | | | Figure 6.19 is illegible but seems to be important. I would suggest that the discussion of this figure include cross references to other chapters where international cooperation is addressed in detail such as chapters 2 and 13. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 14402 | 6 | 39 | 10 | | | See Cline (p. 70) on advantages to China of earlier cutbacks than Copenhagen pledge, if cuts are to reach 1.4 tCO2 per capita by 2050 | noted |
| 9572 | 6 | 39 | 12 | 39 | 13 | Please, replace advantageous terms of trade with avoidance of lock-in problem as advantageous terms of trade is unclear. | noted |
| 16716 | 6 | 39 | 19 | | | Suggest this point of discussion w/in the doc: Late participation also implies that developing countries miss the opportunity to negotiate advantageous emission pathways that could be monetized via trading as part of an international cap and trade program. This agreed endowment could be used as a source of capital which could then be used to buy needed mitigation technology. Entering later may reduce the value of this opportunity. | noted |
| 6277 | 6 | 39 | | 39 | | Figure 6.19 is not legible. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 15221 | 6 | 40 | | | | Figure needs to be revised to make it clear for understanding. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 7683 | 6 | 40 | 1 | | | The figure lacks y-axis label. The NPV/maximum loss should also be noted in the x-axis label to improve readability. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 9986 | 6 | 40 | 32 | 40 | 33 | This part should be completely deleted. Market-based mechanism such as emission trading has several problems. Volatility of emission permit prices affects volatility of product prices as evidenced by fluctuating price developments in the EU-ETS. Therefore, the market-based policy tools of cap-and-trade cannot provide credible incentives for the technological change, as described in (Montgomery, 2005, abstract) and (Baldursson, 2009, page29). These literatures are listed in the No62 line of this table.<br>In addition, CO2 leakage caused by the implementation of the ETS happened actually through transfer of industry from one country to others. Market mechanisms at least under Kyoto-like international scheme, where the condition of all countries' meaningful participation is not met, does not work well, as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No50 line of this table. | Market based schemes are discussed in so far they can induce cooperation, not techhnical change. |
| 16717 | 6 | 40 | 33 | | | Suggest insert before sentence that begins with "The financial transfers that would result …" the following text: Emissions pathways for developing countries in a cap and trade system fore example need not immediately decline, but rather can follow a business as usual pathway until an agreed level of per capita GDP is achieved." Ref work by Bossetti & Frankel. Many do not understand this and highlighting it could be helpful. | noted |
| 4202 | 6 | 40 | 9 | 40 | 29 | The expression of these paragraphs seems slightly ambiguous for the readers. Are there some examples of such partial coalition and its inefficient outcome? What is important in this chapter is, to me, the need for the incentives for the participation. | More discussion will be added |
| 11659 | 6 | 40 | | | | From the figure, GDP loss of fragmented participation seems to be smaller for other DCs than that of full participation in NPV terms, which means that the delay in participation is beneficial for other DCs. The rationale behind this result should be mentioned. | noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10989 | 6 | 40 | 32 | 40 | 33 | In what aspects could schemes like international emission trading be said it is quite successful in inducing cooperation? It should be supported by some facts.<br>Reference: Jared C. Carbone, Carsten Helm, Thomas F. Rutherford, The Case for International Emission Trade in the Absence of Cooperative Climate Policy (2009). | The paper by Carbone et. al is already quoted. |
| 9573 | 6 | 41 | | | | Please, describe expaination and different timing of participation from countries in the text or footnote as it is difficult to understand bar chart. | will improve the chart clarity |
| 6539 | 6 | 41 | | | | Explain the deferent allocation schemes in Figure 6.22. and give a reference paper. | This figure will be replaced with an |
| 5867 | 6 | 41 | | | | Please explain regions (RAI = ?, RNAI = ?). Are negative losses gains? Or does the X-axis show changes, not losses? | This figure will be replaced with an updated one |
| 8675 | 6 | 41 | 1 | | | The results for average financial transfers in figure 6.21 look rather odd, in that for some models they are close to zero. Perhaps the text should explain the huge differences between different model results. How could the right answer be close to zero for any model? | Model variability is often an outcome of model ensamble analysis. This chart will be redrawan with new data, though |
| 9574 | 6 | 41 | 6 | | | Please, add following information as the reason of previous sentense; average emissions in developed countries would grow more slowly or decline, while those in developing countries would increase more rapidly, which has an implication for individual countries burden. | will change the chart and the associated text |
| 9881 | 6 | 42 | 0 | | | In general, I would suggest that all the previous presentation of policy analyses go at the very end of the chapter. It would be logical to present the material in section 6.3.7 first as part of the basis for the policy results. | The chapter will be reorganized so as to give this section more clarity |
| 8676 | 6 | 42 | 0 | | | In general, I would suggest that all the previous presentation of policy analyses go at the very end of the chapter. It would be logical to present the material in section 6.3.7 first as part of the basis for the policy results. | The chapter will be reorganized so as to give this section more clarity |
| 16718 | 6 | 42 | 19 | 43 | 18 | These are very unclear. Suggest rewrite. | Comment is noted and will be considered as the text is adjusted for the |
| 13157 | 6 | 42 | 20 | 42 | 33 | As the chapter is currently too long, I suggest this paragraph and the figure 6.24 that follows is cut. It's hardly surprising that emissions from fossil fuels strongly correlate with non-CCS related primary energy use of fossil fuels, nor that both go down with mitigation (or that there still can be variations across the scenarios). Sacrificing nearly a page to this does not seem necessary. | Figure 6.24 and the surrounding discussion has been replaced by a figure that relates climate targets to the use of fossil fuels. |
| 4203 | 6 | 42 | 20 | 42 | 24 | Resource availability and cost issues should be touched upon here. | Fossil fuel use under different climate targets is discussed more explicitly. Note that Section 7.4 in Chapter 7 deals with |
| 9882 | 6 | 42 | 25 | | | This section briefly mentions "limits on the use of… fossil energy…", but does not really put the future of energy systems and technologies in its proper context which must include some discussion of the peak oil, peak gas, etc. debates. Even Chapter 1 of the WGIII report discusses this issue, and it should be picked up here because it could have a major impact on the prices assumed in each IAM for fossil fuels in the future, as a function of demand. My sense of the history of IAM modeling is that the modeling teams have not paid sufficient attention to this issue, and continue to model fossil fuel supplies and prices in much the same way as they did for the fourth IPCC assessment, even though the IEA and many other organizations have changed their views dramatically on the peak oil issue. Many claim that peak conventional oil production has already peaked in 2006, with important implications for the price of oil and other fossil fuels in the future. Thus, there needs to be a discussion in this section of how oil supplies are modeled by the various IAM teams, and back-up technologies for liquid fuels, etc. | Fossil fuel use under different climate targets is discussed more explicitly. Note that Section 7.4 in Chapter 7 deals with resource availability in more depth. |

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| 8677 | 6 | 42 | 25 | | | This section briefly mentions "limits on the use of… fossil energy…", but does not really put the future of energy systems and technologies in its proper context which must include some discussion of the peak oil, peak gas, etc. debates. Even Chapter 1 of the WGIII report discusses this issue, and it should be picked up here because it could have a major impact on the prices assumed in each IAM for fossil fuels in the future, as a function of demand. My sense of the history of IAM modeling is that the modeling teams have not paid sufficient attention to this issue, and continue to model fossil fuel supplies and prices in much the same way as they did for the fourth IPCC assessment, even though the IEA and many other organizations have changed their views dramatically on the peak oil issue. Many claim that peak conventional oil production has already peaked in 2006, with important implications for the price of oil and other fossil fuels in the future. Thus, there needs to be a discussion in this section of how oil supplies are modeled by the various IAM teams, and back-up technologies for liquid fuels, etc. | Fossil fuel use under different climate targets is discussed more explicitly. Note that Section 7.4 in Chapter 7 deals with resource availability in more depth. |
| 11427 | 6 | 42 | 3 | 42 | 13 | This particular section seems to take the view that the current international climate policy regime is fragmented. This is not accurate considering that the UNFCCC actually provides for a coherent and comprehensive policy regime with respect to various aspects and actions that countries are supposed to do together in a cooperative manner, including on mitigation, adaptation, finance, and technology transfer. In the UNFCCC policy regime, roles and responsibilities are clearly demarcated and outlined. The problem lies not so much with the design and architecture of the UNFCCC policy regime itself but rather with how the various responsibilities and commitments arising from the policy regime have been fully or not fully implemented. | noted |
| 10990 | 6 | 42 | 9 | 42 | 11 | Why does "the long-term constraint enforces a degree of mitigation discipline" mean "to speed up mitigation efforts for the early entrants and delay them for the late entrants"? Why does such a situation happen? It is a little logically complicated, so it should be clearly explained. | will clarify |
| 12106 | 6 | 42 | 18 | 43 | 26 | As a general comment - Chapter 6 "Energy Sector Technology Transitions" is about technical system transformation - it ignores completely 2 key technical system transformation ideas - 1) That Whole of System Optimisation will achieve more cost effective end use energy efficiency than isolated technical stratgies - eg: As IPCC 2007 AR4 Building Chapter stated "Energy efficiency strategies focused on individual energy-using devices or design features are often limited to incremental improvements. Examining the building as an entire system can lead to entirely different design solutions. This can result in new buildings that use much less energy but are no more expensive than conventional buildings. The systems approach in turn requires an integrated design process, in which the building performance is optimized through an iterative process that involves all members of the design team from the beginning." REF (Stasinopoulos, P., Smith, M., Hargroves, K. and Desha, C. (2008) Whole System Design: An Integrated Approach to Sustainable Engineering, Earthscan, London, UNESCO and WFEO at http://www.naturaledgeproject.net/Whole_System_Design.aspx ) 2) There is a cross sector "energy" system synergies that will bring down the costs of transformation eg: namely the synergy between the transport sector (innovations in electric cars + batteries) and their potential to, through "Smart Grids", work with and enhance the transition the distributed renewable electricity supply. [Refs IEA (2011) Smart Grid Technology Roadmap. IEA at http://www.iea.org/papers/2011/smartgrids_roadmap.pdf + IEA (2011) Electric and Plug-In Hybrid Electric Vehicle Technological Roadmap. IEA http://www.iea.org/papers/2011/EV_PHEV_Roadmap.pdf ] I have published on this and can send a summary through if interested. | As discussed in Section 6.2, the entire Chapter 6 is dealing with integrated analysis of mitigation and by construction deals with the intercation between energy demand and supply, but in addition also aims at capturing key interactions between the energy system and other human and natural systems. |
| 10958 | 6 | 42 | 18 | 45 | 16 | Confer: Torvanger, Lund, Rive, Carbon capture and storage deployment rates: needs and feasibility, Mitigation and Adaptation Strategies for Global Change, DOI: http://dx.doi.org/10.1007/s11027-012-9357-7 | Reference will be included in SOD. |
| 9418 | 6 | 43 | | | | Strong relations between fossil primary energy supply and energy-related CO2 emissions are obvious. Thus figure6.24 is not something new since AR4. However, amounts of energy supply and CO2 emissions in different categories are informative. Thus, it is recommended to revise this figure, maybe in time-series trend or to incorporate with Figure6.25 ? | Figure 6.24 and the surrounding discussion has been replaced by a figure that relates climate targets to the use of fossil fuels. |

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| 16719 | 6 | 43 | | | | What is significance of these graphs? Unclear. | Figure 6.24 and the surrounding discussion has been replaced by a figure that relates climate targets to the use of |
| 11751 | 6 | 43 | 10 | 43 | 18 | Delete the sentence [and therefore with the long-term stabilization goal]. Figure 6.25 shows only the uncertainity for deployment of low-carbon energy in the future. The importance of low carbon energy itself never change. (refer to No.22). | There is a clear trend that low-carbon energy deployment increases with the stringency of the long-term climate target (and the decrese in emissions levels in specific years). However, given that the overall final energy use depends on the extent of energy service demand response and energy efficiency |
| 10648 | 6 | 43 | 10 | 43 | 18 | fossil fuel use and industrial processes (Figure 6.25) consists of a lot of uncertaities. It does not seem correlated but it is sure that the low carbon technologies still play an important role. | There is a clear trend that low-carbon energy deployment increases with the stringency of the long-term climate target (and the decrese in emissions levels in specific years). However, given that the overall final energy use depends on the extent of energy service demand response and energy efficiency |
| 4204 | 6 | 43 | 19 | 43 | 26 | The cost and the quality (convenience) of energy form issues should be important. | This point has been emphasized in SOD |
| 13159 | 6 | 43 | 7 | 43 | 26 | Like the preceeding paragraph on fossil fuels, I find also these paragraphs (and the figure that follows) rather trivial and unnecessary. If must be possible to make in less than nearly two pages the rather simple point that mitigatio reduces the use of fossil fuels, increases the use of low carbon energy and, all else being equal, increases low carbon use even further if demand is high. | Comment is noted and will be considered as the text is adjusted for the next draft. |
| 11263 | 6 | 43 | | | | I do not see the kind of information that Fig 6.24 provides, I think they are trival and therefore useless. | Figure 6.24 and the surrounding discussion has been replaced by a figure that relates climate targets to the use of |
| 10991 | 6 | 43 | 10 | 43 | 13 | It is understandable that the use of low-carbon energy is far less well correlated with the CO2 emissions from fossil fuel use and industrial processes. However, the low-carbon energy could be rather far more well correlated with the long-term stabilization goal. Therefore, the expression of "and therfore with the long-term stabilization goal" should be deleted.<br>Reference: S. Pacala and R. Socolow, Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies (2004). | There is a clear trend that low-carbon energy deployment increases with the stringency of the long-term climate target (and the decrease in emissions levels in specific years). However, given that the overall final energy use depends on the extent of energy service demand response and energy efficiency |
| 14684 | 6 | 430 | 46 | 431 | 1 | It is not clear here what the intent of the comment on geoenegineering is in this case. What sort of reference will be made to geoengineering at this point? | Comment is unclear |
| 16720 | 6 | 44 | 21 | | | Suggest inserting: Modeling indicates that the cost of CCS technology is an important determinant in the price of CO2 in cap and trade policy scenarios. If CCS is expensive, the CO2 price under tight CO2 caps will be high. If CCS is relatively inexpensive, the CO2 price will be lower. While it may be possible to achieve transformation by relying solely on renewables and reductions in demand, modeling exercises suggest that the cost of such technology limitations is much higher than those scenarios that allow the use of all low carbon technologies, including CCS and nuclear energy. reference page 36 in this chapter. | The costs of CCS technologies is typically only one among many indicators that have an influence on the CO2 price. The overall portfolio of available options - on the supply and demand side as well as in other sectors |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6278 | 6 | 44 | | 44 | | Of the two figures, 6.24 is clearly more informative and is more important to retain in this chapter than is the information in Figure 6.25. The text that describes Figure 6.26 adequately makes the point. If low carbon energy doesn't have emissions then the amount of low carbon energy that can be used could vary considerably across the models and the different climate sceanrios. That's a pretty straightforward point that doesn't need a half page graph and figure caption to communicate to the reader. | Figure 6.24 has been replaced by a figure that relates climate targets to the use of fossil fuels to link the discussion of climate targets with that on fossil fuel scarcity. |
| 11264 | 6 | 44 | | | | the information of this figure is very limited, it could only be useful if you separate between CCS, RES and nuclear. I do not understand why this figure is in the Executive summary. | There is only limited scope for dealing with individual energy supply technologies within Chapter 6. A more detailed breakdown of low-carbon energy |
| 10992 | 6 | 44 | 11 | 44 | 16 | Why could it be said "it is particularly tightly linked to the importance of fossil CCS in a specific pathway"? Even if we see the figure 6.26, we cannot find any concrete figure which supports the importance of fossil CCS. It should be explained more concretely. | Sentence has been removed. |
| 14685 | 6 | 449 | 35 | 449 | 35 | Is it fair to say that all proposed geoengineering strategies constitute adaptation? I'm not sure this is such a clear association | Any implication that geoengineering is equivalent to adaptation will be removed. |
| 9575 | 6 | 45 | | | | Please, describe model's prerequite for nuclear deployment in the text as while the chart (b) moves towards top in renewables, IEA analysis shows generation by hi REN and hi NUC case in 2050.They seem to be different from results of chart (b) (ETP 2010, Table 3.1, IEA). | The scenarios assessed in Chapter 6 include high and low nuclear or renewable variants similar to those from |
| 5868 | 6 | 45 | | | | Please rework the figure and shorten the text. There are no green or black letters legible, there are too many models (the different trajectories are not distinguishable) and using letters in the same colour as for shadings does not help to read a figure, too. | Figure has been reworked to highlight main points rather than showing individual model behavior. |
| 8349 | 6 | 45 | 1 | | 7 | How about making two figures in a same axis? For example, coal, oil and gas are summed to fossils and Non fossils are divided to renewables and nuclear in (a) figure like (b) figure | Two primary energy ternary plots have been included in the SOD, one with the original split coal, hydrocarbons, non-fossil energy and another that splits low- |
| 16721 | 6 | 45 | 17 | | 25 | Very important point -- make sure this is part of executive summary. | The point that electrification is a robust part of a mitigation strategy has been |
| 9180 | 6 | 45 | 17 | 45 | 25 | It is very important, concrete policy relevant message to policy maker hence should be put in the exec summary. | The point that electrification is a robust part of a mitigation strategy has been |
| 9179 | 6 | 45 | 17 | 46 | 8 | good argument. Also mention that the well-to-wheel efficiency is high for eletricity in many cases (heat pumps, EVs , etc) | The point that electrification is a robust part of a mitigation strategy has been |
| 11753 | 6 | 45 | 21 | 45 | 25 | It is reasonable analysis. | The point that electrification is a robust part of a mitigation strategy has been |
| 10649 | 6 | 45 | 21 | 45 | 25 | This is a good analysis. | The point that electrification is a robust part of a mitigation strategy has been |
| 9366 | 6 | 45 | 22 | 45 | 25 | It raises an important point thus should be remained. | The point that electrification is a robust part of a mitigation strategy has been |
| 6500 | 6 | 45 | 22 | 45 | 25 | This sentence should be left.<br>Because it is described easily to understand that electrication of the end-use sectors is effective as a way of reducing GHG emissions.<br>Even further description is needed. | The point that electrification is a robust part of a mitigation strategy has been emphasized. |
| 11752 | 6 | 45 | 8 | 45 | 10 | [public acceptance issues and other] should be amended to [some] because they aren't problem only for low-carbon technologies. | Sentece has been adjusted. |
| 9576 | 6 | 45 | 8 | 45 | 10 | Please, replace here with following as public acceptance is an issue for all types of generation; electricity generations, including low-carbon technologies, face public acceptance and other barriers that may limit or slow down deployment. | Sentece has been adjusted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10993 | 6 | 45 | | | | In this figure, Electricity Generation Shares should be also classified in primary energy resources in order to analyze fairly. | The electricity figure has been removed and a more detailed discussion of electricity generation can be found in |
| 4773 | 6 | 45 | 8 | 45 | 16 | It is true that some technologies, even low CO2 emission ones, are controversial, as all technologies have an impact on the environment. It is therefore important to develop those technologies under a sustainable way (i.e. in addition to pure technic issues, it is mandatory to identify and ahve support from stakeholders, deeply consultations, appropriate communications, etc.). I can provide examples on request, on the way to develop renewables or other technologies under a sustainable way. | Sentence has been adjusted. Section 6.6 includes a more detailed discussion of sustainable development in this context. |
| 6279 | 6 | 45 | 8 | 45 | 8 | To maintain consistency, replace "CO2 storage" with "CCS" | Language will be consolidated toward |
| 12104 | 6 | 45 | 18 | 46 | 20 | "Energy end use sectors along transformation pathways" misses a key point - the focus should be first on end use energy efficiency and demand management. Energy efficiency and demand management are critical to reducing electricity demand so that renewabel energy investment does enable overall GHG reductions in the electricity sector. If demand keeps rising, no matter how fast renewable energy is implemented, GHG will not be reduced fast enough to avoid dangerous climate change. As California has shown electricity demand can be flattened. The flattening of electricity demand changes the economics of electricity supply and makes the economics of distributed renewables much more favourable.... . This is because<br>- Renewable energy systems are smaller than large centralised fossile fuel power plants and thus have both lower up front costs and shorter construction time reducing the cost of tying up capital unproductively or needing to rely on loans from banks. renewable energy systems can be built quickly enabling income to start flowing much more quickly than large centralised power plants which can take many years to build. (ref Lovins, A.B. et al (2002) Small is Profitable: the hidden economic benefits of making electrical resources the right size, Rocky Mountain Institute, Colorado, p 173. Available at www.smallisprofitable.org/ )<br>- Renewable Energy systems also also overcome the main financial risk of large centralised fossil fuel power stations namely that demand will not match the new level of supply. In cases when future demand fails to meet expectations, additional scheduled increments of renewable energy capacity can be foregone, avoiding the cost of overbuilt centralized capacity. (Ref Hoff, T.E. and Herig, C. (1997) 'Managing Risk Using Renewable Energy Technologies', in Awerbuch, S. and Preston, A. (eds)The Virtual Utility: Accounting, Technology and Competitive Aspects of the Emerging Industry, Kluwer Academic, Boston. Available at www.cleanpower.com./research/riskmanagement/mrur.pdf) □ | In the literature both efficiency focused and supply-side focused approaches have been analyzed which is described here. A statement that prioritizes one over the other cannot be supported from the available literature. |
| 6280 | 6 | 45 | 21 | 45 | 25 | There are many papers going back many years that make this point. It is fine to cite the Sugiyama 2012 paper but there should be a number of other papers cited here as well. The value in citing more than one paper for a point like this is to clearly communicate to the reader that this is a well established point and is not something that can be dismissed as a fluke result that came from only one model. | Other papers have been added. |
| 5869 | 6 | 46 | | | | Please rework the figure and shorten the text. There are no green or black letters legible, there are too many models (the different trajectories are not distinguishable) and using letters in the same colour as for shadings does not help to read a figure, too. | Figure has been reworked. |
| 9883 | 6 | 46 | 11 | | | When you say "economically efficient" do you mean that the net benefits are positive (negative net costs) or do you just mean that the net cost of the energy efficiency related demand reductions if less than the marginal costs of other mitigation supply-side technologies? Please clarify and explain. This might also be a good place to explain the basis for the levels of energy demand reductions allowed in most models. | This interpretation is correct. We will consider clarifying this statement further within space limitations. |
| 8679 | 6 | 46 | 11 | | | When you say "economically efficient" do you mean that the net benefits are positive (negative net costs) or do you just mean that the net cost of the energy efficiency related demand reductions if less than the marginal costs of other mitigation supply-side technologies? Please clarify and explain. This might also be a good place to explain the basis for the levels of energy demand reductions allowed in most models. | This interpretation is correct. We will consider clarifying this statement further within space limitations. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8678 | 6 | 46 | 17 | | | The fact that the carbon intensity declines faster than the energy intensity may also be a sign that the rate of energy efficiency improvement has been constrained to be too low in most IAMs, even though these two issues are not directly related. | Given that emission levels ultimately have to reach zero under climate stabilization, carbon intensity of energy use will eventually have to go down to zero as well while there are limits on energy intensity reduction. A revised figure shows time-dependence of energy vs. carbon intensity improvements and indicates that energy intensity improvements typically dominate over |
| 9884 | 6 | 46 | 18 | | | The fact that the carbon intensity declines faster than the energy intensity may also be a sign that the rate of energy efficiency improvement has been constrained to be too low in most IAMs, even though these two issues are not directly related. | Given that emission levels ultimately have to reach zero under climate stabilization, carbon intensity of energy use will eventually have to go down to zero as well while there are limits on energy intensity reduction. A revised figure shows time-dependence of energy vs. carbon intensity improvements and indicates that energy intensity improvements typically dominate over |
| 9885 | 6 | 47 | 1 | | | It is noteworthy that the highest level of incremental energy reductions relative to the baseline scenario for just a couple of models is about 40% over 45 years, since the base year 2005. Clearly, that is less than 1% per year (it is 0.75%) on an incremental basis. Given the extensive literature on how rapidly incremental energy efficiency could be phased in if there was the political will to do so, 1% per year is very low. An incremental 2-3% per year could probably be achieved if need be, relative to the baseline. For many model runs the incremental level of efficiency improvement is only 20% over 45 years. These results clearly illustrate my concern that energy efficiency improvements have almost always, if not always, been overly constrained, and these facts ought to be discussed in a single section on scenario infeasibility. | It should be noted that energy and carbon intensity improvements were shown compared to baseline, i.e. in addition to the calculated energy intensity improvements another 1-2%/yr which are embedded in the baseline need to be added. In hte revised figure version an index compared to 2010 is shown which eliminated this baseline dependence. Some of the assessed |
| 8680 | 6 | 47 | 1 | | | It is noteworthy that the highest level of incremental energy reductions relative to the baseline scenario for just a couple of models is about 40% over 45 years, since the base year 2005. Clearly, that is less than 1% per year (it is 0.75%) on an incremental basis. Given the extensive literature on how rapidly incremental energy efficiency could be phased in if there was the political will to do so, 1% per year is very low. An incremental 2-3% per year could probably be achieved if need be, relative to the baseline. For many model runs the incremental level of efficiency improvement is only 20% over 45 years. These results clearly illustrate my concern that energy efficiency improvements have almost always, if not always, been overly constrained, and these facts ought to be discussed in a single section on scenario infeasibility. | It should be noted that energy and carbon intensity improvements were shown compared to baseline, i.e. in addition to the calculated energy intensity improvements another 1-2%/yr which are embedded in the baseline need to be added. In hte revised figure version an index compared to 2010 is shown which eliminated this baseline dependence. Some of the assessed |

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| 9887 | 6 | 47 | 15 | | | This line cites various studies including EMF27 that the text relies on. However, it is my understanding that the EMF27 material is not yet published, and is not even accessible yet to the public. Yet, I thought that the IPCC assessments were supposed to include only results already in the scientific literature. Is there a problem, then, with including EMF27 results even though they might be interesting. One scenario study that was not included in this chapter or its references was the Tellus Institute study entitled "The Century Ahead: Searching for Sustainability", which is already published (Sustainability 2010, 2,2626-2651;doi:10.3390/su2082626). This study has four scenarios that represent an even greater range than most studies in terms of energy efficiency improvements and total final energy demand in 2100, etc. It also has two scenarios roughly consistent with RCP2.6. While it does not produce costs for scenarios, it has far more disaggregated information about all sectors of the economy than any other IAM reported on in this chapter, and thus its results would provide interesting contrasts and/or similarities with the results presented in Chapter 6. | The suggested publication will be considered for inclusion in the SOD. The reason for relying on results from the EMF27 study is that it includes a large set of integrated models which allows distilling robust elements of technology strategies. The EMF27 study has been completed in the meantime and submitted papers have been made available to the WGIII TSU for the SOD review. |
| 8682 | 6 | 47 | 15 | | | This line cites various studies including EMF27 that the text relies on. However, it is my understanding that the EMF27 material is not yet published, and is not even accessible yet to the public. Yet, I thought that the IPCC assessments were supposed to include only results already in the scientific literature. Is there a problem, then, with including EMF27 results even though they might be interesting. One scenario study that was not included in this chapter or its references was the Tellus Institute study entitled "The Century Ahead: Searching for Sustainability", which is already published (Sustainability 2010, 2,2626-2651;doi:10.3390/su2082626). This study has four scenarios that represent an even greater range than most studies in terms of energy efficiency improvements and total final energy demand in 2100, etc. It also has two scenarios roughly consistent with RCP2.6. While it does not produce costs for scenarios, it has far more disaggregated information about all sectors of the economy than any other IAM reported on in this chapter, and thus its results would provide interesting contrasts and/or similarities with the results presented in Chapter 6. | The suggested publication will be considered for inclusion in the SOD. The reason for relying on results from the EMF27 study is that it includes a large set of integrated models which allows distilling robust elements of technology strategies. The EMF27 study has been completed in the meantime and submitted papers have been made available to the WGIII TSU for the SOD review. |
| 9888 | 6 | 47 | 22 | | | The first three sentences here are to some extent repeats of prior material presented earlier in the chapter, and I have already commented on those. The first is obviously true and does not require research to support. The second needs to be either re-written to make it interesting, or eliminated as being unclear as what is really meant. The third needs to be clarified also - does it simply mean that constraining the amount of mitigation technologies that can be deployed in one scenario relative to another raises the costs? If so, it is a mathematical truism, as I said before. And to the extent that it means that for any given model and input data set mitigation costs will rise, or become less negative, as the stringency of mitigation increases, that is also a mathematical truth and does not need to claim research support. If somethng else is intended it must be stated clearly. | Comment is noted and will be considered as the text is adjusted for the next draft. |
| 8683 | 6 | 47 | 22 | | | The first three sentences here are to some extent repeats of prior material presented earlier in the chapter, and I have already commented on those. The first is obviously true and does not require research to support. The second needs to be either re-written to make it interesting, or eliminated as being unclear as what is really meant. The third needs to be clarified also - does it simply mean that constraining the amount of mitigation technologies that can be deployed in one scenario relative to another raises the costs? If so, it is a mathematical truism, as I said before. And to the extent that it means that for any given model and input data set mitigation costs will rise, or become less negative, as the stringency of mitigation increases, that is also a mathematical truth and does not need to claim research support. If somethng else is intended it must be stated clearly. | Comment is noted and will be considered as the text is adjusted for the next draft. |
| 6501 | 6 | 47 | 25 | 47 | 27 | This sentence should be left.<br>Because it is described easily to understand that mitigation costs is doubled on average by more stringent CO2 equiv-target from 550 ppm to 450 ppm. | The section has been restructured, but the statement has been retained. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9886 | 6 | 47 | 6 | | | Here infeasibility is discussed, again, for the third time. Please consolidate all these discussions into one section at the very end. Infeasibility is not a key issue in my opinion. | The discussion of infeasibility has been consolidated in the SOD. |
| 13164 | 6 | 47 | 6 | 47 | 7 | The title of section 6.3.7.3. is rather convoluted. | Section was reorganized and title |
| 8681 | 6 | 47 | 6 | | | Here infeasibility is discussed, again, I think for the third time. Please consolidate all these discussions into one section at the very end. Infeasibility is not a key issue in my opinion. | The discussion of infeasibility has been consolidated in the SOD. |
| 6540 | 6 | 48 | | | | Explain the technology portfolio variations in Figure 6.29. and give a reference paper when available. | Due to space constraints Figure 6.29 has been removed. The technology variations will be explained in the caption |
| 7785 | 6 | 48 | | 48 | | Premise in each energy use and other social conditions, on which the model analysis of figure 6.30 is based is uncertain. What factors did the scenarios take in account for each technology use? | Given space constraints of IPCC reports it will unfortunately not be possible to describe the underlying assumptions of |
| 7787 | 6 | 48 | | 48 | | Premise in each energy use and other social conditions, on which the model analysis of figure 6.30 is based is uncertain. What factors did the scenarios take in account for each technology use? | Given space constraints of IPCC reports it will unfortunately not be possible to describe the underlying assumptions of |
| 14403 | 6 | 48 | 1 | | | Could clarify that going from a target of 450 to 550 implies a large proportionate increase in mitigation because we are already at 390 | The issue of overshoot is discussed in Section 6.3.3.6 (SOD). In addtion, the metric used here is CO2-equivalent and includes contributions from gases and |
| 8684 | 6 | 48 | 1 | | | Again, this first sentence is either a simple logical truth, or not clear. | Sentence has been removed. |
| 9890 | 6 | 48 | 17 | | | The influence of CCS on the overall cost results as discussed here make it all the more imperative that the CCS cost and performance input assumptions be presented somewhere in the text, again so that the readers can judge their reasonableness. Again, this report needs much GREATER TRANSPARENCY regarding the assumptions made by each modeling team. The should also mention that there is not yet a single major installation of CCS technology not associated with oil or gas fields, and there is a lot of public debate as to its feasibility and public acceptability. Even the well-known MIT report on CCS technologies of a few years ago is not optimistic. | Given space constraints of IPCC reports it will unfortunately not be possible to describe the underlying assumptions of each and every result. A more detailed discussion of the state and prospects of CCS development can be found in Section 7.5 of Chapter 7 on energy |
| 13279 | 6 | 48 | 17 | 48 | 23 | The importance of CCS has a 4th category: its application to carbon-intensive industry, especially those like cement and iron&steel that produce CO2 via chemical processes as well as fossil fuel combustion and that cannot therefore be largely decarbonised by using renewable or nuclear. Also, a further energy vector that can be produced in combination with CCS is synthetic natural gas. | The application of CCS in industry has been added to the list. |
| 8686 | 6 | 48 | 17 | | | The influence of CCS on the overall cost results as discussed here make it all the more imperative that the CCS cost and performance input assumptions be presented somewhere in the text, again so that the readers can judge their reasonableness. Again, this report needs much GREATER TRANSPARENCY regarding the assumptions made by each modeling team. The should also mention that there is not yet a single major installation of CCS technology not associated with oil or gas fields, and there is a lot of public debate as to its feasibility and public acceptability. Even the well-known MIT report on CCS technologies of a few years ago is not optimistic. | Given space constraints of IPCC reports it will unfortunately not be possible to describe the underlying assumptions of each and every result. A more detailed discussion of the state and prospects of CCS development can be found in Section 7.5 of Chapter 7 on energy |
| 16027 | 6 | 48 | 17 | 48 | 23 | Worldwide there is a big discussion and up to now very little real tested examples so this paragraph is to optimistic and blank out the risks | A more detailed discussion of the state and prospects of CCS development can be found in Section 7.5 of Chapter 7 on energy systems to which a cross- |

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| 14404 | 6 | 48 | 20 | | | Can you say something about the present dominant view of feasibility of CCS? | Given space constraints of IPCC reports it will unfortunately not be possible to describe the underlying assumptions of each and every result. A more detailed discussion of the state and prospects of CCS development can be found in |
| 16722 | 6 | 48 | 23 | | | Suggest insert at end of paragraph: "Likewise, models tend to show that if CCS is expensive, the resulting CO2 price is likely to be high, while if CCS is less expensive, the CO2 price will be lower. | A more detailed discussion of the state and prospects of CCS development can be found in Section 7.5 of Chapter 7 on energy systems to which a cross- |
| 9889 | 6 | 48 | 6 | | | I suggest that the text should make it very clear that the results reported in Figures 6.29 and 6.30 are extremely sensitive to the relative input cost assumptions for each technology listed. This is why I suggested earlier that a table of these key cost assumptions for these key technologies be included in the text so that the readers can form their own judgments as to the reasonableness of those assumptions. For example, I know that the nuclear power input cost assumptions used by most modeling teams seem far lower than actual construction costs today, even corrected for inflation. Also, are their any costs assigned to efficiency in the models? If not, the text should explain that this is one reason by the high efficiency scenarios cost less. | The costs of technologies are only on set of indicators that have an influence on the costs of mitigation. The overall portfolio of available mitigation options - on the supply and demand side as well as in other sectors (e.g., agriculture) - and the substitutability between technologies tends to be more important |
| 8685 | 6 | 48 | 6 | | | I suggest that the text should make it very clear that the results reported in Figures 6.29 and 6.30 are extremely sensitive to the relative input cost assumptions for each technology listed. This is why I suggested earlier that a table of these key cost assumptions for these key technologies be included in the text so that the readers can form their own judgments as to the reasonableness of those assumptions. For example, I know that the nuclear power input cost assumptions used by most modeling teams seem far lower than actual construction costs today, even corrected for inflation. Also, are their any costs assigned to efficiency in the models? If not, the text should explain that this is one reason by the high efficiency scenarios cost less. | The costs of technologies are only on set of indicators that have an influence on the costs of mitigation. The overall portfolio of available mitigation options - on the supply and demand side as well as in other sectors (e.g., agriculture) - and the substitutability between technologies tends to be more important |
| 6506 | 6 | 48 | 6 | 48 | 10 | Figure 6.29 should be left.<br>Because it is illustrated easily to understand that mitigation costs is doubled on average by more stringent CO2 equiv-target from 550 ppm to 450 ppm. | Figure 6.29 was removed due to space constraints, but another figure that illustrates the change in costs between |
| 11261 | 6 | 48 | | | | I am completely missing the discussion of the EERE scenario in Fig 6.29 and 6.30. It is very interesting that despite the fact that you refrain from CCS and nuclear, you can lower the costs substantially. For the 550ppm scenario the effect of refraining from CCS is as large as the effect of the EERE scenario. This should be elaborated further, this is an extremely interesting result. | Comment is noted and will be considered as the text is adjusted for the next draft. |
| 11754 | 6 | 49 | | | | Clarification is needed why the mitigation costs with no nuclear case are almost same in Figure 6.30. If the reason comes from conditon of the Model, such kind of remark should be added in order for readers to recognize. | The figure shows the cost increase of technology constrained scenarios relative to scenarios with a default technology portfolio. Therefore, the similarity of the ranges presented for nuclear indicates that the technology |
| 9577 | 6 | 49 | | | | Two charts of (a) and (b) look strange relationship as mitigation costs of no nuclear apear to be a similar range in (a) and (b). Please, provide the reason in the text. | The figure shows the cost increase of technology constrained scenarios relative to scenarios with a default technology portfolio. Therefore, the similarity of the ranges presented for nuclear indicates that the technology |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6759 | 6 | 49 | | | | The treatment of nuclear power in this model analysis should be specified in Figure 6.30. □ | Given space constraints of IPCC reports it will unfortunately not be possible to describe the underlying assumptions of each and every result, but the |
| 10650 | 6 | 49 | | | | The 450 ppm No Nuclear case is similar to the 550 ppm No Nuclear one. It is strange. There may be some conditions on the cases. Please provide the remarks on the conditions. | The figure shows the cost increase of technology constrained scenarios relative to scenarios with a default technology portfolio. Therefore, the similarity of the ranges presented for nuclear indicates that the technology |
| 5870 | 6 | 49 | | | | Please clarify: The numbers are shares of 7 (or more) scenarios each and not numbers of models using reduced technology portfolio scenarios and - of these - number of feasible scenarios? Else the number of feasible scenarios exceeds the number of reduced technology portfolio scenarios which does not make sense. | Figure 6.29 has been removed due to space constraints. However, an explanation of the numbers at the bottom of the figures has been added to |
| 9987 | 6 | 49 | | | | In this figure, there should be an explanation about the reason why the ratios of nuclear power generation are same in the 550 ppm case and the 450 ppm case. It seems that the capacity and/or generation of the nuclear is intentionally limited and set as the same in both cases. Many assessment models assume the limitation of nuclear power capacity and/or generations considering the public acceptability. It seems that the results are based on this assumption. If so, the results underestimate the contribution of nuclear power in terms of mitigation costs. | The figure shows the cost increase of technology constrained scenarios relative to scenarios with a default technology portfolio. Therefore, the similarity of the ranges presented for nuclear indicates that the technology |
| 9891 | 6 | 49 | 14 | | | Finally, here it is stated that the costs for implementing energy efficiency have not been taken into account "by all models". It should say which models do take it into account, and it should try to estimate the approximate size of the certain "downward bias" this creates in many results presented in this chapter. This major omission must be clearly labeled and identified in each relevant section of this chapter. It is not a "bias", it is a weakness in the structure of the models that omit these types of costs. | Given space constraints of IPCC reports it will unfortunately not be possible to describe the underlying assumptions of each and every result. The point here is that the cost estimate of the low energy intensity case might not be completely |
| 8687 | 6 | 49 | 14 | | | Finally, here it is stated that the costs for implementing energy efficiency have not been taken into account "by all models". It should say which models do take it into account, and it should try to estimate the approximate size of the certain "downward bias" this creates in many results presented in this chapter. This major omission must be clearly labeled and identified in each relevant section of this chapter. It is not a "bias", it is a weakness in the structure of the models that omit these types of costs. | Given space constraints of IPCC reports it will unfortunately not be possible to describe the underlying assumptions of each and every result. The point here is that the cost estimate of the low energy intensity case might not be completely |
| 13280 | 6 | 49 | 17 | 49 | 23 | A wide range of energy system models include the possibility to switch parts of the transport system to electricity and/or hydrogen. Rather than citing one integrated model that does incorporate this possibility, would it not be more sensible to say that the rest tend to overstate the costs of mitigation because they ignore such important options? | Other studies that have explicitly explored the relevance of a transition to electricity/hydrogen in transport have been added. |
| 8688 | 6 | 49 | 18 | | | How do demand-side efficiency measures facilitate the use of low carbon fuels? This point is not clear, and the explanation offered is not clear. Generally, the two issues seem to be independent of each other. | The statement does not refer to efficiency measures, but to demand-side measures more generally. This includes fuel switching which is one important optionto facilitate the use of low-carbon |

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| 6693 | 6 | 49 | 2 | | | With its cost-effectiveness, Nuclear energy will play an important role in reducing mitigation costs than CCS and renewable energies. However, in this figure, an increase in mitigation costs due to constraints of technology availability of nuclear enegy is underestimated, compared with the other energies. It is probably because these estimations are based on the assumptions for the analysis in many models. Many models assume the exogenous scenario or limitation of nuclear power capacity or generations considering the public acceptability. Given such assumptions, the role of nuclear energy to mitigation costs tends to be underestimated. The nuclear energy capacities are inherently limited in the original modeling set-up, which leads to little change in nuclear power generation under different levels of emission reductions. Such assumptions lack a scientific basis and are often determined by modelers on an ad-hoc basis. They bring underestimation of the benefit of nuclear energy. So, the additional explanatory remarks of the figure discussed above should be added in the body text in order to avoid misunderstandings. | Those options that are largely confined to the electricity sector (e.g., wind, solar and nuclear energy) tend to show a lower technology value, because there are a number of low-carbon electricity supply options available that can generally substitute each other. |
| 9892 | 6 | 49 | 24 | | | Again, infeasibility is discussed from lines 24-32. Consolidate and move to end. | The discussion of infeasibility has been consolidated in the SOD. |
| 8689 | 6 | 49 | 24 | | | Again, infeasibility is discussed from lines 24-32. Consolidate and move to end. | The discussion of infeasibility has been consolidated in the SOD. |
| 6503 | 6 | 49 | 29 | 49 | 32 | This sentence should be left.<br>Because it is described briefly that strict CO2 equiv-target does not produce scenarios with limited technology portfolio. | The section has been restructured, but the statement has been retained. |
| 10994 | 6 | 49 | | | | In this figure, mitigation cost is not so different from 550 ppm to 450 ppm in the case of no nuclear. Why is such a result conducted? In comparison with other means, nuclear energy is seemed to be underestimated for mitigation. | Figure 6.30 shows the relative increase of mitigation costs in the absence of specific technologies compared to a case with the full (model-specific) technology portfolio. Given that costs in the full portfolio case increase from 550 to 450 ppm, this means that the cost |
| 6262 | 6 | 5 | | 11 | | While this introductory material is well written, there is substantial repetition of text as well as ideas. Streamlining this introductory material (the Executive Summary, Section 6.1 and Section 6.2) is one way to reduce the number of pages in this chapter. | Editorial. |
| 6265 | 6 | 5 | | 21 | | There is a real dearth of citations to the peer reviewed literature in this early material. There is certainly more than one paper that looks at the increased flexibility that is had from including multiple gases rather than just CO2 (there are too many examples to try and list them all here). An important aspect of AR5 is to survey the existing peer reviewed literature. It is clear that a tremendous effort has gone into putting together the database that CHapter 6 uses but there still is a need to have citations to specific aspects of the peer reviewed literature in the text when a specific point is being made. In the FOD, it seems that the "reference" for much of what is stated is the database. I'm not sure that is sufficient and this is something that the authors of this chapter might want to address as they prepare the SOD. | Accepted. The referencing will continue to be enhanced as the process moves forward. |
| 7849 | 6 | 5 | | 84 | | It is noted that this chapter does not consider the amount of fossil fuels that have already been explorated and which already own e.g. to a company. These resources correspond to significant amount of economic value and any scenario has a significant impact on its market value. The potential loss of market value should be considered as a major driver of policy decisions that finally will translate into the actual emission pathway. | Rejected. This is a topic for the finance chapter. |
| 14388 | 6 | 5 | 1 | | | “many pathways” is a bit at odds with the seeming pessimismistic tone of Chapter 1, which comes close to saying 2° is impossible | Noted. |
| 8056 | 6 | 5 | 1 | 8 | 21 | In the Ex Summary I would like to see more what was said on linkages of mitigation and adaptation (and or knowledge gaps): Compare with page 27, lines 43 - 46 | Rejected. This chapter is focused on mitigation, not on adaptation. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8057 | 6 | 5 | 1 | 8 | 21 | In the Ex Summary I miss the clear language on the necessary great transformation like in page 83, line 45 to page 84 to line 5: 'Within this context, research indicates that efforts to meet a 2.6 W/m2 will be challenging under all strategies, but extraordinarily challenging without the option to overshoot this goal temporarily, substantial, near-term global emissions reduction, coordinated action to achieve these reductions, and a full complement of available technology options including CCS and nuclear power. Indeed, studies indicate a global emissions peak prior to 2020 to meet this goal, with associated dramatic near-term transformations in the energy system and social and institutional infrastructure for producing and consuming energy.' This fits to page 8, line 7 | Noted. The language to describe the requiremments to meet long-term goals is being refined. At the same time, efforts are being made to strike value judgments like "extremely challenging" from the text. |
| 8058 | 6 | 5 | 1 | 8 | 21 | Also 'At the same time, these idealized circumstances are unlikely to materialize. Studies indicate that delays in global action or fragmented action regimes in which mitigation is not undertaken where and when it is least expensive or in which policy structures are not designed to minimize costs can all increase costs dramatically, more than XX% in some circumstances' (p85, line 9 - 12) is worth for being in the Executive Summary. | Rejected. The subjective assessment of what policy structures are or are not likely will be removed from the chapter. |
| 14031 | 6 | 5 | 10 | | | Some of these other societal priorities would also be economic growth and job security | Noted. |
| 14032 | 6 | 5 | 12 | | | Add "cultural change" | Noted. |
| 8612 | 6 | 5 | 13 | | | American pioneers | Noted but not understood. |
| 4767 | 6 | 5 | 17 | 5 | 27 | Yes I agree, but the difficulty is to monetise (give an economic value) to those services (first thing is to recognise all those services, and second to monetise them) | Noted. |
| 6094 | 6 | 5 | 18 | 21 | | Executive summary is excellent. I hope other chapter follow the lead. | Noted. |
| 9825 | 6 | 5 | 19 | | | Here, and throughout the chapter, the economic costs of climate change mitigation are refered to. However, the possibility of net benefits, not costs, must also be included as an appropriate balanced approach. I do not know why the authors think that net costs is the only possibility, even though all runs of existing IAMs might yield that result. They yield that result, in part, because reference case scenarios may not have been run with fossil fuel prices sufficiently above those in the mitigation scenarios, due to the higher prices that might result from higher demand for fossil fuels in the reference cases. Please please rewrite all the economic cost sections acknowledging the possibility of net benefits resulting from mitigation compared to reference cases. Net benefits could also result in renewable energy was much cheaper than fossil-fuel energy, etc. | Noted. The notion of negative costs will be mentioned in the SOD. |
| 8613 | 6 | 5 | 19 | | | Here, and throughout the chapter, the economic costs of climate change mitigation are refered to. However, the possibility of net benefits, not costs, must also be included as an appropriate balanced approach. I do not know why the authors think that net costs is the only possibility, even though all runs of existing IAMs might yield that result. They yield that result, in part, because reference case scenarios may not have been run with fossil fuel prices sufficiently above those in the mitigation scenarios, due to the higher prices that might result from higher demand for fossil fuels in the reference cases. Please please rewrite all the economic cost sections acknowledging the possibility of net benefits resulting from mitigation compared to reference cases. Net benefits could also result in renewable energy was much cheaper than fossil-fuel energy, etc. | Please see the response to comment 9825, which appears to be a duplicate of this comment, despite being submitted by another reviewer. |
| 4766 | 6 | 5 | 2 | 5 | 16 | I fully support this statement, the target is important, but the path to ii is even more | Noted. At the same time, the ES is being revised for the SOD, and this statement may be removed for space |
| 2254 | 6 | 5 | 2 | 5 | 3 | Since there is no evidence that increases in greenhouse gases have a harnful effect on the climate the whole exercise of this chapter appears to be futile, inless there are other "abthropogebic" effects which are considered "dangerous" | Please see WGI and WGII |
| 3628 | 6 | 5 | 2 | 5 | 3 | Please refer to Article 2 of UNFCCC. | Noted. This phrase may not longer be found in the ES in the new revisions. Regardless, whether it remains or a similar statement remains in the introduction, we will no longer include a |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7847 | 6 | 5 | 2 | 5 | 3 | It would be very interesting to know the basis of this statement made in the first sentence. Such statement is only possible if there is a common understanding about that level of climate change that does not yet represent a dangerous interference with the climate system. For the time being there is no real political agreement on such level, expressed as temperature increase compared to earlier levels. The following wording is suggested: There are many transformation pathways to stabilization of greenhouse gas concentrations at a given level. | Noted. This phrase may not longer be found in the ES in the new revisions. Regardless, whether it remains or a similar statement remains in the introduction, we will no longer include a reference to dangerous anthropogenic |
| 11367 | 6 | 5 | 22 | 5 | 22 | The term 'good decisions' is a bit vague and probably too open. Please reconsider that and specify. | Noted. |
| 12622 | 6 | 5 | 26 | 5 | 27 | I see no reason to single out any technologies here. All technologies include trade offs, CCS, Nuclear, Wind, Solar, etc. | Noted. The questiion of when to single out technologies as examples is being |
| 12665 | 6 | 5 | 26 | 5 | 27 | I see no reason to single out any technologies here. All technologies include trade offs, CCS, Nuclear, Wind, Solar, etc. | Noted. The questiion of when to single out technologies as examples is being |
| 11744 | 6 | 5 | 26 | 5 | 27 | Other low carbon technologies like wind and geothiermal have also environmental problems to resolve and CCS isn't only for coal-fired power. It is strange only nuclear and coal-fired CCS are included as examples of other environmental factor. [nuclear power] should be amended to [low carbon technologies] and [coal-fired] should be deleted. | Noted. The questiion of when to single out technologies as examples is being considered for the SOD. |
| 9563 | 6 | 5 | 26 | | | Please, delete examples of nuclear and CCS, or add examples of wind power and geothermal as they involve bird-strikes (wind power) and sources of mercury contamination (geothermal power). | Noted. The questiion of when to single out technologies as examples is being |
| 9564 | 6 | 5 | 27 | | | Please, remove coal-fired from coal-fired CCS as we need any types of CCS in terms of negative and positive emissions. | Noted. The questiion of when to single out technologies as examples is being |
| 7848 | 6 | 5 | 27 | | | The term "coal-fired CCS" might be technical jargon but should be substituted by a more complete term such as: coal-fired power plant with CCS | Editorial |
| 13120 | 6 | 5 | 28 | 5 | 29 | The wording is a bit courageous. Surely not ALL countries MUST bring their emissions "toward zero" for meeting ANY stabilization goal? Reformulate. | Noted. This phrase may not remain in the SOD. If it remains, it will be made |
| 4188 | 6 | 5 | 28 | 5 | 29 | The expression ".. all countries must ultimately bring their emissions toward zero to meet any stabilization goal." seemes to be exaggerated, since equilibrium still allows some emission. | Noted. This phrase may not remain in the SOD. If it remains, it will be made |
| 7390 | 6 | 5 | 28 | 5 | 29 | This is demonstrably incorrect for short-lived gases, where constant emissions still result in stabilisation. It is only true for very long-lived gases. As this is a very policy relevant issue, please make clear that abatement of short-lived gases helps reduce costs but is not a physical necessity, whereas reduction to zero of long-lived gases, particularly CO2, is an absolute physical necessity to meet stabilisation goals. | Noted. This phrase may not remain in the SOD. If it remains, it will be made more clear. |
| 14389 | 6 | 5 | 29 | | | Bring “toward zero”?? My figure is 1.4 tCO2 per person per year | Noted. This phrase may not remain in the SOD. If it remains, it will be made |
| 3070 | 6 | 5 | 29 | | | “all countries must ultimately bring their emissions toward zero to meet any stabilization goal”. This is wrong scientifically (if GHG have a constant finite atmospheric residence time they will stabilize at some elevated level for any emission rate). It is also clearly a fantasy---no country is going to give up vehicular or air travel, for example, or heat all its buildings with electricity (very expensive, even if nuclear power comes back into fashion). | Noted. This phrase may not remain in the SOD. If it remains, it will be made more clear. |
| 6535 | 6 | 5 | 29 | | | Replace "bring their emission toward zero" with e.g. "reduce their emissions significantly" in accordance with AR4 WG1 Report Figure 10.21, or give a reference paper. | Noted. This phrase may not remain in the SOD. If it remains, it will be made |
| 3071 | 6 | 5 | 3 | | | “dangerous anthropogenic interference with the climate” is advocacy, not science, and ignores the fact that the extensive scientific effort devoted to climate modeling has not been matched by any significant effort devoted to determining whether warming or climate change will, on balance, help or harm humanity. The Medieval Climate Maximum was a time of prosperity, at least in northern Europe, and the Little Ice Age a disaster. This may not be extrapolatable to modern anthropogenic warming, but the question has hardly been asked, much less answered. | Noted. This phrase may not longer be found in the ES in the new revisions. Regardless, whether it remains or a similar statement remains in the introduction, we will no longer include a reference to dangerous anthropogenic |
| 9826 | 6 | 5 | 30 | | | Not all countries must undertake substantial reductions in emissions, some can maintain their level or even increase their level in a decent way. | Noted. This phrase may not remain in the SOD. If it remains, it will be made |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13121 | 6 | 5 | 30 | 5 | 32 | I'd suggest moving this conclusion later in the paragraph - currently mitigation quantities and costs are brought up before they are properly defined (i.e. only after the conclusion it's explained that costs and quantities are calculated against a baseline, not, for example, the base year) | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 14033 | 6 | 5 | 30 | | 42 | I wonder how useful it is to distinguish between developing and developed countries when talking about where the largest cuts in emissions will need to take place in the future. If this is brought into the executive summary and is meant to inform the need for coordinated international action to meet global goals, there should be more discussion on where the largest emissions will take place, for example in Asia. | Noted. |
| 11416 | 6 | 5 | 31 | 5 | 35 | The assertion that developing countries will have to undertake greater levels of emission reductions because their emissions are projected to be larger than those of developed countries over the coming century needs to be explained more clearly in terms of what the assumptions are underlying such assertion. Absent a clear explanation of the assumptions for this assertion, such a bare assertion could be used in a non-scientific and political way in order to push specific policy agendas or approaches in the context of international policymaking discussions and negotiations on climate change that could effectively absolve developed countries of any further mitigation commitments and increase the pressure on developing countries to undertake increased mitigation actions. | Noted. The basis for this assertion, continued economic growth in the developing countries, is discussed in greater length in the chapter. |
| 14390 | 6 | 5 | 33 | | | Should clarify that cutting emissions to a low uniform level would be smaller percent cut for most developing countries. (India is currently at about 1tCO2 per capita.) | Noted. |
| 13122 | 6 | 5 | 43 | 6 | 5 | The conclusion here seems to suggest that the scenario results can be used as proof for when emissions need to peak. I don't find this convincing, as this depends completely on the assumptions that have been used when constructing the models (which is acknowledged in the table caption that follows, but not in the text). For example, if a break through for cheap air capture technologies was assumed in the models, the peak could presumably be later. At the very least I would like to see this conclusion supported by a purely carbon budget related argument before I would call the evidence "robust". | Noted. An attempt is being made to distinguish between scenarios with and without negative emisisons technologies and then with different levels of overshoot and delayed action. Regardless, this table will no longer be |
| 11368 | 6 | 5 | 43 | 5 | 47 | This statement needs careful reading . It should be reformulated or cut into several sentences to achieve better reading and reasoning. | Accepted. Sentence needs work. Regardless, the ES is being substantially revised and the ordering |
| 14391 | 6 | 5 | 48 | | | It is annoying when this chapter frequently uses the W/m2 metric rather than the more familiar degrees C or ppm. | Accepted. The chapter is moving to the ppmv CO2-e notation. |
| 9824 | 6 | 5 | 9 | | | also lifestyles and the moral values we hold should be included in the list of choices we must make | Noted. |
| 8611 | 6 | 5 | 9 | | | "the treatment of land use" sounds like a modeling issue - perhaps you mean "how land is used"; also lifestyles and the moral values we hold should be included in the list of choices we must make | Noted. |
| 11243 | 6 | 5 | | | | The executive summary is so far only an introduction how to read scenarios, but there is nearly no content. Fig 6.ES.1 e.g. does not contain an important message, it is trivial (or did I miss something?). I also find Table 6.ES.1 not very informative because it is not clear if this is meant for the idealized scenarios or for a mean over all scenarios. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. |
| 11244 | 6 | 5 | | | | A historical context is missing: there is no reference to AR4 and even not to the SRREN. It would be interesting to know what happened with the models since AR4? How have models developed (e.g. including now BECCS)? What has been learned from the SRREN? What is new in the political discussion that chp. 6 should be able to answer? | Noted. We intend to provide a greater link to AR4 in the next version of the ES. The ES is being substantially revised and the ordering and nature of points |
| 7712 | 6 | 5 | | 7 | | Too much repetetion for describing why this chapter is not complete. The senario models are mostly too premature and they need much time to be established. All the descriptions on 'uncertainty of the models' are very much troublesome for readers. Reconsiderations for the structure would be highly appreciated. | Noted. |
| 16683 | 6 | 5 | | 8 | | Should bring forward and highlight the point made on page 36 of chapter 6 about the benefits of policies that put a price on CO2 emissions -- they provide by far the most efficient, least cost means to reduce emissions. Policymakers should be reminded of this in the context of transformation of the energy system in the executive summary. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10979 | 6 | 5 | 19 | 5 | 22 | What's the role of "measures of macro-economic costs such as GDP losses or changes in total personal consumption" if it were "far from the only characteristics about transition pathways that matter for making good decisions"? Is it a supplementary factor? | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 12608 | 6 | 5 | 1 | 8 | 21 | On the Executive Summary. Woud be good to change to a different letter font the principal message or bullets. | Editorial |
| 9893 | 6 | 50 | 1 | | | It seems to me that land-use issues, and how they interact with other mitigation issues, are so complex and so important, that they deserve more extensive treatment. More material should be presented and the entire topic should be explained relative to how land-use is taken into account in some of the most important IAMs, including the Tellus Institute scenario model Polestar. (See reference above.) Land-use issues should be integrated into each sub-section of this chapter where appropriate. For example, land-use issues should be discussed when discussing model structure, input assumptions, results, policies, etc. | Author team agrees that land-use needs to be better integrated throughout chapter, e.g., reference emissions, model descriptions. Will consider the Polestar publication and how it fits into the chapter. |
| 8690 | 6 | 50 | 1 | | | It seems to me that land-use issues, and how they interact with other mitigation issues, are so complex and so important, that they deserve more extensive treatment. More material should be presented and the entire topic should be explained relative to how land-use is taken into account in some of the most important IAMs, including the Tellus Institute scenario model Polestar. (See reference above.) Land-use issues should be integrated into each sub-section of this chapter where appropriate. For example, land-use issues should be discussed when discussing model structure, input assumptions, results, policies, etc. | Same as previous comment. |
| 7468 | 6 | 50 | 16 | 50 | 19 | “Uncertainty about land-related baseline CO2 emissions and sequestration is significant historically (Houghton et al., 2012; Pan et al, 2011) and in projections. The latest baseline projections for land related CO2 emissions show an enormous range across integrated assessment models, which begins with historical years (Figure 6.31)”. Some of the annual et primary production (NPP), an estimated 53.2 Gt C, may be sequestered. However, the annual use of NPP for energy and non-energy purposes is of the order of 3.5 Gt C, (see general comments in Ch.7). Therefore, there is a considerable surplus of the annual growth of biomass. Thus, the various lines in figure 6.31 may be an over estimate of CO2 emissions from biomass. | Fig 6.31 is supposed to be projections of NET LUCF emissions. We are verifying that that is the case. All of the projections should be either net or gross, and we prefer for the former for this purpose. |
| 14405 | 6 | 50 | 26 | | | Explain the sink. Adoption of ambitious afforestation programs? | Comment pertains to Fig 6.31. We clarify that in the long-run a terrestrial |
| 6916 | 6 | 50 | 2 | | | Refer to WGI AR5, Chapter 6, for mechanisms and quantitative assessement of sources/sinks from carbon and other biogechemical cycles. | Reviewing WG1 AR5 Ch6 and will cite accordingly. |
| 14687 | 6 | 502 | 24 | 502 | 26 | It is worth qualifying this sentence with the preface "if it was to be effective in practice, the net effect would be to accelerate...etc....". | We could not figure out which part of the chapter this comment is referring to. Neither in the single chapter PDF version nor in the full FOD PDF file is |
| 14688 | 6 | 502 | 28 | 502 | 30 | It is important that the boundaries of this cost estimate are made explicit, i.e. does this simply include the cost of the iron, or also the cost of transporting, deploying, monitoring imacts and effectiveness, etc. Costs depend on so many factors that it is important not to prejudge cost of what remains an abstract concept. | We could not figure out which part of the chapter this comment is referring to. Neither in the single chapter PDF version nor in the full FOD PDF file is |
| 14689 | 6 | 502 | 43 | 502 | 43 | It is probably worth noting here that ocean fertilisation activities are now controlled under the London Convention/London Protocol Resolutions LC-LP.1(2008), which disallows all ocean fertilization activities other then legitimate scientific research, and LC-LP.2(2010), which established the assessment framework to determine whether proposed ocean fertilization activities constitute legitimate scientific research (http://www.imo.org/blast/mainframemenu.asp?topic_id=1969). It is also worth noting that , because of concerns over impacts, the direct disposal of CO2 into the water column or on the seabed has been prohibitted in some regions, most notably the North-East Atlantic region under the OSPAR Convention (OSPAR Decision 2007/1 to Prohibit the Storage of Carbon Dioxide Streams in the Water Column or on the Sea-bed, http://www.ucl.ac.uk/cclp/pdf/OSPAR2007-Annex-5.pdf). | We could not figure out which part of the chapter this comment is referring to. Neither in the single chapter PDF version nor in the full FOD PDF file is there a page 502 that is part of Ch.6. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14690 | 6 | 502 | 46 | 503 | 1 | Proposals for alkalinity management do not strinctly accelerate weathering but rather aim to mimic the effect of such enhanced weathering through artificial addition. In addition to concerns regarding impacts of mining, processing and trasmporting on land, the Expert Group report for the CBD SBSTTA on "IMPACTS OF CLIMATE-RELATED GEOENGINEERING ON BIOLOGICAL DIVERSITY" (UNEP/CBD/SBSTTA/16/INF/28, http://www.cbd.int/doc/meetings/sbstta/sbstta-16/information/sbstta-16-inf-28-en.pdf) noted that "While the theoretical chemistry of the processes of enhancing ocean alkalinity is relatively straightforward, the impacts on those processes on biodiversity (if the technique were to be deployed) are much more uncertain. In particular, the biological effects of temporarily enhanced Ca2+ ions and dissolved inorganic carbon are not adequately known". It may be worth including some reference to this | Risks are already mentioned and we believe this is more detailed than can be accommodated in a space allocated. |
| 14686 | 6 | 502 | 4 | | | This entire section would benefit significantly from greater consideration of potential adverse impacts of commonly proposed geoengineering methods, drawing perhaps on the recent report of the Expert Working Group on impacts of geoengineering on biodiversity under the CBD (http://www.cbd.int/doc/meetings/sbstta/sbstta-16/information/sbstta-16-inf-28-en.pdf) | I think this is a reasonable suggestion, one way to deal with it would be to include a table of adverse impacts along with potential benefits. |
| 14691 | 6 | 503 | 17 | 503 | 21 | There are also significant concerns regarding the potential environmental impacts of the most commonly used or proposed amine-based capture chemicals, e.g. Padurean, A., Cormos, C.-C., Cormos, A.-M., Agachi, P.-S. (2011) Multicriterial analysis of post-combustion carbon dioxide capture using alkanolamines. International Journal of Greenhouse Gas Control 5: 676-685 . | There are many proposed approaches to direct carbon capture which are only briefly mentioned in this section. Section 6.5.3 covers these in more detail but does not raise this particular issue. |
| 14692 | 6 | 503 | 23 | 503 | 23 | It is unwise at this stage to state in an unqualified way that SRM has a role in shaping climate policy as it is not clear that it would be effective in any manner, or acceptable as a policy approach. It may be expected to act relatively quickly in reducing solar radiation reaching the Earth's surface, but the speed, uniformity and effectiveness of action remains unknown. | The existence of geoengineering may shape policy outcomes even though it is uncertain and may not be used. |
| 14693 | 6 | 503 | 26 | 503 | 27 | once again this is a highly theoretical treatment and should be explicitly so - it cannot yet be said that SRM 'CAN' temporarily and imperfectly maskclimate change - these are, of course, theoretical modelled prediction,s not empirical observations. | The literature on solar geoengineering now spans many hundreds of papers published over many decades. That literature in turn rests on a body of scientific knowledge of climate that is substantially the same as the body required to understand the climate impacts of greenhouse gases and aerosols. This understanding in turn rests observations as well as theory. It is certainly true that the literature on geoengineering is smaller than the total literature on many other topics, but |
| 14694 | 6 | 503 | 34 | 503 | 34 | In fact, there is little evidence that public understanding of SRM is growing 'rapidly' - without stressing that public awareness understanding is starting from (and remains at) a very low baseline, this statement could be misinterpreted as implying commen knowledge and perhaps even widespread acceptance. | We will edit the text to ensure that we are not implying anything about acceptance of SRM. |
| 14696 | 6 | 504 | 21 | 504 | 29 | This paragraph is also currently quite unclear in significant parts and will need to be reviewed in detail once the text has been redrafted and the meaning is clear | text completely revised, comment no longer applies |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14695 | 6 | 504 | 6 | 504 | 16 | This paragraph is currently very unclear, with some sentences being very long and others incomplete. It also implies once again that SRM is demonstrably able to compensate for changes in temperature or precipitation, without making clear that these are 'in principle' theoretical statements based on limited modelling. In some cases, the model outputs have been tuned by specfici inputs in order to compensate, and it is vital that model parameters and outputs are also distinguished clearly. | The literature on solar geoengineering now spans many hundreds of papers published over many decades. That literature in turn rests on a body of scientific knowledge of climate that is substantially the same as the body required to understand the climate impacts of greenhouse gases and aerosols. This understanding in turn rests observations as well as theory. It is certainly true that the literature on geoengineering is smaller than the total literature on many other topics, but |
| 7469 | 6 | 51 | 13 | 51 | 16 | "GHG mitigation opportunities in land are of one of three types: emissions reductions, terrestrial carbon stock enhancement, or biomass displacement of fossil-fuel based energy. Bio-based products are also a possibility, but one not yet modeled. For a more complete discussion of mitigation technologies, as well as mitigation supply potential, see Chapter 11". The accessible NPP is at least 13.4 Gt C. Thus with improved management , some of this annual growth of biomass could be sequestrated and/or used for energy and non-energy purposes. Most if not used, returns to the atmosphere. | No reference provided. However, there were similar comments on chapter 11. The results reflect the economic costs of mitigation. Technical potential is much larger, but is not cost-effective, as cheaper mitigation options across the |
| 3380 | 6 | 51 | 17 | 51 | 25 | The numbers on bioenergy mitigation potential reported here are high. Here is the following concern: A number of carbon GHG dynamics, e.g. carbon stock dynamics, soil emissions, N20 emissions (high uncertainty), ILUC, but also non-GHG issues, such as albedo tend to make assessment of the global warming impact of bioenergy deployment quite complex and challenging. I am relatively sure that most IAM models used for producing these numbers are relatively ignorant of these effects (see Creutzig et al., 2012). Sometimes, effects point to a positive effects on the global warming impact. Mostly, however, these dynamics seem to compromise the mitigation potential of bioenergy. These dynamics are also relevant for advanced bioenergy sources, e.g. energy crops, but also forest residue use. etc. I am not saying that such high numbers as reported here are not possible. I am saying that the models used are focussing on one set of scenarios, mostly optimistic, and that under plausible other model assumptions, the potential could be significantly lower. A note of caution when interpreting the numbers presented here would hence be appropriate from my perspective.<br>F. Creutzig, A. Popp, R. Plevin, G. Luderer, J. Minx, O. Edenhofer (2012)<br>Reconciling top-down and bottom-up modeling on future bioenergy deployment.<br>Nature Climate Change 2: 320-327 | Agree that it is important to properly characterize the state of modeling and caution about potential bias in results. Existing text does to a degree, but will consider the citation provided to incorporate missing aspects. |
| 9894 | 6 | 51 | 18 | | | If such high proportions are correct, then this implies that land-use issues and modeling must be fully integrated in all sections of chapter 6, as I suggested above. | See previous reply line 766. |
| 8691 | 6 | 51 | 18 | | | If such high proportions are correct, then this implies that land-use issues and modeling must be fully integrated in all sections of chapter 6, as I suggested above. | Same as previous comment. |
| 7470 | 6 | 51 | 26 | 51 | 30 | "More generally, transformation pathway studies have produced total global land-use CO2 emissions reductions of up to 5 and 6 GtCO2/year [ 1.4 – 1.6 Gt C] in 2030 and 2050 respectively (Fisher et al., 2007); L. Clarke 27 et al., 2009), with up to 10 GtCO2/year [2.7 Gt C] having also been estimated (Wise et al., 2009), in scenarios in which terrestrial carbon is subject to the same immediate and global price as fossil and industrial emissions". As stated above, the accessible NPP is at least 13.4 Gt C, with present use estimated to be 3.5 Gt C. Therefore there is a considerable surplus of accessible annual growth of biomass, to more than satisfy the above forecasts. Most of the traded biomass is very competitive when compared to fossil fuels. In fact fossil fuels and electricity are subsidized in many countries. | See previous reply line 770. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13167 | 6 | 51 | 36 | 51 | 38 | This message doesn't come through very strong from the figure and I wouldn't add a reference to it in this sentence. It would be much more appropriate later, for example for the sentence on lines 39 and 40 ("However…") | Good suggestion. |
| 18634 | 6 | 52 | | | | Page 52 contains an interesting reasoning on the need for policy coordination (but shouldn't that be discussed in the policy chapters?) | It is here because it affects cost and net effectiveness of land based mitigation. Coordination should be in policy chapter |
| 9895 | 6 | 52 | 19 | 52 | 29 | The same can be said for bioenergy and it´s interaction with land-use | Couldn't figure out the meaning of this |
| 7471 | 6 | 52 | 19 | 52 | 23 | "To understand bioenergy's transformation role, it is important to understand bioenergy's role within the energy system. The research results surveyed in (Rose et al., 2012) found bioenergy contributing up to 15% of cumulative primary energy over the century during stabilization. Figure 6.33 shows more recent annual results, where bioenergy is projected to provide 20 to 250 EJ in 2050 (10 to 30% 22 of total primary energy) and 10 – 330 EJ in 2100 (20 to over 40%) for immediate global action scenarios". While bioenergy may contribute up to 15% of the primary energy system, the accessible annual growth of biomass is of the order of 500-515 EJ, and the total terrestrial NPP is an estimated 2000 EJ. The accessible NPP is much greater than the figures estimated on lines 19-23! Again, the estimates in Figure 6.33 are on the low side. | See previous reply line 770. Note that cost is a consideration. So, while there may be substantial NPP or EJ of biomass available it may be costly to access and to convert (not to mention net emissions and coordination issues). |
| 6402 | 6 | 52 | 37 | 52 | 40 | All of these acronyms or abbreviations are confusing. The reader doesn't know what they refer to, and what they mean. When I got to this, I naturally wanted to gloss over this and skip this part. | Thank you for pointing this out. |
| 5871 | 6 | 53 | | | | Not legible, enhance / rework or delete. 3 x 15 colums along the x-axis is too much! | Agree. A different figure needed. |
| 6403 | 6 | 53 | 15 | 53 | 15 | Abbreviation of BioCCS is inconsistent with other abbreviations in the chapter (BECS, BECCS) | Standardizing to BECCS |
| 9587 | 6 | 53 | 15 | 53 | 17 | Please, describe the reality of BioCCS here as it may have limitation to deploy and uncertainty as follows; Rhodes and Keith in a 2008 peer-reviewed commentary on biomass with capture noted that while the high end of estimates for potential biomass availability support the view that biomass could provide the central mechanism for managing global climate and energy challenges, it is doubtful because [1] of the deep uncertainty in the feedstock supply estimates; the environmental implications of maximizing production; the complex social and ethical issues arising from the required re-organization of global land use; and the potentially high costs of such a strategy.<br>They further note that [2] relatively large allocations of land in the developing world would be required to support the scales of bio-energy development implied by globally-aggressive biomass-based strategies. For example, land availability estimates indicate that 84% of arable land not in commercial use is in tropical regions of the world. Local food production capacity, which likely represents a more immediate concern in the developing world than carbon emissions, could be displaced. More generally, rural populations could be forced to adapt to radically changed local environments, including environmental consequences from large-scale biomass production. The notion that these disruptions should be absorbed by the developing world in order to mitigate carbon emissions in industrialized nations raises complex ethical issues of "biomass justice".<br>[1] J.S. Rhodes and D.W. Keith (2008) Biomass with capture: negative emissions within social and environmental constraints: an editorial comment, Climatic Change, 87, p. 323, lines 9-14.<br>[2] J.S. Rhodes and D.W. Keith (2008) Biomass with capture: negative emissions within social and environmental constraints: an editorial comment, Climatic Change, 87, p. 323, lines 31-41. | Need a clear statement that all indications are that realities of bioenergy are complex and challenging. Sustainable bioenergy, if it exists, has yet to be identified. Cross-referencing bioenergy x-cut as well. |
| 13170 | 6 | 53 | 19 | 53 | 21 | This should also be mentioned on page 48, lines 17-23. Currently bioCCS is mentioned as one of three reasons why CCS is important for 450 ppmCO2eq, but this text here suggests that the three reasons mentioned are unlikely to be equally significant. | Thank you. Coordinating on text across sections. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7472 | 6 | 53 | 28 | 43 | 31 | “There are significant challenges to accessing the potential estimated above. Among other things, there are large fundamental historical scientific uncertainties about terrestrial carbon stocks and fluxes (e.g., (Henry et al., 2011); Houghton et al., 2012) that combined with uncertainty about economic behavior, complicate estimation of mitigation potential, as well as actual mitigation ---“. I have estimated the above-ground stock of accessible woody biomass to be an estimated 544 Gt wood, 9272 Gt C – over 10000 EJ). Accounting for below-ground woody biomass (150 Gt C) and soil carbon below the trees (600 Gt C), the total stock of C is in the region of 1020 Gt C. Then of course there is a carbon store in inaccessible forest and in grassland and some in crops, plus the store in the soils beneath these land use types. | Unfortunately, no reference provided to properly evaluate and address comment. Appears to be similar to previous comments, so please see those replies (e.g., line 770 and 778). |
| 8692 | 6 | 54 | 15 | | | Section 6.4.1 is very good. You might want to add at the end that the implication of this section is that IAM modeling and scenario creation is for the purpose of achieving certain climate and social targets in the future, as knowledge of the earth/climate system increases. Because the mitigation trajectory actually followed by the world will be evolving based on new information, it makes no sense to talk about the probability as of today of any climate mitigation scenario occuring. And uncertainties in our current knowledge base will get reduced over time as we learn more, and as we take corrective action when the chosen mitigation trajectory gets off course. To me this should be the major theme of the entire chapter 6, and this material might best be put up front in the introduction to the chapter. | Agreed, the notion of sequential decision-making is an important theme. The author team will work on adding references to studies explicitly examining stochastic control and will incorporate the notion into the introduction section. In addition, a clearer discussion of how to interpret scenarios in the context of uncertainty about input parameters will |
| 9897 | 6 | 54 | 33 | 54 | 34 | "models or scenarios that assume the future availability of a negative emissions energy conversion technology" should be presented more in detail or at least a reference should be made. Otherwise I doubt how decision makers might perceive this statement. They might see this as a call for non-action. | The statement is an objective assessment of the results in published stabilization scenarios. It is an important characteristic of the ensemble of published scenarios that pathways with the possibility of negative emissions in the future can have higher emissions in the near-term while meeting the same target at the end of the century (the |
| 9067 | 6 | 54 | 14 | 58 | 7 | 6.4 Integrating long term and short term perspectives can be deleted due to limitations on the nos of pages | The structure of the chapter is being revised to best cover the material within the prescribed outline. However, we likely need to keep some or most of the material in this section. Every effort will |
| 6917 | 6 | 54 | 16 | 54 | 20 | Suggest to refer to the WGI AR5, Chapter 12 assessment for long-term climate change considerations. | We will include the reference. |
| 10995 | 6 | 54 | 24 | 54 | 26 | In this sentence, what does "the most relevant decisions" actually mean? It should be clearly stated. | "Most relevant" meaning those most important for analysis to inform. We will |
| 6918 | 6 | 54 | 40 | 54 | 42 | Refer to WGI AR5, Chapter 11 for an assessment of uncertainty in near-term forcings and of near term climate change. | We will include the reference (both here and above in Figure 6.3). |
| 6281 | 6 | 55 | | 55 | | Remove "ORNL" from the graphic and replace with "History" who compiled these data are not the important point to convey in this graphic. | Agreed. |
| 15222 | 6 | 55 | | | | Figure 6.34, Range for Copenhagen Pledges in the graph needs to be clarified where the range is. | We will include a reference and corresponding numerical data for the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6105 | 6 | 55 | | | | In Figure 6.34, there is a red dot in 2050 showing G8 target. As far as I know, G8 always declared between 2007, at Heiligendamm and 2011, at Deauville on the need to reduce global emissions by 50% by 2050. But throughout its declarations, leaders never say from when. In 2007 at Heiligendamm, declaration stipulates "49. In setting a global goal for emissions reductions in the process we have agreed today involving all major emitters, we will consider seriously the decisions made by the European Union, Canada and Japan which include at least a halving of global emissions by 2050". At that time some countries thought the base year should be 1990 and others thought it as 2005. This was the reason why the base year remain unclear. I have checked Declaration in 2008 Toyako Summit, Japan, 2009 L'Aquilla Summit, Italy, 2010 Muskoka Summit, Canada, 2011 Deauville Summit, France and 2012 Camp David, USA. The wording is almost same as that in Toyako Summit in 2008 that "We seek to share with all Parties to the UNFCCC the vision of, and together with them to consider and adopt in the UNFCCC negotiations, the goal of achieving at least 50% reduction of global emissions by 2050 ---", except that in 2012 where no reference was made to 50% reduction. In this sense, G8 Target shown in the Figure 6.34 is quite unclear. However, I have found in page 57 line 7-8 the following expression, i.e. "target proposed by the G8 of a 50% reduction relative to 2000 ---". From the above, "G8 Target" should be replaced by "50% reduction from 2000". | We will clarify this data point with a reference and explicit defintion. |
| 3152 | 6 | 55 | 10 | | | This chapter has a few figures that could be iconic for the WG3 overall. They include: figs 6.5, 6.6, 6.7 and 6.34. As you trim the chapter pls try to keep those figures and work with TSU to make them clear. For example, add historical data to figure 6.7 to help put the pathways into context. | OK. The author team will work in improving the graphic in Figure 6.7 to see whether historical data can be |
| 7684 | 6 | 55 | 11 | | | The first clause should already mention what the ranges mean, e.g. "… CO2 emission ranges in scenarios with Category 0 to Category 6 radiative forcing targets". The comment aplies also to Figure 6.35. Also change "AMPERE protocol" to "AMPERE project". | We will clarify the figure caption and description. |
| 6282 | 6 | 56 | | 56 | | Remove "ORNL" from the graphic and replace with "History" who compiled these data are not the important point to convey in this graphic. | Agreed. |
| 9898 | 6 | 56 | 12 | 56 | 13 | Deviating from the cost-minimizing near-term emissions profile does not necessarily increase global costs of meeting a long-term stabilization goal. Proper life cycle costing calculations can support decision making for the cost minimal solution in the long run. | Integrated assessment models take into account "life-cycle" costs already and can be used to calculate a stabilization pathway that minimizes these costs. By |
| 16723 | 6 | 56 | 12 | | 15 | Clarify please -- low cost options to reduce emissions to meet the 2 degree target are expiring -- we are going to be left only with much more expensive options if we continue on current course. | Right, the cost dimension is important here. We will work on revising the text |
| 8113 | 6 | 56 | 25 | 57 | 2 | This paragraph might consider including: Rogelj, J., McCollum, D., O'Neill, B. & Riahi, K. Feasible 2020 emission windows for staying below 2°C during the twenty-first century. Nature Climate Change (in review, 2012). | We will include the reference. |
| 9899 | 6 | 57 | 10 | | | Please provide the references for the "published scenarios about option value". Otherwise questions like: which decision-makers are addressed, politicians on a global, national or local scale or managers? | This sentence should be reworded to avoid grammatical confusion. It is intended to say that broad conclusions about option value can be drawn from the literature of published scenarios. It |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11429 | 6 | 57 | 11 | 57 | 13 | The statement in these lines that "there is some evidence that an emissions pathway through 2020 that follows the pledges in the Copenhagen Accord preserves the option of achieving a long-term target in the range of 450 CO2-e" should be qualified and explained with respect to its bases and its assumptions. A balancing statement or discussion should be provided that wuld also show what the other evidence might indicate in terms of the Copenhagen/Cancun pledges, particularly of developed countries, being insufficient and needing to be scaled up. Without such an explanation or balancing statement, the current text could be taken by readers of IPCC AR5 as an implicit policy endorsement by the IPCC AR5 that developed countries' pledges under the Copenhagen Accord/Cancun Agreements are already sufficient and that they no longer need to show much greater ambition in terms of their mitigation targets for the period up to 2020. This could be taken by many, especially from developing countries, to mean that the burden for future mitigation efforts should therefore be on developing countries. If this becomes the case, then the scientific credibility and neutrality of the IPCC could become subject to challenge as it could be seen as having shifted from being a scientific body into becoming a policy recommending body with built in biases in favor of developed countries. | The statement is an objective assessment of the results in published stabilization scenarios. There are in fact several scenarios in which only the Copenhagen targets are enforced through 2020 but that in the long run can reduce emissions sufficiently to meet a 450 CO2-e target in 2100. The converse - that in other scenarios enforcing only Copenhagen through 2020 makes the achievement of 450 CO2-e by 2100 impossible - is difficult to deduce given the less than systematic reporting of infeasibilities. On the other hand, the cost dimension is important, and we will work on revising the text to bring out the result that doing "only Copenhagen" through 2020 raises the costs of 450 relative to an optimal path. More generally, the thrust of the comment seems to be about burden sharing and the allocation of mitigation responsibility among countries, whereas |
| 12310 | 6 | 57 | 20 | 57 | 23 | The use of the term "institutions" might be too limiting since this isrelated to climate releated policy instruments in a broader sense. | Could not the capacity to implement a particular policy instrument be considered an "institution"? Perhaps |
| 11755 | 6 | 57 | 36 | 57 | 38 | Even though ETS and carbon tax are examples, readers could misunderstand such institutions are better than others.Howard Geller and Jakin Nordqvist show the effectiveness of energy efficiency labeling, Japan's Top Runner Programme in their respective paper. [such as domestic and international emission trading.....with carbon pricing] should be deleted.<br>1.Howard Geller (2005):[The Experience with Energy Efficiency Policies and Programmes in IEA Countries : Learning from the Critics.IEA Information Paper], http://www02.abb.com/db/db0003/db002698.nsf/ca7e93ab03030d22c12571380039e8fc/0912873430b22467c12571da0032d460/$FILE/The+Experience+With+Energy+Efficiency+Policies+and+Programmes+in+IEA+Countries.pdf<br>2.Joakim Nordqvist (2006):[Evaluation of Japan's Top Runner Programme within the framework of the aid-ee project], http://www.aid-ee.org/documents/018TopRunner-Japan.PDF | It is our reading of the literature that market-based policies are in most cases the best mechanism for achieving deep emisisons cuts at minimal economic cost. It is also true that policies such as EE standards and labeling have been shown to be effective at overcoming information- and related externalities associated with consumer purchases. However, we do not see evidence that this type of policy can act as a substitute or equivalent alternative to a market- |

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| 9578 | 6 | 57 | 36 | 57 | 37 | Please, add following as good examples of no market mechnism; Howard Geller[1] showed the effectiveness of energy efficiency labeling as follows-In Europe, the average efficiency of new refrigerators and freezers was static or even declining prior to directives on energy efficiency labelling and standards. Thus the 27% decline in the average electricity use of new refrigerators and freezers sold in the EU between the early 1990s and 1999 was attributed to labelling and standards. Nordqvist[2] also evaluated Japan's Top Runner Programme to indicate that the Top Runner approach might contribute to about one sixth or more of the total Japanese savings ambition by 2010.<br>[1]Howard Geller (2005)<br>The Experience with Energy Efficiency Policies and Programmes in IEA Countries : Learning from the Critics. IEA Information Paper<br>http://www02.abb.com/db/db0003/db002698.nsf/ca7e93ab03030d22c12571380039e8fc/0912873430b22467c12571da0032d460/$FILE/The+Experience+With+Energy+Efficiency+Policies+and+Programmes+in+IEA+Countries.pdf<br>[2] Joakim Nordqvist (2006)<br>Evaluation of Japan's Top Runner Programme within the framework of the aid-ee project<br>http://www.aid-ee.org/documents/018TopRunner-Japan.PDF | It is our reading of the literature that market-based policies are in most cases the best mechanism for achieving deep emisisons cuts at minimal economic cost. It is also true that policies such as EE standards and labeling have been shown to be effective at overcoming information- and related externalities associated with consumer purchases. However, we do not see evidence that this type of policy can act as a substitute or equivalent alternative to a market-based emissions policy. |
| 10651 | 6 | 57 | 36 | 57 | 38 | Readers may misunderstand domestic and international emissions trading markets could only produce good devidents. But Howard Geller and Jakin Nordqvist argue the effectiveness of energy efficiency labeling, Japan's Top Runner Programme in their respective paper. [such as domestic and international emission trading.....with carbon pricing] should be deleted.<br>1.Howard Geller (2005):[The Experience with Energy Efficiency Policies and Programmes in IEA Countries : Learning from the Critics.IEA Information Paper],<br>http://www02.abb.com/db/db0003/db002698.nsf/ca7e93ab03030d22c12571380039e8fc/0912873430b22467c12571da0032d460/$FILE/The+Experience+With+Energy+Efficiency+Policies+and+Programmes+in+IEA+Countries.pdf<br>2.Joakim Nordqvist (2006):[Evaluation of Japan's Top Runner Programme within the framework of the aid-ee project], http://www.aid-ee.org/documents/018TopRunner-Japan.PDF | It is our reading of the literature that market-based policies are in most cases the best mechanism for achieving deep emisisons cuts at minimal economic cost. It is also true that policies such as EE standards and labeling have been shown to be effective at overcoming information- and related externalities associated with consumer purchases. However, we do not see evidence that this type of policy can act as a substitute or equivalent alternative to a market- |
| 6499 | 6 | 57 | 36 | 57 | 39 | This sentence should be eliminated.<br>Because short-term mitigation efforts should not be limited to developing of domestic and international emissions trading market and carbon pricing. | It is our reading of the literature that market-based policies are in most cases the best mechanism for achieving deep emisisons cuts at minimal economic cost. It is also true that policies such as EE standards and labeling have been shown to be effective at overcoming information- and related externalities associated with consumer purchases. However, we do not see evidence that |
| 11428 | 6 | 57 | 4 | 57 | 13 | The references to the Copenhagen targets or the Copenhagen Accord should be replaced with references to the Cancun targets or the Cancun Agreements. While the substantive content of these two instruments - particularly with respect to the emission reduction pledges or targets of various countries - were essentially the same, the legal status of these instruments in relation to the UNFCCC policy regime are not equal. The Copenhagen Accord and the targets pledged under it were not adopted by the UNFCCC Parties but were only noted, whereas the Cancun Agreements (decision 1/CP.16) were adopted by the Parties - thereby giving the latter a stronger and more durable normative policy standing under the UNFCCC policy regime. | The reference to the national pledges adopted under the UNFCCC will be clarified and standardized across the report. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12311 | 6 | 57 | 40 | 58 | 2 | This paragraph could include some more about the implementation and deployment and the possible barriers related to implementation and deployment. | The author team will consider expanding the discussion to include barriers to implementation and deployment - presumably in the current context the comment refers to identifying and |
| 16724 | 6 | 57 | 40 | | 48 | Highlight -- very important. | This is a key message of the section. |
| 3297 | 6 | 57 | 16 | 58 | 7 | This is good section. Keep it. | OK. |
| 9900 | 6 | 58 | 17 | 58 | 27 | During the life of a technology diverse barriers might emerge. This paragraph should be elaborated to raise awareness among decision-makers that the "complex process of interactions" has to be managed and can be managed. | We are not sure what precisely the reviewer means with "complex process of interactions", but we have made more explicit that barriers that might emerge |
| 9896 | 6 | 58 | 42 | | | the models don't "predict" this, this effect is built into the models as the prior sentence makes clear. | Yes, we agree that the choice of the word 'predict' is unfortunate here. |
| 8693 | 6 | 58 | 42 | | | the models don't "predict" this, this effect is built into the models as the prior sentence makes clear. | See the previous comment and our reply, which somehow is duplicated. |
| 16725 | 6 | 58 | 7 | | | Suggest insert: However, market participants will not invest in development or deployment of large, low emitting technologies if they lack confidence in the political commitment to the carbon pricing system. Investment decisions are made looking at the long term price outlook, while operating decisions are made based on the current, or spot price of emissions. | This is an important point. The author team will work on ways to incorporate this point into the discussion. |
| 6283 | 6 | 58 | 9 | 58 | 38 | There are a few statements in this section that while I might agree with personaly, I am not sure they belong in this report or if there is sufficient literature that can be cited to substantiate the point. "The likelihood of a unified global policy for greenhouse gas mitigation is low for the near future." | We same to agree here, but recognise the reviewer has a point; we have reformulated this and the subsequent |
| 9068 | 6 | 58 | 8 | 63 | 48 | 6.5 Integrating technological and societal change can be deleted due to limitations on the nos of pages | The authors have been instructed to dwell on this subject at this place in the report and chapter, so we cannot delete it. But efforts have been made to write |
| 6284 | 6 | 58 | 10 | 60 | 33 | The vast majority of this nearly three pages of text is about how integrated assessment models deal with technological change. That is it is process oriented. Given the need to reduce the length of this chapter significantly, it would seem that much of this material could be cut back, the relevant literature could be cited and then you could get to the outcome / what the result is; which is that technology is important because it reduces cost significantly lines 7-14 on page 60. | Yes, our discussions seem to go into the direction of cutting this section back to some extent, even while it is hard to cite specific references as the literature on this subject is so large. Also, during the revising of the FOD and SOD we will have to make sure that these elements are appropriately addressed in either |
| 3298 | 6 | 58 | 8 | | | This is good section, especially page 58, line 39 to page 59, line 3. | Noted. We will account for this while nevertheless attempting to somewhat |
| 4209 | 6 | 58 | | | | The term "risk" should be more clearly defined. There are some risk categories in the deployment of new technologies. For instrance, when the certaintechnology is implement only in the small portion, then cost is high whle the outcome is negligible small (or negative, in some cases). In case of carbon tax, partial implementation will results a large distortion and thus none will consider it seriously afterwards. This is an example of bad taxtics. Second, there is a counter-risk when an option is widely implemented. This is discussed well. Third, there can be a risk when a large implementation is failed. This is a business risk but can cause additional societal risk such as finantial crisis. | The term risk will be clearly defined in the AR5 glossary, and Section 6.7 will adhere to this. The introduction of the section will focus on clarifying the type of risk addressed in the section (the risk of mitigation failure) and distinguish it from risk trade-offs (Chapter 6.6) and risk |
| 15223 | 6 | 59 | | | | Figure 6.36 needs to be clarified. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4205 | 6 | 59 | | | | hard to read! | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 5872 | 6 | 59 | | | | Figure is not legible, please rework. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 16727 | 6 | 59 | 11 | | 20 | Do we need the references to the models, or here are the main points and then list the citations. | There was an editing problem in the creation of the references for the FOD. We will make sure this doesn't happen |
| 10794 | 6 | 59 | 31 | | | Figure is garbled and confusing. Please redesign | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 13174 | 6 | 59 | 32 | 59 | 38 | For the models implementing e.g. learning curves, it would also be useful to indicate whether they assume perfect foresight with intertemporal optimization. This is likely to have a big impact on model decisions, as the model knows the "winning technologies" beforehand (i.e. no uncertainty) and knows also how much having these technologies is worth in the future (i.e. there is no uncertainty about anything else, such as climate target, either). | Noted. We now briefly refer to this. |
| 14456 | 6 | 59 | 32 | | | This graph is illegible. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 4206 | 6 | 59 | 4 | 59 | 20 | The effects of learning curve is that the increase of cummulative production induces cost reduction and promotes further implementation. This means, from another side of view, that small implementation in the early stage weakens the penetration. Thus, technology susbtitution is delayed or never implemented (lock-in effect). It seems to me this inverse efffect should be also touched upon here. | True. We have now included a sentence along these lines in the new version of this section. |
| 16726 | 6 | 59 | 8 | | | Replace "fossil fuels" with "high-emitting technologies". Fossil fuels can be useful with the correct technologies. | Yes , that is true. We have changed this. |
| 4768 | 6 | 6 | | | | Are categories represent the different range of "radiative forcing in 2100 (W/m²)" ? | Noted. Categories will be clearer in the |
| 5854 | 6 | 6 | | | | Please indicate what is given in the brackets (ranges, standard deviation, …). | Noted. |
| 8055 | 6 | 6 | | | | For me the information in Table 6.2 is at least as relevant as in Table 6.3 (which became Table ES.1). Why not include all data from the two tables in ES.1 ? | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. In addition, it is not clear |
| 8614 | 6 | 6 | 10 | | | The top row of this table should be labelled "Year of Peak Emissions" and just "Peak Emissions". Also, the last three columns must be labeled as percentages. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. In addition, it is not clear |
| 12305 | 6 | 6 | 12 | 6 | 16 | This part focus on technology strategy. It is also important to see this in connection with climate change policies in a broader context, not only in relation to technology. This also involves how to handle risk sharing in a situation where there is a need for a shift in technology. There is more risk and higher cost involed for the early movers. Hence, this might create a need for other policies, especially in the transformation phase. This should also be reflected in the body of the text, for instance section 6.7 and/or section 6.3.5. | Noted. |
| 13123 | 6 | 6 | 13 | 6 | 15 | The wording is again too brave. Nobody knows what WILL happen in the scope of an almost 100 year long transition. These are model outcomes, reflecting very specfic sets of assumptions and the conclusions should be framed with that in mind (i.e. do not reformulate model outcomes as forecasts, but keep it clear that the statement about "predictions or forecasts" (page 15 line 6) is still valid) | Rejected. All the evidence that has been reviewed in this chapter indicates that to meet ambitious concentration goals will require a very different energy system |
| 2255 | 6 | 6 | 15 | 23 | 19 | Again, this mystrious preoccupation with EMISSIONS when the supposed theoretical influence is atmospheric CONCENTRATIONS. There is no scientificall established relationshio between the two | Rejected. This is an issue for WGI. |

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| 4769 | 6 | 6 | 17 | 6 | 20 | I fully agree however it is difficult to put an economical value to all those elements. | Noted. |
| 9827 | 6 | 6 | 17-20 | | | As already mentionned, this perspective does not allow for the possibility of macro-economic benefits, which would make it much easier for policy makers to choose a transformation pathway over a reference scenario. Moreover the time perspective should be integrated: as the financial crisis demonstrates the shortterm macroeconomic costs are considered in decision making: they can be calculated quite easily based on predictions and they are relevant to politician as arguments in election campaigns. But longterm macroeconomic costs and benefits are often neglected. | Noted. The issue of negative costs will receive mention in the chapter, although it is unlikeley it will make it to the ES given space constraints. |
| 8615 | 6 | 6 | 17-20 | | | This sentence perfectly illustrates my point above. It does not allow for the possibility of macro-economic benefits, which would make it much easier for policy makers to choose a transformation pathway over a reference scenario. | Noted. The issue of negative costs will receive mention in the chapter, although it is unlikeley it will make it to the ES |
| 2181 | 6 | 6 | 2 | 6 | 4 | Expressing the stabilisation level as a radiative forcing is fine, but will not be very helpful to most readers. It should be possible to presnt this as transient or equilibrium temperature change with dialogue with WGI. | Rejected. At present, given the uncertainties in the relationship between concentrations and temperature, a clear methodology has not been articulated to express concentration pathways in terms of temperature. At the same time, the chapter will be modified to include a |
| 13124 | 6 | 6 | 25 | 6 | 27 | The range of model outcomes (which I assume this refers to) does not automatically provide a mapping of real life uncertainties. Also, as mitigation costs are a function of the baseline AND the cost range understandably increases the further away one is from the baseline, couldn't one alternatively interpret this range as reflecting the uncertainties of the baselines? Finally, one would expect the energy (and other) systems of 2100 to be quite different from those of today, no matter what is assumed for the mitigation target. Rephrase. | Noted. These are all good points. |
| 8616 | 6 | 6 | 25-27 | | | This sentence is correct - but it should say "net cost or benefit estimates" not "cost estimates". The reader needs to be clear that costs or benefits are measured relative to a baseline scenario's costs. The point is that the uncertainty in net costs goes in both the positive and negative directions depending on the values of all the input assumptions. This is another reason, supporting my point above, why the critical role of the variations in input assumptions between models should be explained. | Noted. The issue of negative costs will receive mention in the chapter, although it is unlikeley it will make it to the ES given space constraints. |
| 14392 | 6 | 6 | 9 | | | Define RC | Accepted. We will define the RCPs in |
| 6095 | 6 | 6 | 9 | | | It will be better for reader friendliness purpose to add concentration level and, if possible, temperature increase expressed in terms of probability. Alternative simplified idea is to refer to Table 6.2. | Noted. At present, given the uncertainties in the relationship between concentrations and temperature, a clear methodology has not been articulated to express concentration pathways in terms of temperature. At the same time, the chapter will be modified to include a section that attempts to explain the link between temperatures and |
| 11250 | 6 | 6 | | | | In the Executive Summary it is said that “dramatic changes” are required and that “dramatic expension” of low-carbon sources has to be included. But there is no reference to the chapter. Where can these "dramatic” changes be seen? | Noted. The changes in the energy system can be found in the section on energy system transitions. |
| 10980 | 6 | 6 | 25 | 6 | 27 | Why "such estimates must be based on characterizations of energy and other systems that are very different from those of today"? Does it mean the composition of future energy supply will widely and drastically change in comparison with that of current one? | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. Regardless, a major result from the literature in this chapter is that |

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|---|---|---|---|---|---|---|---|
| 15224 | 6 | 60 | | | | Figure 6.37 needs to be clarified. | There was an editing problem in the creation of the figures for the FOD. We will make sure this doesn't happen again |
| 6407 | 6 | 60 | 29 | 62 | 30 | I know this is the FOD, but filling in the references here would be helpful. | There was an editing problem in the creation of the references for the FOD. We will make sure this doesn't happen |
| 13175 | 6 | 60 | 8 | 60 | 8 | Should the numbers 1-6 be replaced with references? | There was an editing problem in the creation of the references for the FOD. We will make sure this doesn't happen |
| 17809 | 6 | 61 | | | | please refer to the document, UN 2012. From transition to transformation. Sustainable and inclusive development in Europe | Noted. |
| 9901 | 6 | 61 | 0 | | | It would be very good if the case can be made here even more strongly that increasing the level of R&D expenditures quite substantially is still bound to be highly cost effective by providing some rough estimates of how big the long run benefits might be from improved low carbon technologies. | We will expand this part with newer studies, if they become available. |
| 8694 | 6 | 61 | 0 | | | It would be very good if the case can be made here even more strongly that increasing the level of R&D expenditures quite substantially is still bound to be highly cost effective by providing some rough estimates of how big the long run benefits might be from improved low carbon technologies. | Will expand with newer studies, if available |
| 3299 | 6 | 61 | 1 | | | The table is fine, but it needs more explanation in the title paragraph and/or the text about it. | Yes, we agree. We particularly also emphasize the uncertainties associated |
| 3149 | 6 | 61 | 1 | | | This chapter has a few figures that could be iconic for the WG3 overall. They include: figs 6.5, 6.6, 6.7 and 6.34. As you trim the chapter pls try to keep those figures and work with TSU to make them clear. For example, add historical data to figure 6.7 to help put the pathways into context. | ok |
| 16728 | 6 | 61 | 10 | | | point made that policy must be credible -- this is very important for investors in big, long lived assets. Can you explain a bit more for people? | We could, but given the length limitations we may best refer that task to |
| 6106 | 6 | 61 | 15 | 61 | 16 | There is a sentence that "alternatively, carbon taxes greater than the Pigouvian level are recommended when one accounts for market imperfections in the knowledge sector (REFERENCE)". Pigouvian tax is a tax that materialize not only cost effectiveness but also economic efficiency (relying upon cost benefit analysis). Whereas in page 26, this chapter says that CBA is not approapriate for the purpose of discussiing stabilization pathways because CBA leads to increasing concentration. The expression here is inconsistent with the above expression. Also reference is absolutely needed. | Pigouvian taxation is independent of CBA analysis. The point here is to show that multiple policies can be welfare improving when there are multiple externalities |
| 14039 | 6 | 61 | 31 | 63 | 48 | In this part it would be appropriate to refer to wider interpretations of transformation and how this relates to sustainability pathways. Literature to consider: National Research Council. 2011. Climate Stabilization Targets: Emissions, Concentrations, and Impacts over Decades to Millennia. Washington, DC: National Academies Press; WGBU. 2011. World in Transition: A Social Contract for Sustainability. Summary for Policy-Makers, Berlin:Wickson, F. A.L. et al 2006. Transdisc. research: characteristics, quandaries and quality. Futures 38: 1046-1059; Raskin, P. et al. 2002. Great Transition: The Promise and Lure of the Times Ahead. SEI,Tellus Institute; Brown, L. 2010. PLAN B 4.0. New York: W.W. Norton and Company; Leichenko, R. and K. O'Brien, 2008. Environmental change and globalization: Double exposures. Oxford Press. ; Leiserowitz, A. A., R. Kates, and T. M. Parris. 2006. Sustainability values, attitudes, and behaviors: A review of multinational and global trends. Annu. Rev. Environ. Resour. 31: 413-44; Pelling, M. 2010. Adaptation to Climate Change: From Resilience to Transformation. London: Routledge; O'Brien, K. 2011. Global Environmental Change (2): From Adaptation to Deliberate Transformation. Progress in Human Geography. Published Online 10 November 2011; Westley, F., Olsson, P. Folke C. et al. 2011. Tipping Towards Sustainability: Emerging Pathways of Transformation. 3rd Nobel Laureate Symposium on Sustainability, Stockholm. | These are valuable suggestions, as indeed we do not only want to refer to integrated assessment modeling work on transformation pathways, but bring forward wider interpreattions of these pathways. |
| 13176 | 6 | 61 | 7 | 61 | 8 | Give references. | There was an editing problem in the creation of the references for the FOD. We will make sure this doesn't happen |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 10996 | 6 | 61 | 18 | 61 | 20 | What does the term of "behavioral anomalies" mean concretely? It should be clearly stated. | Yes, we agree: we clarified this. |
| 9902 | 6 | 62 | 0 | | | An analysis of 104 empirical studies of innovation to change showed the following barriers, that could refine and structure the discussion of barriers:<br>Issues of resourcing (76%), for instance, “not enough resources” (Post and Altman 1994), “lack of adequate resources such as time and staff” (Adams and McNicholas 2007), limited or no budgeting (e.g. Harris 2000 and Anumba et al. 2006), access to capital and lack of time (Rohdin and Thollander 2006).<br>Issues of capabilities (75%), for instance, “low technology literacy” (Stewart, Mohamed and Marosszeky 2004), “ill-equipped in terms of training and expertise” (Whitaker 1987), “employees are not trained” (Tamimi and Sebastianelli 1998), “lack of understanding” (Waldron 2005), “lack of technical skills” (Rohdin and Thollander 2006), “lack of skill, knowledge and expertise” (Kirkland and Thompson 1999), etc.<br>Issues of communication (64%), for instance, “communication barriers” (Heide, Grønhaug and Johannessen 2002), “communication overload and distortion” (Allen 2002), “lack of communication within the team” (Attaran and Nguyen 1999), “lack of communication among those sharing responsibility for different aspects” (Kunda and Brooks 2000), “poor communication practices that damaged employee commitment to projects” (Jacobs et al. 2006), “tension among departments arising from the incompatibility of actual or desired responses” (Aggarwal 2003), etc.<br>Issues of organizational structure (62%), for instance, bureaucracy (e.g. Molinsky 1999; Borins 2000; Abdul-Hadi, Al-Sudairi and Alqahtani 2005), “salary structure” (Al-Qirim 2007), “complexity, centralization, and formalization”(e.g. Allen 2002), “rigid organizational boundaries” (Butler 2006), “departmental fortresses” (Cicmil 1999), and organizational structure (e.g. Scarbrough and Lannon 1988; McGaughey and Snyde 1994; Yauch and Steudel 2002).<br>Abdul-Hadi, N., Al-Sudairi, A. und Alqahtani, S. (2005): Prioritizing barriers to successful business process re-engineering (BPR) efforts in Saudi Arabian construction industry, In: Construction Management \& Economics, Vol. 23, Nr. 3, S. 305-315.<br>Adams, C.A. und McNicholas, P. (2007): Making a difference: Sustainability reporting, accountability and organisational change, In: Accounting, Auditing and Accountability Journal, Vol. 20, Nr. 3, S. 382-402.<br>Aggarwal, N. (2003): Organizational Barriers to Market Orientation, In: Journal of Management Research, Vol. 3, Nr. 2, S. 87-97.<br>Allen, R.Y.W. (2002): Assessing the impediments to organizational change: A view of community policing, In: Journal of Criminal Justic, Vol. 30, Nr. 6, S. 511-517.<br>Al-Qirim, N. (2007): The adoption and diffusion of E-commerce in developing countries: The case of an NGO in Jordan, In: Information Technology for Development, Vol. 13, Nr. 2, S. 107-131.<br>Anumba, C.E.H., et al. (2006): Understanding structural and cultural impediments to ICT system integration: A GIS-based case study, In: Engineering Construction & Architectural Management, Vol. 13, Nr. 6, S. 616-633.<br>Attaran, M. und Nguyen, T.T. (1999): Design and implementation of self-directed process teams, In: Management Decision, Vol. 37, Nr. 7, S. 553-561.<br>Borins, S. (2000): What Border? Public Management Innovation in the United States and Canada, In: Journal of Policy Analysis and Management, Vol. 19, Nr. 1, S. 46-74.<br>Butler, J.C. (2006): Ten Lessons Learned: Data Warehouse Development Project, California Department of Fish and Game, In: CrossTalk: The Journal of Defense Software Engineering, Vol. 19, Nr. 10, S. 16-20 | Thanks for this long list of suggestions, which we have considered. |
| 16729 | 6 | 62 | 34 | | | Insert at the beginning of section "the difference between engineering potential vs. market potential" | Rejected. The list is about drivers of the energy efficiency gap. What you |
| 16730 | 6 | 62 | 38 | | | Also due to capital budget constraints and decision makers preferring non-energy related investment options if they have a higher relative return. | Noted. |
| 6408 | 6 | 62 | 9 | 62 | 9 | "all the more so after Fukushima" is conjecture and should be reworded. | Noted. This section was completely rewritten in the new draft and does not |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5925 | 6 | 62 | 9 | | | Suitable references to nuclear policies after Fukushima are: 1. Globally: P. Joskow, J. E. Parsons, The Future of Nuclear Power After Fukushima, Econ Ener Env Pol 1(2) (2012) 99-113, and 2. Concerning EU countries: Syri S., Kurki-Suonio T., Satka V., Cross S., Nuclear power at the crossroads of liberalised electricity markets and CO2 mitigation - case Finland. Energy Strategy Reviews (accepted with minor rev.) | Noted. This section was completely rewritten in the new draft and does not contain this matter anymore. |
| 3300 | 6 | 62 | 34 | 62 | 38 | This is an important paragraph. It needs more explanation to 'bring it up to' other paragraphs' length and depth. | we will improve the link between this paragraph and the rest of the section |
| 10954 | 6 | 62 | 44 | 62 | 44 | Fischer et al. (2011) missing in reference list. | Rejected. The reference actually *is* in the reference list ("Fischer & al 2011"). |
| 18640 | 6 | 63 | | | | Page 63: The challenge is to avoid self-reinforcing loops between technical choices, life-styles and institutions which result in a carbon intensive lock-in. | we will give one example of this loop like the link between urban sprawl, the structure of transportation modes and |
| 17474 | 6 | 63 | 14 | 63 | 15 | Meaning not clear to me | difficult for us to see what you think unclear in this page. We will anyway |
| 9903 | 6 | 63 | 18 | | | Changes in consumption patterns are mentioned here, but I think much more attention ought to be given to the basic issue of economic growth in this sub-section. As you know, many advocates of "no growth", "low growth", etc. have become much more active over the last several years, and the world economic crisis has fed into concerns about how much economic growth is sustainable, and compatible with climate change mitigation. Yet, I don't believe that the IAM literature has many climate change mitigation scenarios that reflect these debates by doing sensitivity analyses using much lower economic growth rates for certain regions of the world, especially the OECD countries, than the growth rates used in the base case scenarios. These types of sensitivity cases should have been run by more IAM modeling groups by now, but even if the literature on this issue is skimpy, the issue should be discussed in this section of the report. Preferably, this section should be moved up front in the chapter to where all input assumptions are presented together, as I have previously advocated. It is important to discuss low economic growth scenarios because economic growth is one of many key policy levers that could be relied on to reduce greenhouse gas emissions, if needed. | we understand the point; and we will examine seriously your proposal. However, it will be more easy to do so, for reasons of time constraints; in the 2nd order draft. We retaing anyway the point that questions about changes in consumption patterns relate to the even more fundamental question of economic growth in matured economies |
| 8695 | 6 | 63 | 18 | | | Changes in consumption patterns are mentioned here, but I think much more attention ought to be given to the basic issue of economic growth in this sub-section. As you know, many advocates of "no growth", "low growth", etc. have become much more active over the last several years, and the world economic crisis has fed into concerns about how much economic growth is sustainable, and compatible with climate change mitigation. Yet, I don't believe that the IAM literature has many climate change mitigation scenarios that reflect these debates by doing sensitivity analyses using much lower economic growth rates for certain regions of the world, especially the OECD countries, than the growth rates used in the base case scenarios. These types of sensitivity cases should have been run by more IAM modeling groups by now, but even if the literature on this issue is skimpy, the issue should be discussed in this section of the report. Preferably, this section should be moved up front in the chapter to where all input assumptions are presented together, as I have previously advocated. It is important to discuss low economic growth scenarios because economic growth is one of many key policy levers that could be relied on to reduce greenhouse gas emissions, if needed. | same question, same response |
| 9904 | 6 | 63 | 26 | 63 | 28 | Life cycle costing should be explicitly mentionned here as an instrument that can assist decision makers in assessing tradeoffs, such as between commuting and housing. | we are not sure that the Life Cycle Costing methods are mature enough to assist decisions makers in assessing the trade offs between commuting and housing. We will see whether such analyis exist. If not we will pinpoint the |
| 6694 | 6 | 63 | 3 | 63 | 7 | Good text. A big issue of carbon tax is that a family budget is damaged by it. | thanks |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9500 | 6 | 63 | 3 | 63 | 7 | good issue - It is obviously mentioned that a carbon tax has a bad influence for consumers | thanks |
| 6409 | 6 | 63 | 30 | 63 | 31 | I don't understand what "is a way of controlling the induction of automobile dependant transportation patterns" means | we will explain more clearly that investment in infrastructure combined with appropriate energy and real estate pricing determine the amount of mobility |
| 17420 | 6 | 63 | 35 | | | "Another critical sector here is agriculture and food production." It is not particularly helpful here to simply refer to these sectors without some explanation of how and why they are critical. | good point. We will develop and give some pieces of littérature |
| 16733 | 6 | 63 | 38 | | 44 | This presumes the market does not work to balance the utility of these activities as compared to the utility of cutting emissions in response to the carbon price -- in free economies, consumers act to maximize utility, not minimize costs. Emissions associated with some of the points you list may be very valuable to consumers (they have high willingness to pay). Example: Consumers may be willing to pay a lot for a flight for a vacation. The flight will become more costly with a carbon price -- yet consumers still want a vacation. If they take vacation with flight does this mean the policy failed? If the cap has integrity, the needed reductions are happening in activities with lower associated utility or very low cost reductions. | I am not sure I understand how you point is connected with the message of this para. I will try and be more explicit. The point is that, a) in a market economy with market (energy, real estate, land, labor) and institutional failures (including fiscal systems), a cap on emissions will entail welfare losses (as you say, activities with a lower utility or more costly) b) correction of these |
| 6410 | 6 | 63 | 47 | | | "unlock(ed)" overnight is colloquial and could be written "cannot be easily undone" or something more focused professional-sounding. | OK will be corrected |
| 16731 | 6 | 63 | 7 | | | These cost impacts can be mitigated via rebates or allocations of allowances to make price changes more gradual, giving consumers time to adjust. | OK we will suggest that. |
| 16732 | 6 | 63 | 7 | | 15 | Good. | thanks |
| 16734 | 6 | 64 | | | | Is Sustainable Development defined well enough to be meaningful in the context of climate policy? Is there a discipline around this so that terms are defined or understood? Does it ask too much of a climate policy to also need objectives of Sustainable Development (however it is defined)? | Noted. The IPCC plenary saw the relevance to discuss mitigation in the context of broader sustainable development and for that reason |
| 15225 | 6 | 64 | | | | section 6.6 seems to repeat the contents in chapter4: Sustainable Development. Please revise. | Noted. Chapter 4 is meant to provide framing (conceptual) whereas here the focus is on the applied side. We will ensure that sections/chapters build on |
| 16735 | 6 | 64 | 17 | | 43 | From an economic perspective, this does NOT mean these policies lower the cost to reduce CO2 (CO2 price is not good proxy for economic cost). Rather, they force actions that would not happen unless the CO2 price was very high, meaning the $/ton cost of the action is very high. These policies hide the true costs of lowering carbon from the carbon market -- they do not result in additional emission reductions, only in the reduction of higher cost instead of relatively lower cost reductions. These "co-benefits" come at a very high, but hidden, CO2 price. | Noted. The statement here is about the level of carbon tax and not about aggregated economic or societal costs. |
| 13177 | 6 | 64 | 21 | 64 | 25 | This should be cross referenced with what is being said on page 36, lines 7-17 (suggesting that cap-and-trade mitigation is more expensive if it's combined with instruments targeting subsystems) and on page 30, lines 9-13 (emission price does not reflect full costs of mitigation, if additional policies affecting emissions are in place). | Noted. This section has been significantly restructured with the new draft. |
| 9905 | 6 | 64 | 3 | | | What is meant by "sustainable development" in this report should be described in the introductory section 6.6.1. Which time scale is considered and which dimensions of decision making? | Accepted. This section was revised, references to Ch.4 added. |
| 8696 | 6 | 64 | 3 | | | What is meant by "sustainable development" in this report should be described in the introductory section 6.6.1. | This comment is a duplicate of comment no 9905, please see for |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3378 | 6 | 64 | 34 | | | Another reference for co-benefits of urban transport climate change mitigation measures is: F. Creutzig, D. He (2009) Climate change mitigation and co-benefits of feasible transport demand policies in Beijing. Transportation Research D 14: 120-131. The "co-benefits" are of an order of magnitude larger than climate benefits. | Accepted. Congestion, air pollution, accidents and noise are now covered in Table 6.5 which is i.a. sourced from Section 8.7 which in turn contains a |
| 4207 | 6 | 64 | | | | This section is very important especially for the decision makers in de elopping coutries. More concrete case studies, reports and studies in development economics should be refered. Currently model simulations and some case studies are mentioned. | Accepted. We have now attempted this by introducing Table 6.5. |
| 11430 | 6 | 64 | | 64 | | This section could be improved through the incorporation of specific references to various provisions of the UNFCCC that reflect the linkage between the achievement of sustainable development and effective climate change actions - e-g- UNFCCC Arts. 2, 3.4, 4.7. | Noted. |
| 17922 | 6 | 64 | 28 | 64 | 43 | The literature and details covered in this paragraph are very interesting, but might or should be covered in the respective sector chapters. In my eyes, the role of chapter 6 would rather be to provide the link between the framing and sectoral discussions of SD and co-benefits/co-costs with the tranformation pathway literature and provide an overview of methodological challenges. | Accepted. We have now attempted this by introducing Table 6.5. |
| 17349 | 6 | 64 | 30 | 64 | 34 | "Travel demand and choice of travel mode depend on land use planning interventions" there is no direct "dependency" or "causality" between travel demand, modal choice and physical spatial attributes of cities. The word dependency can here be rather misleading. The major part of the transport literature supports the proposition that travel is a derived demand, and both modal choice and phycical movement are more dependend on income, preferences, cost of transport, housing markets and demographic characteristics than a result of land use planning per se. The choice of words is important as well as the use of the most current literature. Suggest to use more recent literature here than (Cervero and Kockelman 1997), the latest appears to be with (Ewin and Cervero, 2010) which is OK. Problem seem to be that the academic literature will be strong on elasticities but scenarios cannot be built using them. | Noted. This section has been significantly restructured with the new draft. |
| 17923 | 6 | 64 | 45 | 65 | 27 | Please explain what is meant by 'Baseline Sustainable Development Policies and Actions' or paraphrase. These paragraphs seem to describe important caveats to conventional ways of accounting for costs of alternative baseline scenarios which are used throughout the chapter 6 which are partly based on the metrics discussion of chapter 3. At the same time, too little literature is provided (apart from the ecosystme service context) to substantiate the claims made. The part on different baselines in different regions is very promising but would need to be expanded (possibly by referring to the following paper: Steckel, Jan, Robert J. Brecha, Jessica Strefler, Michael Jakob und Gunnar Luderer (in review): Development without energy? Assessing future scenarios of energy consumption in developing countries. Working Paper. Submitted to Ecological economics (http://www.pik-potsdam.de/members/steckel/publications/development_energy_new) | Noted. This section has been significantly restructured with the new draft. |
| 13178 | 6 | 65 | 1 | 65 | 2 | This statement needs to be made more clearly. Is it meant to say that a given, non-minimized cost can be achieved with a number of technical systems? Or, in case least cost systems are discussed, should "identical" be preceeded with the word "nearly"? And why does this all depend on whether endogenous technical change is allowed? | Noted. This section has been significantly restructured with the new draft. |
| 16028 | 6 | 65 | 14 | 65 | 21 | Inapprehensible | Noted. This section has been significantly restructured with the new |
| 16736 | 6 | 65 | 21 | | | Is it established that "leapfrogging" is indeed possible in any but the smallest state/region? Has this been well established in the literature? | Noted. This section has been significantly restructured with the new |
| 16737 | 6 | 65 | 27 | | | add to last sentence: "with the understanding that within the economic context, forcing higher cost reductions via policy measures is a more costly and less efficient approach than allowing a CO2 price to shape consumption and investment choices which allows utility maximization within the society." | Noted. This section has been significantly restructured with the new draft. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2184 | 6 | 65 | 28 | 67 | 36 | The key conclusions of this section need to be brought forward into the SPM. The conclusion that sustainability pathways have lower costs, additional co-benefits across sectors, improved health and wellbeing, greater equity, improved security, etc is probably the most important conclusion of the chapter, or even the entire WGIII report. | Noted. In the new draft co-benefit issues indeed have become part of the chapter ES and summary documents. |
| 11431 | 6 | 65 | 29 | 65 | 30 | The reference to the "sustainable development and green economy paradigms" should be reformulated in order to reflect the latest multilateral consensus coming out from the Rio+20 summit on the relationship between sustainable development and the green economy - i.e. of green economy in the context of sustainable development and poverty eradication as one of the important tools available for achieving sustainable development and that it could provide options for policy making but should not be a rigid set of rules. The Rio+20 outcome document provides a lot of multilaterally agreed policy statements regarding how green economy is not considered as a paradigm separate from that of sustainable development - e.g. paragraphs 56-74, Rio+20 Outcome Document (see http://www.uncsd2012.org/content/documents/727The%20Future%20We%20Want%2019%20June%201230pm.pdf) | Noted. This section has been significantly restructured with the new draft. |
| 16738 | 6 | 65 | 36 | | | Suggest add sentence: "Working outside of linked, CO2 markets, it is difficult to imagine how transfers of the scale needed would be funded." | Noted. This section has been significantly restructured with the new |
| 13181 | 6 | 65 | 40 | 65 | 45 | These seem like a rather courageous claims and presumably depend completely on how some of these benefits have been monetized. More references supporting these are needed, in any case, and I would even then suggest a more careful formulation, due to the difficulty of comparing costs against benefits that are non-trivial to monetize. | Noted. This section has been significantly restructured with the new draft. |
| 13180 | 6 | 65 | 41 | 65 | 41 | Reference is not included in the bibliography (or, alternatively, the given publication year is wrong_ | Accepted. This section has been significantly restructured with the new |
| 9988 | 6 | 65 | 42 | 65 | 45 | Low carbon technologies should include "heat pump technology" because heat pump has huge potential to reduce GHG emission, as described in (IEA, 2011, page16). This literature is listed in the No51 line of this table. | Noted. This section has been significantly restructured with the new draft. |
| 16739 | 6 | 65 | 45 | | | Suggest add after "etc." the following: "the benefits of which may be difficult to quantify." | Noted. This section has been significantly restructured with the new |
| 13179 | 6 | 65 | 7 | 65 | 11 | There are some incomplete sentences on these lines. | Noted. This section has been significantly restructured with the new |
| 17924 | 6 | 65 | 32 | 65 | 36 | Please provide a reference to substantiate the results in these sentences. | Noted. This section has been significantly restructured with the new |
| 10997 | 6 | 65 | 42 | 65 | 45 | Why will higher upfront costs of low carbon technologies "be more than balanced by gains from fuel conservation, enhanced energy security, improved air quality etc."? I should be supported logically.<br>Reference: IEA, Energy Technology Perspectives 2012 Pathways Clean Energy System, http://www.iea.org/Textbase/npsum/ETP2012SUM.pdf | Noted. This section has been significantly restructured with the new draft. |
| 6541 | 6 | 65 | 44 | | 45 | Replace "additional costs are more than balanced" with e.g. "additional costs can be balanced", as the description is not always true and it is ease to find the opposite. | Noted. This section has been significantly restructured with the new |
| 16740 | 6 | 66 | 29 | | 44 | This is not supported by economic literature -- it reads as a sustainability advocacy piece. Suggest it be rewritten with more attention to economic literature looking at total economic costs rather than simply the modeled CO2 prices. I do not disagree with the point that it is less costly for developing countries as compared to already developed countries to become low emitting economies. This is supported by research -- this should be the focus without folding in the discussion of sustainability which touches on many other aspects of development besides climate. | Rejected/Accepted. The author team has been tasked to contextualize with sustainable development, for this reason this continues to be covered in the new draft. The new draft, though, indeed tries to further substantiate the findings as |
| 11432 | 6 | 66 | 29 | 66 | 29 | Same comment as with page 65, lines 29-30, with respect to the relationship between sustainable development and green economy. | Noted. This section has been significantly restructured with the new |
| 13182 | 6 | 66 | 9 | 66 | 9 | Unclear what/where this "table 1" is. First table in section 6.5 shows R&D needs. | Accepted. This reference has been corrected when restructuring this section. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16352 | 6 | 66 | 20 | | | I have the impression that section 6.6 needs substantial revision and development.<br>While section 6.3 provide costs, this section does not seem to link costs of stabilisation to sustainable development. The role of subsection 6.6.3 seems unclear, as it apparently focuses on a specific interpretation of the term 'low carbon society' (LCS) which is much narrower than the title would suggest (in particular, the last paragraph suggests that LCS is not viewed as a general concept but as a new and very specific framework). | Noted. This section has been significantly restructured with the new draft. |
| 9299 | 6 | 66 | 1 | 66 | 3 | Please add the following example and reference.<br>------(Shukla, Garg, and Dhar 2009). The regional cooperation between local government and cement industry generated co-profits to treat municipal wastes in cement kiln (MORIMOTO, NGUYEN, CHIHARA, HONDA and YAMAMOTO; Vol.2 No.4 2006, Journal of Life Cycle Assessment, Japan "Proposals for Classification and an Environmental Impact Evaluation Method for Eco-Services: Case study of Municipal Waste Treatment in Cement Production") | Noted. This section has been significantly restructured with the new draft. |
| 13183 | 6 | 67 | 16 | 67 | 16 | Unclear what/where this figure 1" is. First figure in section 6.5 shows technology specific cost trajectories. | Accepted. This reference has been corrected when restructuring this section. |
| 13184 | 6 | 67 | 22 | 67 | 22 | 6.2.3. is interpreation of model infeasibility. Probably 6.3.3. was meant? | Accepted. This reference has been corrected when restructuring this section. |
| 16029 | 6 | 67 | 25 | | | include: reduction of artificial fertilizer | Noted. This section has been significantly restructured with the new |
| 16742 | 6 | 67 | 27 | | 36 | Suggest delete this paragraph. How is this supported? What does it mean? I can imagine poorly designed systems that do not include carbon from land use changes causing problems, but this can be solved via better market design. What else is this referring to? | Noted. This section has been significantly restructured with the new draft. |
| 8698 | 6 | 67 | 27 | | | This last paragraph does not make much sense, and is not supported by references to research. I would either leave it out completely or re-write it to state more defensible positions supported by research. | Noted. This section has been significantly restructured with the new |
| 16350 | 6 | 67 | 28 | 67 | 30 | The sentence is not clear: what is the meaning of "increasing climate consequences" (following mitigation)?<br>In addition, It is frustrating to make such a general and theoretical statement -- that spending efforts in an area (mitigation) might reduce efforts in other areas (adaptation and 'development') without actually summarising studies that assess this type of risk and conclude whether it is possible to avoid it or not. There should be at least a link to the appropriate sections of the report. | Noted. This section has been significantly restructured with the new draft. |
| 11433 | 6 | 67 | 35 | 67 | 36 | The statement that "sustainable development is an essential framework to align mitigation and adaptation policies and actions" could be further strengthened by linking it to the various provisions of the UNFCCC that shows such a relationship - e.g. UNFCCC Arts. 2, 3.4, 4.7 | Noted. This section has been significantly restructured with the new draft. |
| 16741 | 6 | 67 | 8 | | 18 | Should compare the costs of non-market based policies in terms of the amount of emission reductions achieved to the CO2 price policies which drive the same amount of emission reductions. You will undoubtedly find that the latter is much less costly. Yes, RD&D with state support can create large value for a society, but large scale deployment to meet other policy positions then requires non-market actors to decide how much of what produced by whom -- the problem of picking winners and losers. This socializes broader economic risks, removing it from the private sector. | Noted. This section has been significantly restructured with the new draft. |
| 17926 | 6 | 67 | 28 | 67 | 30 | This kind of very general claim definitely needs a reference and might need to be reworded since the whole point of the section (and other discussions on co-benefits/co-costs) is to describe how to identify low-carbon pathways that are consistent with SD goals to avoid the mentioned unintended consequences. | Noted. This section has been significantly restructured with the new draft. |
| 17927 | 6 | 67 | 30 | 67 | 36 | These sentences resemble some of the key messages of Chapter 4 without any cross-reference (and, indeed, any references). Please liaise with the Chapter 4 LAs to make sure that the results are consistent. | Noted. This section has been significantly restructured with the new |
| 15226 | 6 | 68 | | | | Figure 6.38 needs to be revised. | Accepted. Replaced with other figure. |
| 15227 | 6 | 68 | | | | Section 6.7 on Risk. Methodology dealing with risks should be identified. | Rejected. Risk analysis is dealt with in Chapter 2 of the report. |
| 5873 | 6 | 68 | | | | Figure is not legible, please rework. | Accepted. Replaced with other figure. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 5874 | 6 | 68 | 1 | 70 | 14 | Table can be deleted, information is only referred to in 4 lines in the text (p. 70, l. 11-14) and these lines do not explain why the table should show any risks. Text and table can be deleted without loss of information. | Rejected. The relevance for levels, rate and share of deployment for a risk assessment is explained in the text. The table will be moved to Section 6.6. to |
| 3150 | 6 | 68 | 1 | | | This chapter has a few figures that could be iconic for the WG3 overall. They include: figs 6.5, 6.6, 6.7 and 6.34. As you trim the chapter pls try to keep those figures and work with TSU to make them clear. For example, add historical data to figure 6.7 to help put the pathways into context. | Noted. |
| 12312 | 6 | 68 | 16 | | | It would be helpful if this section also could focus on how to develop policy strategy and instruments in relation to risk. You might want to coordinate with section 6.3.5 regarding where in chaper 6 this best should be adressed. | Policy instruments are discussed in detail in Part 3 of the WG3 report (Chapter 13-16), and Uncertainty and Risk Management is covered in Chapter |
| 3379 | 6 | 69 | | | | What are the assumptions of the life-cycle emissions of bioenergy in this table? I suspect that most of the underlying scenarios assume "advanced" = 0 gC02e/MJ. What if it turns out that most realized cost-efficient bioenergy deployment has a notable carbon footprint? Is there place for such a not-first-best-world scenario? | Carbon footprint of bioenergy is include in many integrated assessment model scenarios in the underlying database. ILUC emissions are not an input to these models, but an output. There are also scenarios in the database that do not fully account for ILUC emissions, but |
| 9579 | 6 | 69 | | | | Please, provide the reason for inclusion ofCCS and lack of hydro with the text or the table. | CCS deployment is relevant for the discussion of risks. Hydro power carries risks too, but models see only small changes in hydro power deployment compared to other low carbon technologies. The focus of the table is on |
| 16743 | 6 | 69 | | | | Suggest delete. Lacks any context. How derived? | Rejected. The relevance for levels, rate and share of deployment for a risk assessment is explained in the text. The table will be moved to Section 6.6. to allow joint discussion of co-benefits and risk trade-offs. The explanation of how |
| 7473 | 6 | 69 | | | | Only so-called modern energy is shown on this table. Why? | The phase out of traditional biomass use is not a main topic of Chapter 6. The foscus of Table 6.7 is on risks due to |
| 3151 | 6 | 69 | 1 | | | This chapter has a few figures that could be iconic for the WG3 overall. They include: figs 6.5, 6.6, 6.7 and 6.34. As you trim the chapter pls try to keep those figures and work with TSU to make them clear. For example, add historical data to figure 6.7 to help put the pathways into context. | Noted. |
| 16744 | 6 | 69 | 7 | | 18 | And what causes the transformation? This seems to lack basis in terms of letting people know how this occurs. Social pressure? Gov't mandates? Appeals to our better nature? | The term transformation refers to the changes in energy amnd land use induced by reducing emissions and mitigating climate change. Climate policy implementation, including its |
| 9906 | 6 | 69 | 9 | | | The Tellus Institute scenarios study referenced above also stresses the need for societal transformation to achieve climate mitigation targets, so this reference should be added here as Raskin, et.al., 2010. See in particular the Great Transition scenario in this paper. | If the general discussion in the paragraph is retained in the SOD, the reference will be added. However, the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8697 | 6 | 69 | 9 | | | The Tellus Institute scenarios study referenced above also stresses the need for societal transformation to achieve climate mitigation targets, so this reference should be added here as Raskin, et.al., 2010. See in particular the Great Transition scenario in this paper. | If the general discussion in the paragraph is retained in the SOD, the reference will be added. However, the |
| 4770 | 6 | 7 | | 7 | | Yes, waiting for these definitions. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 18625 | 6 | 7 | | | | Some sensational statements/conclusions such as:<br>Page 7: Macroeconomic costs for scenarios without CCS and nuclear power are estimated to be as much as two to three times higher than comparable scenarios with full availability of these technologies (all other things being equal). | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. This statement will be revisited |
| 4189 | 6 | 7 | | | | The interpretation of this figure is not straightforward. One will find a clear relationship and other will not. I would like authors to talk about these figures carefully. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 5856 | 6 | 7 | | | | Please make sure you explain "EMF". If the order in the header is "Overshoot … NTE" it should be kept this way in the table lines: "Overshoot" above "NTE". | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 5855 | 6 | 7 | | | | Please make sure you explain "final enegy categories" to the reader. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 9178 | 6 | 7 | | 7 | | it should be noted the costs presented here are estimated based on the assumption that the governmental intervention is cost effective - often it is not the case. As such these are minimum cost estimate. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 8617 | 6 | 7 | 1 | | | Why do you include "low-carbon" in the title of the vertical axis? Isn't this the total primary energy supply? What does "low-carbon" refer to"? | Noted. |
| 8618 | 6 | 7 | 1 | | | Where does the text refer to these figures? | Noted. |
| 14451 | 6 | 7 | 1 | | | Axes should start at (0,0). | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 11745 | 6 | 7 | 11 | 7 | 13 | Clarificaton is needed why macroeconomic costs for scenarios without CCS are estimated to be higher. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. This statement may not |
| 9829 | 6 | 7 | 11 | 7 | 13 | Please quote the sources for the statement, that the macroeconomic costs for scenarios without CCS and nuclaar power are astimated to be as much as two to three times higher than comparable scenarios. The sentence beginning "For example,….." seems likewise to be false, unless properly qualified. However, there is a new element here which is the relative cost of nuclear power and CCS compared to other no carbon electric generation options. So if the price of nuclear and CCS-related power is more expensive than renewable power options like wind and solar, which many people believe, then not having nuclear and CCS in the mix would actually lower the macroeconomic costs, not raise them. So it all depends, again, on the actual values of key input assumptions, including the price of fossil fuels, as discussed above. So the ranges of input assumptions that yield the result cited must be provided, when making such a sweeping statement. And it must be clear to the reader that with other assumptions the statement would not be true. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. This statement may not remain. If it does, it will be supported by text material within the chapter. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8620 | 6 | 7 | 11 | | | Similarly, the sentence beginning "For example,….." seems likewise to be false, unless properly qualified. However, there is a new element here which is the relative cost of nuclear power and CCS compared to other no carbon electric generation options. So if the price of nuclear and CCS-related power is more expensive than renewable power options like wind and solar, which many people believe, then not having nuclear and CCS in the mix would actually lower the macroeconomic costs, not raise them. So it all depends, again, on the actual values of key input assumptions, including the price of fossil fuels, as discussed above. So the ranges of input assumptions that yield the result cited must be provided, when making such a sweeping statement. And it must be clear to the reader that with other assumptions the statement would not be true. | Please see the response to comment 9829, which appears to be a duplicate of this comment, despite being submitted by another reviewer. |
| 9830 | 6 | 7 | 15 | 8 | 2 | Mitigation efforts will have an impact on the competitiveness of nations, described in theoretical explanations like the | Noted. |
| 9278 | 6 | 7 | 6 | 7 | 7 | There is no data in the "no CCS" column. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 9828 | 6 | 7 | 8 | | | Again, based on my discussion on the cost issue above, I believe this sentence is just plain false. I believe the correct version would be: "All other things being equal, [meaning if all other input assumptions are held constant] the net costs or benefits of mitigation increase disproportionately with increasing stringency of the long-term stabilization goal." | Accepted. We will mention the issue of negative costs. At the same time, the literature we are reviewing overwhelmingly indicates that there will |
| 8619 | 6 | 7 | 8 | | | Again, based on my discussion on the cost issue above, I believe this sentence is just plain false. I believe the correct version would be: "All other things being equal, [meaning if all other input assumptions are held constant] the net costs or benefits of mitigation increase disproportionately with increasing stringency of the long-term stabilization goal." | Please see the response to comment 9828, which appears to be a duplicate of this comment, despite being submitted by another reviewer. |
| 16685 | 6 | 7 | 9 | 7 | 13 | Do not lose this point -- extremely important for readers to understand that costs increase dramatically if the full suite of technologies can not be deployed based on their relative competitiveness under a carbon price. Should also include the point that costs will likely be much higher than calculated if other policy measures are used instead of a CO2 price to incentivize the deployment of low emitting technologies. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. This statement may not |
| 10981 | 6 | 7 | 11 | 7 | 13 | The sentence of "macroeconomic costs for scenarios without CCS and nuclear power are estimated to be as much as two to three times higher than comparable scenarios with full availability of these technologies." is good, in terms of indicating the substantial contribution of CCS and nuclear power to mitigation. It should not be deleted. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. This statement may not |
| 16745 | 6 | 70 | 1 | | 5 | These seem to me to be extremely different cases -- not clear they hold any lesson for the climate problem in terms of their scope or complexity or means to drive the change needed. | Taken into account. The broad discussion of transformation processes |
| 13186 | 6 | 70 | 11 | 70 | 11 | Should be table 6.7. | Yes. Reference corrected. |
| 16353 | 6 | 70 | 28 | 70 | 29 | I do not think that the risks of transformation needs to be considered along risks from climate change _alone_, as this sentence suggests. Transformation should be considered in a much broader view: taking into account the benefits and risks from climate change, but also the co-benefits from an integrated transformation to more sustainable societies. Transformation seeking climate mitigation alone is much less justified than transformation seeking sustainability as a whole.<br>Please improve this paragraph and add links with sections discussing co-benefits and sustainable development. | Taken into accout - the discussion of potential adverse side effects |
| 8699 | 6 | 70 | 28 | | | This paragraph should make it clear in conclusion that while of course there will be many risks and serious social disruptions caused by following strong mitigation scenarios such as RCP2.6, the world must do so anyway, because the risks from serious climate change will be far greater. On the other hand, pursuing transformation pathways that actually achieve sustainable development goals will be win-win strategies for humanity. | The IPCC aims to give a broad assessment of mitigation pathways aiming at different levels of mitigation. It is supposed to be policy relevant, but not policy prescriptive. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11434 | 6 | 70 | 36 | 71 | 6 | There is no reference to policy barriers to technology deployment, transfer and diffusion such as intellectual property rights and other policy instruments. By not including such a reference, the identification of risks to increased technology deployment is therefore incomplete. The IPCC AR5 should be scientific in terms of identifying all possible risks and providing a discussion of these risks. | Noted. |
| 16747 | 6 | 70 | 40 | | | Rather than "physical resource scarcity" it may be better to say "input price risks …" Scarcity will manifest itself in higher prices. We can typically find supplies but we may not be happy with how expensive they've gotten during times of tight supply or spikes in demand. | Noted. |
| 16746 | 6 | 70 | 6 | | | Use of the word "risks" … do we mean costs? Or uncertainty? | The term risk will be clearly defined in the AR5 glossary, and Section 6.7 will adhere to this. The introduction of the section will focus on clarifying the type of risk addressed in the section (the risk of |
| 17929 | 6 | 70 | 17 | 70 | 17 | The inclusion of environmental side-effects in a risk discussion is not consistent with agreements reached in Wellington by which environmental side-effects will be framed as either co-benefits or co-costs of mitigation policies/actions and technical and operational risks would be discussed seperately. If this should not be appropriate for specific kind of side-effects (e.g. page 71, lines 3-4), this concern should be raised during LAM3. | The discussion of potential adverse side-effects has been moved to Section 6.6 Sustainable Development where it will be discussed together with co-benefits. This includes environmental side effects. |
| 18641 | 6 | 71 | | | | Page 71: The next draft may discuss shares of “fluctuating renewables” in relation to grid integration. Refer to our studies and the IEA study | Noted. The discussion of supply technology risks is mostly done in Chapter 7, and relevant parts are now summarized in Section 6.6. Thus, the |
| 9580 | 6 | 71 | 1 | 71 | 5 | These parts have biases for nuclear; please, take into account following and reflect some in the text; Abram and Ion describe the International Generation-IV Initiative which was established with the aim of fostering the research and development necessary to underpin the development of a new generation of nuclear energy systems. These Generation-IV systems, which comprise both the reactors and their associated fuel-cycle facilities, are intended to deliver significant advances compared with current advanced light water reactors in respect of economics, safety, environmental performance, and proliferation resistance. The Generation-IV systems are expected to be developed to the point of commercial deployment by at least 2030. The Generation-IV International Forum (GIF) members have identified six reactor systems that offer the potential for meeting the Generation-IV goals. (T. Abram and S. Ion (2008) Generation-IV nuclear power: A review of the state of the science, Energy Policy 36 (2008), See downloaded file “Abram Ion 2008.pdf”) | Rejected. Risks of nuclear energy are treated evenly with risks of other energy technologies. The discussion of supply technology risks is mostly done in Chapter 7, and relevant parts are now summarized in Section 6.6. Thus, the discussion of risks of Nuclear energy will be moved to Section 6.6 from 6.7. |
| 6412 | 6 | 71 | 13 | 71 | 13 | "status quo bias" is a behavioral decision-making term that doesn't really apply here. I understand the intent of the sentence, and it seems to me as though reference to path dependence is more appropriate here. | Noted. |
| 13187 | 6 | 71 | 21 | 71 | 21 | The reference is incorrect; the authors of the cited paper are Strachan and Usher. | Taken into account. Reference corrected. |
| 16749 | 6 | 71 | 31 | | 47 | Problems of the intersection of energy security vs. food security are not the result of climate policy per se but rather the misguided attempt to push preferred technologies without having given thought to the life-cycle carbon emissions associated with the technology. These problems could be partly avoided through better accounting of carbon as well as not mandating particular technologies (bio-fuels for transport in this instance). | Noted. |
| 4208 | 6 | 71 | 36 | 71 | 40 | Most important societal risk is "unemployment" especially in the transition period. | Noted. |
| 16748 | 6 | 71 | 9 | | 30 | Perhaps this can be simplified to say that as some technologies increase their share of the market, they may cause increases in system operating costs not reflected in the costs of an individual project. As written seems overly complicated. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17930 | 6 | 71 | 31 | 71 | 32 | Please liaise with Chapter 7 to provide a consistent assessment of the challenges of fluctuating renewables and whether this should be framed as a risk (rather than an institutional and technological barrier). | Fluctuating renewables can pose a risk to energy system reliability and thus are an adverse side effect and risk trade off. Now delegated to Section 6.6 that will |
| 15934 | 6 | 71 | | | | It may be worth discussing the water footprint of the energy technologies available for use today - as they will in a very large part determine the water use intensity of the world's mitigation strategies (in an ideal world ofcourse) - which is an important part of any comprehensive solutions set. | The water footprint of mitigation technologies is a potential adverse side effect and risk trade-off and will now be discussed in Section 6.6 Sustainable |
| 16750 | 6 | 72 | 11 | | 20 | Would be helpful to report how large an increase in commodity food prices and how this impacts the very poor more than rich (who consume more processed food and for whom food budget is smaller share of household budget). How can we mitigate these impacts and where does it matter? | Noted. We agree that information on food price increases are highy relevant, and the relevant literature is referenced |
| 16751 | 6 | 72 | 39 | | 47 | This should be using the outputs from integrated models which rely on carbon price -- the various chapters do poor job of laying out least cost to most costly options and are very difficult to line up, especially when comparing across sectors. So the question is, if author relies on the various chapters, how do they line up the options and the associated costs? What do you assume drives the transformation? This is important -- if it is a Co2 price that rises over time, we don't know precisely what techs will deploy where, but we know the transformation will occur if market participants are confident in policymakers long term commitment. If driven by individual country's policy mandates, then more effort may be required to ensure there are not unintended consequences or large amounts of emissions' leakage. | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies becoming available. The section is therefore being restructured for the SOD. |
| 17932 | 6 | 72 | 26 | | | The use of the terms 'public acceptability' is inconsistent with agreements reached in Wellington (p.36). In accordance with chapter 2 usage, the term 'public perception' would be preferrabe (even to 'public acceptance' on page 71, line 6). | Changed to public perception |
| 16752 | 6 | 73 | 22 | | 46 | I don't understand the value of this discussion. Is it needed to articulate the potential technology deployment under a CO2 price? Or is it to define for policymakers those policies or standards they should implement? Models can only roughly show whether a path is possible and the relative costs of different pathways -- they are imperfect. As the future unfolds, we learn and adjust. Models can not foresee the details or reliably chart every future change. | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies |
| 11757 | 6 | 73 | 36 | 74 | 2 | Delete to save the volume. These seem to be needless. | The misuse of the bottom-up/top-down terminology in the literature illustrates that it is important to stress this point. However, we will make an effort to |
| 9582 | 6 | 73 | 36 | 74 | 2 | Please, delete here or move to footnote. | The misuse of the bottom-up/top-down terminology in the literature illustrates that it is important to stress this point. However, we will make an effort to |
| 6413 | 6 | 73 | 6 | 73 | 21 | There seems to be too much summary of AR4 and not enough direct articulation of the important evolution in AR5. | Discussion of comparison between sectoral and integrated studies in AR4 |
| 11756 | 6 | 73 | 6 | 73 | 21 | Delete to save the volume. These seem to be needless. | Discussion of comparison between sectoral and integrated studies in AR4 |
| 9581 | 6 | 73 | 6 | 73 | 21 | Please, delete here. | Discussion of comparison between sectoral and integrated studies in AR4 |
| 9419 | 6 | 74 | | | | There are so many lines and it is difficult to understand this figure and its explanation. | The lines have no meaning and were not part of the original document. There seems to have been a conversion error |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16753 | 6 | 74 | | | | How is this useful to policymakers? Better information might be: 1) how big is energy use in buildings, can it be reduced via market price on carbon for less than similar reductions in the electric sector? The goal should not be zero-net-energy use by buildings, but rather reducing emissions at the lowest possible costs. If zero net energy use is less costly than zero emissions from other sources, they should happen first. If the cost of zero net use is more costly, it should happen much later. Economic modeling and experience show that carbon price is most efficient and effective -- help policymakers understand how building energy use responds in that context. | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies becoming available. The section is therefore being restructured for the SOD. |
| 9907 | 6 | 74 | 2 | | | One of the major bottom-up studies that has been done with a great degree of sectoral disagregation is the Raskin, et. Al. 2010 study of four scenarios referenced above. (Sustainability 2010) This study provides far more detail than is described in sections 6.2 and 6.3 of this chapter. The Tellus Institute paper is supported by a 300 plus page Technical Documentation of the Polestar model on the Tellus website www.tellus.org. The link is: http://www.tellus.org/publications/files/TheCenturyAhead_TechDoc.pdf | The suggested publication will be considered for inclusion in the SOD. However, as pointed out by the reviewer, parts of Section 6.3 are probably the place where this information should be |
| 8700 | 6 | 74 | 2 | | | One of the major bottom-up studies that has been done with a great degree of sectoral disagregation is the Raskin, et. Al. 2010 study of four scenarios referenced above. (Sustainability 2010) This study provides far more detail than is described in sections 6.2 and 6.3 of this chapter. The Tellus Institute paper is supported by a 300 plus page Technical Documentation of the Polestar model on the Tellus website www.tellus.org. The link is: http://www.tellus.org/publications/files/TheCenturyAhead_TechDoc.pdf | The suggested publication will be considered for inclusion in the SOD. However, as pointed out by the reviewer, parts of Section 6.3 are probably the place where this information should be |
| 6497 | 6 | 74 | 9 | | | 6.8.2.1 (Sectoral Energy Use Industry, Transport, Human Settlement) and 6.8.3 (Regional (Sectoral) Analysis and Transformation Pathways Industry, Transport, Human Settlement) had better to be aggregated.<br>Because they are similar in the content. | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies |
| 9583 | 6 | 75 | 16 | 75 | 18 | Please, replace here with following; public acceptance is one of the common and major obstacles that should be solved when building new power facilities. | Comment is noted and will be considered as the text is adjusted for the |
| 9584 | 6 | 75 | 20 | | | Please, add the following information; developing infrastructure such as transmissions for new plants take a long lead-time, therefore, it is indispensable to solve the institutional issues for infrastructure development and particular barriers for uncertainty for policy implementation. (ECORYS (2010)<br>“Assessment of non-cost barriers to renewable energy growth in EU Member States “)<br>http://ec.europa.eu/energy/renewables/studies/doc/renewables/2010_non_cost_barriers.pdf<br>ECORYS [1] identified the nine major issues and ranked these issues in order of severity, divided over three groups. According to the study, “most severe types of barriers” include:<br>1) Administrative hurdles like planning delays and restrictions, lack of coordination between different authorities, long lead-times in obtaining authorizations, severe costs for obtaining permission, etcetera.<br>2) Barriers linked to grid connection and access affecting all RES-E technologies, are the second main obstacle - not so much in terms of the physical connection (where administrative and cost issues dominate), but limited priority access with regard to fossil power production, insufficient transport capacity linked to obsolete infrastructure, and limited interconnection capacity may block or at the least delay renewables development.<br>3) Issues related to limited information and awareness include a lack of general knowledge on RES benefits, poor dissemination of support measures, poor knowledge dissemination of pilot and/or demonstration projects and insufficient funding for awareness campaigns. | This point is based on the discussion in the energy systems chapter (Chapter 7) and will be resolved in accordance with the discussion there. |
| 13281 | 6 | 75 | 22 | 75 | 34 | As mentioned earlier, CCS is a key option for decarbonisation in a number of important industry sectors. This is especially true for those sectors, such as cement and iron&steel, that cannot be fully decarbonised with renewables or nuclear, as some of their CO2 output results from chemical reactions | This point has been added in the discussion of economics of mitigation. Depending on space availability we will |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16754 | 6 | 75 | 22 | | 34 | This is not that helpful. What is the significance? In a carbon constrained world with a carbon price, these sectors or commodities would factor in the carbon price. As the price increased, the commodity price or activity costs would increase driving innovation to find substitutes, change processes to reduce emission intensity or otherwise respond to reduce this part of their cost structure. | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies |
| 16030 | 6 | 75 | 26 | | | another 30% or more | This point is based on the discussion in the industry chapter (Chapter 10) and will be resolved in accordance with the |
| 16755 | 6 | 75 | 36 | 76 | 6 | Is the goal in a climate policy to reduce energy use or to reduce carbon emissions? Much of this discussion is based on engineering studies which ignore or overlook many market realities which are not easily dealt with even via a policy. The policy should be emissions focused. The building sector efficiently participates in lowering emissions by responding to the carbon price signal embedded in the delivered energy -- to go beyond this usually means inefficiency -- which is likely unsustainable. | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies |
| 15013 | 6 | 76 | 12 | 76 | 16 | Compared with the description on LDV, this part of aviation is too long. | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies |
| 15115 | 6 | 76 | 12 | 76 | 16 | The statement in this paragraph is not accurate. In 2010, the 37th Session of the Assembly of ICAO endorsed among other things: (1) a global aspirational goal of 2 per cent annual fuel efficiency improvement up to year 2050 ;(2) a medium term global aspirational goal from 2020 that would ensure that while the international aviation sector continues to grow, its global CO2 emissions would be stabilized at 2020 levels and (3) develop a global CO2 Standard for aircraft aiming for 2013. | The FOD version of Section 6.8 is based on an ad-hoc review of the sectoral chapters with an attempt to compare the findings presented in these chapters with the developments in the transformation pathways assessed in Chapter 6. The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire |
| 16757 | 6 | 76 | 23 | | | Recent research re electric vehicles shows that most owners charge their vehicle at home. There is not the need for the massive charging infrastructure frequently cited. You might find these helpful: • Idaho National Labs (which helps run the EV Project – a DOE initiative funded by ARRA): http://avt.inl.gov/index.shtml, http://avt.inl.gov/pdf/EVProj/EVProjInfrastructureQ22012.pdf<br>• UC-Davis (preeminent research institution on PEV driver behavior): http://phev.ucdavis.edu , http://pubs.its.ucdavis.edu/publication_detail.php?id=1470 (groundbreaking study on driver behavior) □ | The FOD version of Section 6.8 is based on an ad-hoc review of the sectoral chapters with an attempt to compare the findings presented in these chapters with the developments in the transformation pathways assessed in Chapter 6. The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire |
| 16767 | 6 | 76 | 23 | | | Re time needed to make infrastructure changes for fuel switch by transport to electricity -- this is true if discussing moving from vehicles to rail perhaps, but if discussing vehicle fuel switch to electricity, there have been several studies that show this may be relatively easy w/out the massive infrastructure change -- most people charge (or will charge) their electric vehicle or plug in electric hybrid vehicle at home in the evening. This is supported by work cited here: • Idaho National Labs (which helps run the EV Project – a DOE initiative funded by ARRA): http://avt.inl.gov/index.shtml, http://avt.inl.gov/pdf/EVProj/EVProjInfrastructureQ22012.pdf<br>• UC-Davis (preeminent research institution on PEV driver behavior): http://phev.ucdavis.edu , http://pubs.its.ucdavis.edu/publication_detail.php?id=1470 (groundbreaking study on driver behavior) □ | The FOD version of Section 6.8 is based on an ad-hoc review of the sectoral chapters with an attempt to compare the findings presented in these chapters with the developments in the transformation pathways assessed in Chapter 6. The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire |

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| 15014 | 6 | 76 | 24 | 76 | 26 | Need to stress that these options are not easy to implement. | Comment is noted and will be considered as the text is adjusted for the |
| 17135 | 6 | 76 | 25 | | | DELETE: modal shift<br>REVISE TO: well harmonized multi-modal transport. | Comment is noted and will be considered as the text is adjusted for the next draft. |
| 16253 | 6 | 76 | 41 | 76 | 42 | I would be hesitant to call spatial planning a "holistic approach". | This point is based on the discussion in the human settlements chapter (Chapter 12) and will be resolved in accordance |
| 8047 | 6 | 76 | 7 | 76 | 11 | This view on transport is too much car centered. We know OECD countries like Japan where public transport has a market share of 50 %. Of course cars are mostly the biggest source of emissions. But in the beginning of this chapter there should not be the car (as the main problem) but the transport structure with its diversity. | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies |
| 16756 | 6 | 76 | 8 | | 26 | Looking at aviation -- fuel is already the largest costs component, so carefully managed. A carbon price embedded in the fuel should be adequate to create economically efficient emission reductions. Producing separate targets based on engineering potential are likely driving uneconomic reductions and distracts policymakers from the true least costs approach. Renewable fuel standards, using bio-energy via liquid fuels, done outside of a comprehensive carbon market that includes land use changes, risks large increase in emissions via increased deforestation. | This point is based on the discussion in the transport chapter (Chapter 8) and will be resolved in accordance with the discussion there. |
| 8048 | 6 | 77 | 23 | 77 | 28 | We know that the cost ($/t CO2) in the transport sector are often higher that in other sectors (with this logic not much should be done in the transport sector). But we know the multiple co-benefits if we reduce CO2-emissions in the transport sector (e.g. modal shift leads to better air, less accidents, livable cities) which often are more important that the value of the CO2 saved. Conclusio: to look only on CO2 is not helpful, mention also the many other co-benefits. | Co-benefits of climate mitigation will be discussed in Section 6.6. |
| 16758 | 6 | 77 | 30 | | 40 | What are the economics of high density vs. low density development? Why are some cities high density and others low density? There is utility in both -- how increase utility/desirability of high density? If CO2 cap includes emissions from land use changes, electricity, industrial activity and direct emissions from fossil fuels, how are cities in different context likely to evolve? Has this been examined anywhere to compared to current development trends? | This point is based on the discussion in the human settlements chapter (Chapter 12) and will be resolved in accordance with the discussion there. |
| 16254 | 6 | 77 | 31 | 77 | 31 | The reference (Müller et al 2011) is wrong: this article has not been published yet (will be submitted in September 2012 to Science). | Reference will be updated. |
| 5233 | 6 | 77 | 6 | | | Emissions from energy conversion are not considered here separately, although a different logics is applied in the chapter 6.8.2.1. | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies |
| 4210 | 6 | 77 | | | | Will LCA approach be touched upon here? | The comparison of sectoral and integrated mitigaiton studies is still work in progress and therefore the entire Section 6.8 is under revision with more information from both sets of studies |
| 9420 | 6 | 78 | | | | There are so many lines and it is difficult to understand this figure and its explanation. It is more informative to analyze relations between sectoral energy use and sectoral CO2 emissions. When discussing sectoral CO2 emissions, it is imporant to clarify whether effects of electricity savings in the demand side are included in the demand side or such electricity saving potentials in the demand side are counted in the Power sector. | The lines have no meaning and were not part of the original document. There seems to have been a conversion error in the preparation of the FOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18642 | 6 | 79 | | | | A box on page 79 discusses mitigation wedges and and MACs. Underlines the methodological problems. No one has ever claimed that it is anything else that a very simplistic way of presententing choices to be made (in relation to an assumed BAU, statical and doesn't mirror dynamics) but it can still be a relevant way to present that there are alternatives laying at our feet. What is the alternative? Expecting that policymakers and the general public should understand the full dynamics? | The box is supposed to create awareness of the methodological problems that some methods frequently used in policy relevant studies have. |
| 16759 | 6 | 79 | 2 | | 10 | Thank you for relating this back to a carbon price. | You are welcome. |
| 16760 | 6 | 79 | 35 | | 46 | Good points! | Thank you. |
| 7474 | 6 | 79 | 6 | 79 | 8 | "The mitigation options differ greatly by activity, regions, system boundaries and the time horizon. Forestry mitigation options - including reduced deforestation, forest management, afforestation, and agro-forestry - are estimated to contribute between 1.27 and 4.23 Gt CO2/yr [0.35 and 1.15 Gt C] abatement in 2030 ---". These are very low figures, especially when the accessible NPP for woody biomass is about 27 Gt C – 98 Gt CO2. This is over 20 times the CO2 estimate for 2010! Thus, using more fully the annual NPP of trees will more than satisfy this meager target. | This point is based on the discussion in the AFOLU chapter (Chapter 11) and will be resolved in accordance with the discussion there. |
| 18626 | 6 | 8 | | | | Page 8: Technology alone will not stabilize greenhouse gas concentrations. | Noted. |
| 12306 | 6 | 8 | 13 | 8 | 13 | Please insert "and sinks" after "emissions". | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. This statement may not |
| 9177 | 6 | 8 | 16 | | 21 | You must refer to SRM - even if you stabilize consentration you may have high climate change impacts. SRM has to be developed as insureance | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. This statement may not |
| 12623 | 6 | 8 | 19 | 8 | 21 | Bioenergy and CCS is a very valid technology but may be constrained by the availability of sustainable biomass. This must be taken into account when estimating the infultration of bio CCS into any overshoot scenario. | Noted. |
| 12666 | 6 | 8 | 19 | 8 | 21 | Bioenergy and CCS is a very valid technology but may be constrained by the availability of sustainable biomass. This must be taken into account when estimating the infultration of bio CCS into any overshoot scenario. | Noted. |
| 4771 | 6 | 8 | 20 | 8 | 20 | Please explicit acronyms: CCS "carbon capture and storage", and CDR "carbon dioxide removal" | Editorial. |
| 13126 | 6 | 8 | 20 | 8 | 20 | Write out CDR, as it appears here for the first time. | Editorial. |
| 2183 | 6 | 8 | 23 | 8 | 43 | The ClimateWorks Australia Low Carbon Growth Plan for Australia (and its 2011 update) should be included in the database. They can be accessed by authors and reviewers at http://www.climateworksaustralia.org/publications.html | Noted. There is an open call for scenarios to support this synthesis. The developers of the highlighted scenario |
| 9834 | 6 | 8 | 23 | 8 | 36 | Where is the database available for the reader? Please provide information. This is also very important concerning the issue on assumptions raised above. The report gains credibility when the public has the possibility to access at least part of the information. | Noted. The database will be made available upon completion of the final draft. |
| 9831 | 6 | 8 | 3 | | | I think you mean "Changes in technology" or "Improvements in technology…" to the degree they are incorporated into baseline scenarios, as the next sentence makes clear. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 9832 | 6 | 8 | 3 | 8 | 21 | Life style has a huge impact and the willingness-to-accept on real-world feasibility and should be considered. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13125 | 6 | 8 | 3 | 8 | 6 | Although I do not seriously doubt this conclusion, I don't think it can be made based on the model outcomes. In other words, technology alone will not bring emissions down unless one expects technologies capable of doing this to emerge and implements them in the model (i.e. low cost, carbon free, high potential technologies. A very optimistic fusion scenario, for example). The current observation is somewhat circular and just indicates that virtually nobody has created such a scenario. One can naturally speculate that this is because such a scenario would seem "unlikely", but one could equally well argue that it's "likely" that the 2100 energy system has aspects that would today be consider "unlikely" - or ones we are currently know nothing about. Qualify the conclusion better. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. If this statement remains, it will be clarified |
| 11369 | 6 | 8 | 3 | 8 | 5 | The statement "Technology alone will not stabilize greenhouse gas concentrations" would preferably need a short reasoning on 'why'. The following two sentences read also very 'isolated'. This should be better connected and justified. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 16686 | 6 | 8 | 3 | | | Insert "improvements absent a CO2 price" after "Technology …" at start of sentence. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 8621 | 6 | 8 | 3 | | | I think you mean "Changes in technology" or "Improvements in technology…" to the degree they are incorporated into baseline scenarios, as the next sentence makes clear. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in |
| 9835 | 6 | 8 | 38 | | | Trade-offs in transition pathways are a very important issue that should be considered more in depth and positioned at a more prominent part of the report. | Noted. |
| 9836 | 6 | 8 | 44 | 10 | 15 | Writing the report from a normative scenario perspective and adding a backcasting approach would increase the possibility to raise the awareness of decision makers, like in this sentence. This perspective could enrich the whole report. The questions given in this part should be positioned in a more prominent place of the report and used as guidelines for structuring. Moreover it might encourage decision-makers to think in options and longterm consequence | Noted. |
| 3072 | 6 | 8 | 44 | 8 | 46 | Same comment as p. 5 lines 3 and 29, above | See response to previous comment. |
| 4190 | 6 | 8 | 44 | 8 | 44 | "dangerous" -- Does it mean "determinstic" or "probabilistic" or both? It seems to me, "possible dangerous" would be better expression. Otherwise, it sounds as if "zero-emission" could avoid all climate risks. | Noted. This phrase may not longer be found in the introduction in the new revisions. Regardless, whether it remains or a similar statement remains in the introduction, we will no longer |
| 13216 | 6 | 8 | 44 | 8 | 44 | In the past, IPCC has always carefully avoided to express an opinion on what is "dangerous", considering that it was a political matter, not a scientific one. Please, don(t use this word when qualifying the most severe emissions reduction discussed by the policy makers | Noted. This phrase may not longer be found in the introduction in the new revisions. Regardless, whether it remains or a similar statement remains in the introduction, we will no longer |
| 14394 | 6 | 8 | 46 | | | “Co2 emissions … must eventually be brought to or below zero.” This is flat out wrong. According to IPCC SAR4, Scientific, p. 512, there is a natural exit of 3.3 GtC (12.1 GtCO2) from the atmosphere annually. So at stabilization there could be new emissions of at least this amount, not requiring going to zero. Since most abatement cost models show extremely non-linear cost curves as emissions are cut toward zero, it is misleading and unduly pessimistic to assert that emissions must be cut to zero. My figure for the required target for CO2 emissions to achieve 450 ppm stabilization is 1.4 tCO2 per capita per year. | Noted. The introduction is being revised and the ordering and nature of points that it makes will be different in the SOD. If this statement remains, it will be clarified |
| 13127 | 6 | 8 | 46 | 9 | 1 | I assume this comment has been left in accidentally? | Noted. |
| 14452 | 6 | 8 | 46 | | | CO2 emissions can never be zero, all animals respire CO2 and organic matter decomposes. Do you mean net fossil-fuel and LUC derived CO2 emission must be zero? This concept must be edited for accuracy. | Noted. The introduction is being revised and the ordering and nature of points that it makes will be different in the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15426 | 6 | 8 | 46 | 9 | 1 | It's not clear how /if this author comment will be integrated in the text; in our opinion, it should not be integrated in the text; if it is integrated, it should in no way weaken the statement that CO2 emissions must be brought down to or below zero. No credible scientist has suggested that the existence of geoengineering would change the need to dramatically and immediately reduce CO2 emissions -- in fact, scientists involved in geoengineering research have made assurances that geoengineering SHOULD NOT and WOULD NOT dilute or detract from mitigation efforts. | Noted. |
| 14393 | 6 | 8 | 7 | | | Need to translate 2.6 W/m2. Using 0.3°C/W-2 as the direct warming effect and 1.9 as the multiplier to get total including feedback, each W-2 translates to 0.57°C (with climate sensitivity at 3°C for doubling). So the target of 2.6 represents an extremely ambitious limit of 1.5°C. The usual 2°C limit would be 3.5 W-2. That is the border between category 2 and 3. Are the authors trying to insert an unusually ambitious goal through the back door? | Noted. At a climate sensitivity of 3 W/m2, long-term equilibrium RF of 2.6 Wm2 is equivalent to 2 degrees of warming. At the same time, the transient temperature could be very |
| 9833 | 6 | 8 | 7 | | | This sentence raises other critical issues. This line says "Many integrated models are unable to produce scenarios …". What I think this sentence should say to be properly qualified is "Given the sets of input assumptions utilized in some integrated assessment models when running the 2.6 W/m2 stabilization scenario, including limits on the availability of certain supply-side and higher efficiency end-use technologies..." Again, part of my point is that the models are not the problem, it's the input assumptions that yield certain results given the model structures. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. If this statement remains, it will be clarified |
| 8622 | 6 | 8 | 7 | | | This sentence raises other critical issues. This line says "Many integrated models are unable to produce scenarios …". What I think this sentence should say to be properly qualified is "Given the sets of input assumptions utilized in some integrated assessment models when running the 2.6 W/m2 stabilization scenario, including limits on the availability of certain supply-side and higher efficiency end-use technologies..." Again, part of my point is that the models are not the problem, it's the input assumptions that yield certain results given the model structures. | Please see the response to comment 9833, which appears to be a duplicate of this comment, despite being submitted by another reviewer. |
| 11371 | 6 | 8 | | | | Despite being an introduction section, references to literature are required for certain statements, where especially also 'literature' is being mentioned | Noted. |
| 6905 | 6 | 8 | 44 | 8 | 46 | Missing reference to support this rather strong statement (actually true for the entire section!). Please refer to WGI AR5 (or to the WGI TAR or the WGI AR4) for the physical science basis to support this statement. | Noted. Referencing will be improved in the SOD. |
| 6536 | 6 | 8 | 46 | | | Replace "be brought to or below zero" with e.g. "be reduced significantly" in accordance with AR4 WG1 Report Figure 10.21, or give a reference paper. | Noted. The introduction is being revised and the ordering and nature of points that it makes will be different in the |
| 6904 | 6 | 8 | 16 | 8 | 18 | Suggest to refer to WGI AR5, Ch12, in relation to stabilization, allowable emissions, and projected climate change in the underlying assessment supporting this statement. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. If such a statement remains, it |
| 10982 | 6 | 8 | 18 | 8 | 19 | The reasons why "pathways increased flexibility in the near-term implies deeper reductions in the long-term" are not clearly stated. | Noted. The ES is being substantially revised and the ordering and nature of points that it makes will be different in the SOD. If this statement remains, the |
| 2426 | 6 | 80 | 10 | 80 | 13 | This is a weird statement. One can always make a confident summary of current understanding, even if the understanding is low. I can confidently say that we don't know about something. Or do the authors mean something else? I would question the statement that there is a "deep body of policy analytic literature" on iron fertilization. | text completely revised, comment no longer applies |
| 15430 | 6 | 80 | 14 | | | DELETE: "usefully" -- subjective (rhetorical) adjective is unnecessary and, in this context, inappropriate. | text completely revised, comment no |
| 8510 | 6 | 80 | 15 | 80 | 15 | What is “geosphere”? May be “lithosphere”? | text completely revised, comment no |
| 8511 | 6 | 80 | 18 | 80 | 18 | “Biochar” is not a “technology”. A reader can understand this slang if a list of methods and their characteristics is presented previously. | The term "methods" was decided upon |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2424 | 6 | 80 | 20 | 80 | 42 | I think the case for iron fertilisation is somewhat overdone. It is not clear why more than a third of the section is devoted to iron fertilisation given the current uncertainties on C export to the deep ocean. | In the final presentation iron fertilization receives a more proportianate coverage |
| 2425 | 6 | 80 | 20 | 81 | 9 | This text should cross-reference Chapter 6 of WGI assessment. In fact, most of it could be removed if Chapter 6 is cross-referenced, which would free up some space to discuss WGIII specific issues on CDR. | The section was rewritten and connections to the relevant parts of the |
| 13740 | 6 | 80 | 20 | 80 | 20 | It is possible (add:) to a certain degree... | text completely revised, comment no |
| 15431 | 6 | 80 | 21 | | 42 | What is missing from this summary is the assertion by scientists that iron fertilization, as a climate change response strategy, should be abandoned. See, for example, A. Strong, J. Cullen, and S. W. Chisholm. (2009) Ocean Fertilization: Science, Policy, and Commerce, in Oceanography: Vol. 22, No. 3, 236-261 and Strong et al., "Ocean fertilization: time to move on," Nature 461, 347-348 (17 September 2009) \| doi:10.1038/461347a, published online 16 September 2009 and CBD Technical Series 45, "Scientific Synthesis of the Impacts of Ocean Fertilization on Marine Biodiversity," 2009. Because of possible negative impacts and the lack of scientific justification for pursuing it as a climate change response, iron and other forms of ocean fertilization have been subject to a de facto moratorium in the Convention on Biological Diversity since 2008; the moratorium was strengthened in 2010 and reaffirmed at the Rio+20 UNCSD 2012 conference. (Rio+20 outcome document, "The Future We Want," 2012, para 168: "We stress our concern about the potential environmental impacts of ocean fertilization. In this regard, we recall the decisions related to ocean fertilization adopted by the relevant intergovernmental bodies, and resolve to continue addressing with utmost caution ocean fertilization, consistent with the precautionary approach." [online] http://www.uncsd2012.org/thefuturewewant.html) | The authors avoided such strong policy recommendations and instead focused on identifying limits and issues of the various methods. |
| 15432 | 6 | 80 | 24 | | | INSERT: "intended" -- i.e., "the intended net effect" | text completely revised, comment no |
| 2427 | 6 | 80 | 25 | 80 | 25 | "a given ATMOSPHERIC input of fossil carbon" | text completely revised, comment no |
| 15433 | 6 | 80 | 26 | | | INSERT A NEW SENTENCE after "…fossil carbon:" "The assumption that this would result in permanent sequestration has been challenged." See, for example, A. Strong, J. Cullen, and S. W. Chisholm. (2009) Ocean Fertilization: Science, Policy, and Commerce, Oceanography: Vol. 22, No. 3, 236-261 and Strong et al., Nature 461, 347-348 (17 September 2009) \| doi:10.1038/461347a, published online 16 September 2009. | text completely revised, comment no longer applies |
| 2428 | 6 | 80 | 27 | 80 | 27 | "mass ratio" | text completely revised, comment no |
| 8512 | 6 | 80 | 28 | 80 | 28 | Sulfur is a macro-component of sea salt. It is not considered as a critical nutrient for marine biota. It cannot be used for “ocean fertilizing”. May be “sulfur” is mistakenly used instead of “phosphorous”? | text completely revised, comment no longer applies |
| 15434 | 6 | 80 | 29 | | 30 | INSERT after: costs are expected to be low (Shepherd et al. 2009): "though disruptions to the marine ecosystem, including the marine food web, are expected to be significant." (A. Strong, J. Cullen, and S. W. Chisholm. (2009) Ocean Fertilization: Science, Policy, and Commerce, in Oceanography: Vol. 22, No. 3, 236-261 and Strong et al., "Ocean fertilization: time to move on," Nature 461, 347-348 (17 September 2009) \| doi:10.1038/461347a, published online 16 September 2009 and CBD Technical Series 45, "Scientific Synthesis of the Impacts of Ocean Fertilization on Marine Biodiversity," 2009) | the following is included in the brief paragraph outlining ocean iron fertilization: "There are a number of possible risks including downstream decrease in productivity, expanded regions of low oxygen concentration and increased N2O emissions (See WGI |
| 9908 | 6 | 80 | 4 | | | I would either omit section 6.9 or greatly shorten it. The grounds for omitting it are that geoengineering technologies have never been carefully integrated into climate mitigation scenarios, and certainly not by IAMs. Furthermore the lack of knowledge of the physics, chemistry, and economics of geoengineering schemes are so great at this time as to make most discussions of these possibilities almost pure speculation. | The literature on solar geoengineering now spans many hundreds of papers published over many decades. That literature in turn rests on a body of scientific knowledge of climate that is substantially the same as the body required to understand the climate impacts of greenhouse gases and |

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| 8701 | 6 | 80 | 4 | | | I would either omit section 6.9 or greatly shorten it. The grounds for omitting it are that geoengineering technologies have never been carefully integrated into climate mitigation scenarios, and certainly not by IAMs. Furthermore the lack of knowledge of the physics, chemistry, and economics of geoengineering schemes are so great at this time as to make most discussions of these possibilities almost pure speculation. | Same as previous |
| 8509 | 6 | 80 | 4 | 80 | 5 | The title of section 6.9 might be unclear for a reader. What is “carbon”? What “radiation” should be managed? What should include “environmental risks”? It could be better to use the following title: “Geo-engineering approaches to prevent global warming”. | the title distinguishes between the different approaches to geoengineering due to their heterogenity. The need to distinguish different approaches due to the very different potentials and risks they pose is a key message of the |
| 8052 | 6 | 80 | 4 | 82 | 39 | In this paragraph on geoengineering I miss the political aspect on some of the drivers. We see the fossil fuel industry as a driver - there some who have been climate deniers for a long time, they did not want mitigation, and now they say it is too late for mitigation we have to go to geoengineering. | This is not the place for political analysis. |
| 3147 | 6 | 80 | 4 | | | section 6.9 (on geoengineering) sticks out and doesn't belong here. What does geoengineering have to do with transition pathways? | Answer: ??? (I personally agree that it makes little sense to have geoengineering in this chapter but it is a |
| 8050 | 6 | 80 | 42 | 80 | 42 | the wording 'with a wide variety of potential benefits and impacts' sounds too positive having in mind the 'large-scale disruption to ecology of the ocean'. Write at least 'with a wide variety of potential benefits and large negative impacts' | text completely revised, comment no longer applies |
| 16761 | 6 | 80 | 43 | 81 | 21 | This is very clearly written and logical -- helpful! | text completely revised, comment no |
| 13739 | 6 | 80 | 7 | 80 | 7 | Insert before "a diverse": " As global emissions continue to surpass the expectations deployment of carbon negative technologies can be seen as a requirement to stay below 2 degrees of warming in this century (de Elzen et al., 2012)." | text completely revised, comment no longer applies |
| 3285 | 6 | 80 | 4 | | | The two subsections (6.9.1 and 6.9.2) take very different angles to approach the two broad types of geoengineering (CDR and SRM) and would benefit from harmonization. | No specific suggestions for harmonization were provided so it is |
| 8508 | 6 | 80 | 4 | | | In section 6.9 (between 6.9 and 6.9.1) the main principles of geo-engineering should be presented: (a) definitions of SRM and CDR; (b) difference between SRM and CDR; (c) goals of SRM and CDR implementation; (d) conditions of beginning and stopping of SRM and CDR implementation (timescale of implementation); (e) potential efficiency of different geo-engineering methods (or potential forcing). The objective of geo-engineering formulated in 6.9 should correspond to formulations given in the Introduction: “to prevent abrupt or catastrophic damages which can be provoked by possible climate crisis”. It should be kept in mind that geo-engineering of CDR type deals with GHG removal ONLY FROM THE ATMOSPHERE (not from smoke gases in the industry). | We agree that more clarity about timescale would be beneficial. The link tying geoengineering to abrupt climate change is too strong, this is but one of a set of arguments advanced for the possible use of geoengineering. |
| 6285 | 6 | 80 | 5 | 80 | 6 | One outcome of the IPCC Experts Meeting on Geoengineering which was held in Lima in 2010 was that there would be a statement to the effect: "While the term "geoengineering" is used in some discussions of what can be done to address climate change, that term does not have a specific scientific or technical meaning that is understood across many different research cmmunities. Therefore, this section will discuss the two distinct research topics of "Carbon Dioxide Removal" and "Solar Radiation Management" that are often lumped under this broader term of "geoengineering." This could serve as a short block of text that separates the boldfaced headers for Sections 6.9 and 6.9.1. | Yes. |
| 6290 | 6 | 80 | | 81 | | A general note on section 6.9.1, this section is pretty light on references to the peer reviewed literature. For key points, I would suggest citing more (perhaps many more) peer reviewed papers. For example, there is a large literture about the potential role of BECCS and more than just the Wise et al, 2009 paper should be cited here. The short paper by Dooley in the IPCC Geoengineering Experts meeting cites a number of these papers on the role of BECCS and some of those peer reviewed paper (and not the Dooley summary) should be cited here. | OK. |

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| 6287 | 6 | 80 | 11 | 80 | 13 | The authors of Chapter 6 need to figure out what should be covered in Section 6.9. If the focus of Section 6.9 is narrowly defined to be what does the peer reviewed literature tell us about the role of CDR and SRM in "Transformation Pathways" then I think this sentence ought to read that it is only for BECCS that there is a robust literature about how SRM and CDR play in Transformation Pathways. Yes there is a literaure about iron fertilization but it is an engineering, ecological and earth system science focused literature and not a literature about how iron fertilization fits into a portfolio of potential responses to cliamte change. That is a question for the authors of Chapter 6 is should there be a clear emphasis about what is known and more importantly not known about how CDR and SRM fit into "Transformation Pathways" and less a description of the basic technologies absent this sense of how they fit into a broader set of actions? Also any sentence that says there is a sufficiently deep body of scientific and policy analytic literature ought to have way more than two citations. | True, there is little in the literature on transformatoin pathways |
| 6289 | 6 | 80 | 20 | 81 | 3 | There is nearly a page devoted to ocean fertilization but at the end the reader has no better understanding of how does this concept of ocean fertilization fit into "Transformation Pathways." Is ocean fertilization 100% of the solution to anthroprogenic climate change or 0.01%? Is it really cheap and therefore something that would be done early (assuming a Hotelling like price path for GHC emisssions to the atmosphere) or is it very expensive? I am not suggesting that Chapter 6 needs to answer these questions but I do think the authors and review editor(s) for Chapter 6 neeed to think about wheter in the context of Chapter 6 or WGIII's contribution to AR5 it is better to devote a page telling the reader about the basic biological and biogechemical processses involved in ocean fertilization. Or is it better to point the reader to good technical literature that describes the potential processes for iron fertilization and then devote the text here to making it clear that before AR6 comes around there is a pressing need to understand how this class of CDR activities would fit into "Transforamtion Pathways." Compare the text on ocean fertilization to the text two paragraphs down about BECCS and DAC. BECCS and DAC are also complex systems but the reader is (appropriately) not walked through whether it is better to use NaOH or something else to capture CO2 from the air or the specifics of the configuration of the DAC units or other critical technical details. For the purpose of this chapter the discussion of DAC, BECCS and biochar seem to be at the right level and hit the points that are relevant for a discussion of "Transformation Pathways." | In the final report iron fertilization receives a more proportianate coverage with a little over one paragraph. |
| 4309 | 6 | 80 | 45 | 81 | 3 | the possibility to add alkalinity to the oceans might be workig in theory, but in practice it poses a large challenge. thus, it is not only risky and expensive, but also highly impractical (see Borel, B. (2008): Cleaning up CO2 with a twist of lime. Cosmos Magazin. http://www.cosmosmagazine.com/node/2117) | The paragraph on enhanced weathering notes the idealized nature of some studies and points to a number of risks and limitations and concludes that "The confidence level on the carbon cycle impacts of enhanced weathering is low" |
| 4311 | 6 | 80 | 6 | 81 | 21 | all CDR-approaches involving BE-CCS or DAC have the same storage-obstacles common CCS has. (see IPCC special report on CCS). That has to be noted in this particular section to make it more balanced. | the final report notes: "Carbon captured through CCS, BECCS and DAC are all intended to use the same storage reservoirs (in particular deep geologic |

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| 6919 | 6 | 80 | 6 | | | This section mostly focuses on the assessment of the physical science basis of specific geoengineering options. However, this component of the assessment of Geoengineering is done in WGI AR5 and a reassessment here in WGIII Ch6 must be avoided to avoid unnecessary overlap and potential inconsistency within the WG AR5 assessment. Rather than producing your own assessment, reference to WGI AR5, Chapter 6 should be made for a comprehensive assessement of the physical science basis of CDR. We suggest to also consider the cross-WG IPCC Expert Meeting Report on Geoengineering held in June 2011 (IPCC, 2012: Meeting Report of the Intergovernmental Panel on Climate Change Expert Meeting on Geoengineering [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, C. Field, V. Barros, T.F. Stocker, Q. Dahe, J. Minx, K. Mach, G.-K. Plattner, S. Schlömer, G. Hansen, M. Mastrandrea (eds.)]. IPCC Working Group III Technical Support Unit, Potsdam Institute for Climate Impact Research, Potsdam, Germany, pp. 99. ). | This section has been rewritten and expanded. It was decided to gives an accessible overview of the physical scence before exploring the other relevant issues. Sections 6.9.1.2, 6.9.2.2 and 6.9.3 give this broader perspective |
| 6286 | 6 | 80 | 7 | 80 | 11 | Consider moving the sentence about there being many different CDR techniques and we don't know that much about how they would play out in practice up into the short section suggested to separate Section 6.9 and 6.9.1 and make it a more general statement about CDR and SRM. Then cite the many reports that stress this point that there are lots of potential ideas but few if any have really been fleshed out or tested in the real world (we have nuclear power plants and we have half a century of opperational data from them, there is no comperable body of knowledge for anthroprogenic CDR or SRM schemes). This point needs to be front and center before the individual technologies are discussed. IPCC, Meeting Report of the Intergovernmental Panel on Climate Change Expert Meeting on Geoengineering, O. Edenhofer, et al., Editors. 2012, IPCC: Potsdam, Germany. p. 108 Vaughan, N.E. and T.M. Lenton, A review of climate geoengineering proposals. Climatic Change, 2011. The Royal Society, Geoengineering the climate: Science, governance and uncertainty, 2009, The Royal Society: London. p. 98. Asilomar Scientific Organizing Committee, The Asilomar Conference Recommendations on Principles for Research into Climate Engineering Techniques, 2010, Climate Institute: Washington DC. p. 40. | The final report notes carefully the limits to current knowledge on these methods. |
| 6288 | 6 | 80 | 7 | 81 | 21 | At the IPCC experts meeting on geoengineering there was considerable discussion about not throwing everything under the header of CDR. In particular, there was push back as to whether things like no till agriculture, afforestation, and potentially even BECCS should be included under CDR. The reason for not including changes to agricultural practices and forestry under CDR is that these are already well developed concepts with their own literature and even accounting rules and that nothing is gained by including them under CDR/geoengineering. I think I would leave DAC, BECCS, biochar and ocean fertilization in this section 6.9 but I would seriously consider removing much of the "traditional" terrestrial management things from this discussion. | Yes |
| 2429 | 6 | 81 | 1 | 81 | 1 | I assume you mean "atmosphere" rather than "biosphere" here. | text completely revised, comment no |
| 8051 | 6 | 81 | 10 | 81 | 16 | This sounds as if this technology had no problems with acceptance. We know the SR on CCS and the optimistic expectations, but since then much of the optimism on CCS projects has vanished. Please reflect shortly that BECCS could meet the same problems, and the question where the huge amount of biomass would come from is equally an open one. | These issues are covered in the final draft. |
| 2430 | 6 | 81 | 12 | 81 | 14 | Is this "summary" still up to date? | This section has been rewritten, updated |
| 2431 | 6 | 81 | 14 | 81 | 16 | The sentence contradicts itself: the cost of BECCS is similar to coal with CCS although the cost of biomass is unrelated to coal. I suspect you mean the cost of the CCS is similar for BECCS and for a coal-fired power plant. However the two technologies achieve different things: coal+CCS produces (almost) carbon-free energy, BECCS produce energy and (ideally) withdraws carbon from the atmosphere. | text completely revised, comment no longer applies |
| 15436 | 6 | 81 | 14 | | | After "comprehensive summary." INSERT A NEW SENTENCE: "However, safe and permanent storage of CO2 is a major hurdle; leaked CO2 could have significant negative impacts (Shaffer, 2010)." See Gary Shaffer, "Long-term effectiveness and consequences of carbon dioxide sequestration," Nature Geoscience, 3, 464 – 467 (2010) Published online: 27 June 2010 \| doi:10.1038/ngeo896 | text completely revised, comment no longer applies |

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| 14337 | 6 | 81 | 23 | 81 | 25 | The text emphasises the "fact" that SRM would act quickly. However, recent studies havemitigated this prospect. Cf. Williamson, P., Watson, R.T., Mace, G., Artaxo, P., Bodle, R., Galaz, V., Parker, A., Santillo, D., Vivian, C., Cooper, D., Webbe, J., Cung, A. and E. Woods (2012). Impacts of Climate-Related Geoengineering on Biological Diversity. Part I of: Geoengineering in Relation to the Convention on Biological Diversity: Technical and Regulatory Matters. Secretariat of the Convention on Biological Diversity. Montreal, Technical Series No. 66 | Most of a paragraph is now devoted to the issues of geological storage. |
| 13741 | 6 | 81 | 23 | 81 | 23 | Rephrase: "The feature that makes SRM special for climate policy is the very quick response of climate variables upon its successful deployment (Shepherd et al. 2009)." | text completely revised, comment no longer applies |
| 8515 | 6 | 81 | 23 | 81 | 23 | “Role” cannot act quickly or slowly. SRM methods can. | text completely revised, comment no |
| 8514 | 6 | 81 | 23 | 81 | 24 | It is appropriate to add two references: Budyko, 1982 (Budyko, M.I. 1082. The Earth’s Climate: Past and Future. New York: Academic Press) and Izrael, 2005 (Izrael, Yu.A. 2005. An efficient way to regulate the global climate is the main objective of the solution of the climate problem. Russian Meteorology and Hydrology, No. 10, pp. 1-4) | text completely revised, comment no longer applies |
| 15437 | 6 | 81 | 23 | | | Section 6.9.2. should be considered for deletion due to the speculative and controversial nature of SRM. At the very least, the section needs an introduction that conveys the speculative / theoretical nature of SRM, such as the following: At the beginning of line 23, INSERT: Blocking or reflecting sunlight away from the earth (so-called Solar Radiation Management) is a controversial proposition because it has the potential to cause significant environmental damage, including releasing additional GHGs into the atmosphere, changing weather patterns (including reducing rainfall), damaging the ozone layer, diminishing biodiversity, reducing the effectiveness of solar cells, and risking sudden and dramatic climatic changes if the efforts are stopped, either intentionally or unintentionally. SRM will not address the problems of atmospheric GHGs or ocean acidification and could even worsen ocean acidification and ozone depletion. (Robock A., Oman L. & Stenchikov G. [2008]. Regional climate responses to geoengineering with tropical and Arctic SO2 injections., J. Geophys. Res., 113, D16101, doi: 10.1029/2008JD010050.) Political questions are equally critical: Who controls the Earth’s thermostat? Who will make the decision to deploy if such drastic measures are considered technically feasible and with whose consent? If something goes wrong, who is responsible for the damages? (See ETC Group, Geopiracy, The Case Against Geoengineering, 2010 [online] http://www.etcgroup.org/content/geopiracy-case-against-geoengineering) | SRM was included in the final report given the growing literature base and public and policy awareness. The final report is substantially altered from the earlier draft form and much care has been taken to note technical uncertainties and risks but also the socio-political and ethical issues that SRM raises. |
| 8516 | 6 | 81 | 26 | 81 | 26 | SRM methods do not “mask”. Cooling effect caused by them counteract warming effect caused by GHGs. | text completely revised, comment no |
| 13742 | 6 | 81 | 28 | 81 | 29 | Rephrase: "Emissions reductions result in mitigation of climate change on time-scales of more than decades because of the inertia inherent in the carbon cycle. On the century timescale, however, only the reduction of emissions and sequestration of GHGs can reduce the long-run climate risk; SRM might provide rapid cooling for only both a limited time and limited level of GHG concentrations. ..." | We do not think this text makes sense because it (falsely) condones acceptance of the idea that SRM would be used to provide rapid cooling. Since many climate impacts depend on the rate of temperature change it is hard to |
| 8517 | 6 | 81 | 30 | 81 | 30 | It would be better to add the word “concentrations”: …only reduction of concentrations of long lived GHG can reduce… | text completely revised, comment no longer applies |
| 2423 | 6 | 81 | 34 | 81 | 43 | This paragraph does not bring much and could be deleted if space is needed. | text completely revised, comment no |
| 8961 | 6 | 81 | 34 | | | This claim is not true. Public understanding, as well as technical understanding is minimal. | This claim is no longer made |
| 13743 | 6 | 81 | 34 | 81 | 34 | Rephrase "Scientific understanding and public understanding of SRM is, though growing rapidly, still very limited (Shepherd et al. 2009); (Mercer et al., 2011)." | "Very" limited is a value judgment. It is objectively true that with a doubling time of about two years the growth in |
| 8962 | 6 | 81 | 38 | | 44 | Scientiic opinions should be weighed, not counted. Joseph Henry ca. 1850. The claims here are meaningless. | text completely revised, comment no longer applies |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8518 | 6 | 81 | 43 | 81 | 43 | It is appropriate to add a separate paragraph: “Along with theoretical investigations (Izrael et al. 2007 – Izrael Yu.A., Borzenkova I.I., and Severov D.A. 2007. Role of stratospheric aerosols in the maintenance of present-day climate. Russian Meteorology and Hydrology, No 10, pp. 1-4) some limited field experiments related to SRM were conducted lately in Russia (Izrael et al. 2011 – Izrael Yu.A., Zakharov V.M., Ivanov V.N. et al., 2011. Field experiment to simulate influence of aerosol layers on changeability of solar insolation and meteorological characteristics of the atmospheric boundary layer. Meteorology and Hydrology, No 11, pp. 5-14, in Russian). The results of the experiments to study interaction of solar radiation with artificial aerosols and natural cloud layers demonstrated that reduction of radiation flux led to relatively fast reaction of temperature and turbulent heat fluxes within atmospheric boundary layer. It was shown that partial screening of the surface by aerosol can be considered as effective means for control of solar radiation intensity and temperature regime of air boundary layer. There are broad prospects for international cooperation to carry out field experiments of different scale under the auspices of World Meteorological Organization. | WG1 covers more of the technological and physical science basis and as such WG3 is not the appropriate venue for this issue. |
| 8519 | 6 | 81 | 44 | 81 | 48 | The effectiveness of a geo-engineering method is its capability to compensate (partly of fully) positive radiative forcing caused by GHGs. The effectiveness of SRM and inability of SRM to compensate effects of GHGs perfectly on regional scale are absolutely different things. The effectiveness of space-based and stratospheric-based RGM methods are not limited on global scale (Lenton T.M. and Vaughan N.E., 2009. The radiative forcing potential of different climate geoengineering options. Atmos. Chem. Phys. Discuss., vol. 9, pp. 2559-2608; The Royal Society, 2009. Geoengineering the climate: Science, governance and uncertainty. ISBN: 978-0-85403-773-5, 83 p.). Indeed, theoretically it is possible to compensate perfectly any change of a climatic parameter (global averaged) by SRM but due to different physical basis of greenhouse warming and SRM regional distribution of the parameters will be different. | We do not believe this citation materially as to the understanding of geoengineering, so we propose not to include it on account of the space constraints. |
| 15435 | 6 | 81 | 9 | | | At end of line 9, INSERT: In all cases, permanent (or even medium-term) sequestration has not been established. (A. Strong, J. Cullen, and S. W. Chisholm. (2009) Ocean Fertilization: Science, Policy, and Commerce, in Oceanography: Vol. 22, No. 3, 236-261 and Strong et al., "Ocean fertilization: time to move on," Nature 461, 347-348 (17 September 2009) \| doi:10.1038/461347a, published online 16 September 2009 and CBD Technical Series 45, "Scientific Synthesis of the Impacts of Ocean Fertilization on Marine Biodiversity", 2009) | This section notes a number of limitations of ocean iron fertilization and raises the issue of the longevity of carbon storage in general however section 6.5.3.2 covers these specific issues in more detail. |
| 4310 | 6 | 81 | 14 | 81 | 16 | Biomass is currently a decentral form of energy while CCS necessarily requires a centralized system. The comination of both has so far only been on a theoretical level and migh in practice require a different mode of biomass-“production“ (large plantations, infrastructure...). This has an impact on costs and overall CO2-mitigation levels (UBA 2011, S.23, Aznar, c., Lindgren, K., Larson, E. & Möllersten, K. (2006): Carbon capture and storage from fossil fuels and biomass – costs and potential role in stabilizing the atmosphere. Climatic Change, Volume 74, Numbers 1-3 / Januar 2006, S. 47-79.) | BECCS is covered alongside other CDR techniques and a number of limitations are noted both in section 6.9.1.1 and 6.9.1.2 but are covered in more detail in section 6.5.1 of WG1 |
| 6291 | 6 | 81 | 20 | 81 | 22 | It is probably true that the Socolow APS study of DAC is the only broad-based study and I think that study is accurately described here, however this is an IPCC assessment of the peer reviewed literature and I think peer reviewed papers on the cost of DAC also ought to be cited. Zenz House, K., et al., Economic and energetic analysis of capturing CO2 from ambient air. PNAS, 2011. Baciocchi, R., G. Storti, and M. Mazzotti, Process design and energy requirements for the capture of carbon dioxide from air. Chemical Engineering and Processing, 2006. 45(12): p. 1047-1058. in additon to work produced by Keith et al and Lackner et al should probably be cited here too. | The report has been updated and a broader range of literature has been cited. Section 6.5.1 of WG1 covers this particular issue in more depth. |

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| 9585 | 6 | 81 | | | | Please, take into account the following information in the text;<br>The other key geo-engineering mechanism, Solar Radiation Management (SRM), is suggested as a low-cost climate change intervention tool that may temporarily alleviate climate change. More is known about SRM as scientific research into the field continues and research programs are sponsored. Nevertheless, the inherent efficacy of SRM remains limited as it cannot perfectly compensate for the effects of the proliferation of green house gases.<br>A critical climate issue is the serious problem of the decrease in the pH of the Earth's oceans. The increased levels of anthropogenic CO2 in the atmosphere have already caused significant ocean acidification during the past decades and the rate of ocean acidification is ever increasing [1]. Hoegh Guldberg et al., in an academic paper on climate change effects on coral reefs [2], project that ocean acidification will bring about an oceanic pH drop of 0.4 pH units by the end of this century, with ocean carbonate saturation levels potentially falling below levels necessary to sustain coral reef accretion by 2050. An IPSO backed expert workshop summary report [3] contends that acidification increases the susceptibility of corals to bleaching, changes the behaviour and toxicity of heavy metals and may reduce the limiting effect of iron availability on primary production in some parts of the ocean.<br>Consequently, as a result of the above, the environmental and societal impact is clearly huge. Stabilizing and turning around the effects of climate change on the oceans is a long-term task, according to the National Oceanic and Atmospheric Administration (NOAA) chief Jane Lubchenco [4].<br>The United Kingdom's Parliamentary Office of Science and Technology published a short briefing note on geo-engineering research in 2009 [5]. It mentions the significant uncertainty intrinsic in models predicting SRM effects. The note hinted that climate outcomes not foreseen by modelling might arise and, importantly, it also states that SRM 'has no effect on the other consequences of elevated CO2 levels such as ocean acidification.' The publication goes on to report that solar radiation management techniques 'can do nothing except buy time for efforts to reduce atmospheric CO2 to succeed as they do not address the root causes of climate change.'<br>Similarly, the IPCC Meeting Report of the Intergovernmental Panel on Climate Change Expert Meeting on Geoengineering [6] emphasises that whilst SRM may impact precipitation patterns on a regional basis, SRM by itself offers no substantial solution for CO2-induced ocean acidification. Likewise, in a paper published by the Royal Society, it is said that SRM techniques will not address effects caused by increased concentrations of atmospheric greenhouse gases, such as ocean acidification [7].<br>Therefore, it may be prudent to include such an inherent shortcoming in the draft section on SRM and its related capabilities and limitations.<br>[1] Gangjian Wei, Malcolm T. McCulloch, Graham Mortimer, Wengfeng Deng and Luhua Xie. (2009) Evidence for ocean acidification in the Great Barrier Reef of Australia. Geochimica et Cosmochimica Acta. Volume 73, Issue 8, Pages 2332–2346<br>http://dx.doi.org/10.1016/j.gca.2009.02.009<br>[2] Hoegh-Guldberg, et al. (2007). Coral Reefs Under Rapid Climate Change and Ocean Acidification. Science. Vol. 318 no. 5857 pp. 1737-1742<br>http://dx.doi.org/10.1126/science.1152509<br>[3] Rogers, A.D. & Laffoley, D.d'A. 2011. International Earth system expert workshop on ocean stresses and | |
| 8399 | 6 | 81 | | | | Since this section focuses on risks, the risk due to cessation of SRM should be mentioned, a risk that is proportional to the amount of SRM used. (Coordinated with Chapter 13, which also discusses SRM) | In the revised section the risks of SRM are covered in greater detail than in the |
| 3286 | 6 | 81 | 22 | | | This subsection completely ignores the literature on other types of SRM than stratospheric aerosol injections. While the stratospheric injections have been the most extensively studied method, there is a considerably body of literature especially on cloud brightening but also on surface albedo modification (there are too many publications to be listed in detail here; they can be easily found with little effort). I also find the cited literature biased toward a couple of North American research groups, and e.g. the European studies on the feasibility and effects of different SRM methods are ignored. In addition, some of the major risks related to SRM methos (such as termination effects, ocean acidification, potential hydrological changes related to monsoon circulation and rainfall in the Amazon region, etc.) merit more discussion. | The section has been rewritten and now covers a range of SRM methods which are covered in more detail in section 7.7.3. |

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| 6920 | 6 | 81 | 22 | | | This section mostly focuses on the assessment of the physical science basis of specific geoengineering options. However, this component of the assessment of Geoengineering is done in WGI AR5 and a reassessment here in WGIII Ch6 must be avoided to avoid unnecessary overlap and potential inconsistency within the WG AR5 assessment. Rather than producing your own assessment, reference to WGI AR5, Chapter 7 should be made for a comprehensive assessement of the physical science basis of SRM. | Answer: we will ensure that better coordination with WG1. |
| 6292 | 6 | 81 | 23 | 81 | 24 | Suggest striking the first sentence here and moving the citations at the end of the current first sentence to the end of the current second sentence. Both sentences say the samething but the current second sentence is more informative and uses more technically precise terminology "decades" as opposed to "quickly." | text completely revised, comment no longer applies |
| 6293 | 6 | 81 | 28 | 81 | 29 | Suggest striking sentence that beggins with "Emissions mitigation neceearily…" This point about the relative time scales of mitigation and SRM is made at least three times in this opening paragraph. This can be said once. Also the repetition of this point makes it sound as if these things are substitutes as opposed to commpliments. In terms of SRM and mitigation being compliments, I'd suggest citing a number of papers that make this point. A recent addition to the literature on this point is Smith SJ and PJ Rasch (2012) The Long-Term Policy Context for Solar Radiation Management Climatic Change (accepted). | We agree this point should only be made once. |
| 6294 | 6 | 81 | 29 | 81 | 30 | While true, the sentence that says "Mitigation cannot…" seems a bit inconsistent with the discussion earlier in this chapter about how near term actions or inaction drives the shape of longer term options. Again, the point here should not be whether SRM or mitigation is better or faster or whatever other metric but rather that they represent potential commpliments but that there really isnt a literature describing this complementary role in terms of "Transformation Pathways" and that really is somethign that needs to be developed before AR6 | The reason they are potential compliments is that the have differing capabilities. |
| 4312 | 6 | 81 | 31 | 81 | 31 | this sentence ignores the well acknowledged „moral hazard“ problem. therefore you might insert „...misconception to think of a simple climatic one-time trade-off between“ | the moral hazard problem is raised in the final report |
| 8403 | 6 | 81 | 32 | 81 | 33 | I'm not sure that the paper cited actually talked about tradeoffs, although Goes et al. explicitly look at this and should probably be referenced. Also, our recent paper shows that, if SRM was needed, then SRM and mitigation would need to occur together in order to reduce both near- and long-term risks. References: Smith, Steven J and PJ Rasch (2012) The Long-Term Policy Context for Solar Radiation Management Climatic Change (accepted). Goes M, Tuana N, & Keller K (2011) The economics (or lack thereof) of aerosol geoengineering. Climatic Change 109:719–744 DOI 10.1007/s10584-010-9961-z. | We will look at the new Smith and Rasch paper. |
| 6295 | 6 | 81 | 34 | 81 | 35 | The Shepherd et al 2009 paper is not listed in the references so this reviewer can not determine to what extent that paper supports the assertion that the science SRM and public support for SRM has "grown rapidly." The Mercer 2011 article is listed in the references and can be found on line. It is not clear how the Mercer paper supports the assertion that "public understanding of SRM is growing rapidly." The Mercer paper includes time series data on the "publics expososure" to news stories about SRM but that is clearly not the same as understandng. The Mercer paper cites unpublished previous studies that show public awareness of SRM is potentially less than 10%. Malone et al 2010 based on the pioneering work of Bishop et al 1986 argued that surveys with response rates that low are likely measuring non-stable psuedo opinions. The Mercer paper states "We found that the assessed familiarity of geoengineering is likely around 8%, which is greater than past empirical assessments." and notes that this is a single assessment. Again, I do not see any evidence that "public support for SRM" has grown rapidly. Delete this concept from AR5 which is meant to assess the collective wisdom of the peer reviewd literature and not one or (depending on what is in the Shepherd paper) two papers. Malone, E., J. Dooley, and J. Bradbury, Moving from misinformation derived from public attitude surveys on carbon dioxide capture and storage towards realistic stakeholder involvement. International Journal of Greenhouse Gas Control, 2010. 4(2): p. 419-425. G.F. Bishop, A.J. Tuchfarber, R.W. Oldendick Opinions on fictitious issues: the pressure to answer survey questionsPublic Opinion Quarterly, 50 (1986), pp. 240–250 | This text will either be removed or altered to ensure that there is no implication that support is growing rapidly. The point that does seem supported by data is that knowledge is growing rapidly. |

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| 6296 | 6 | 81 | 34 | 81 | 43 | Delete this entire paragraph. It is not clear what the point of this paragraph is supposed to be. This section should either discuss how SRM fits into Transforamtion Pathways or describe key technical / scientific points. The history of SRM literature and how it grew from a tiny litterature to a slightly larger literature isn't a core point. | this paragraph has been removed and the final version of the report does focus on these issues. |
| 6297 | 6 | 81 | 44 | 82 | 13 | This is well written and informative. I think that this text here as well as a shortened version of the first paragraph in Section 6.9.2 is probably all that needs to be said about SRM in terms of Transformation pathways. I would end this section with a paragraph stressing that much work needs to be done to understand the role of SRM and CDR in Transforamtion Pathways (i.e., society's potential responses to climate change) and then be done with it. [i would certainly cite the Moreno-Cruz et al 2012 paper but probably drop the sentence that describes the particular metric used in that study. the text in the proceeeding sentence that says "but (c) one of the first studies to examine the effectives geoengineering in compensating for temperature or precipitation changes on a regional basis shows that SRM can compensate for increased GHG surprisingly well even at a regional level" is adequate discription of the Moreno-Cruz et al 2012 work for the purpose of chapter 6 in WGIII [WG1 or WGII would seem better places to discuss the specifics of this study]. | The text has been rewritten and around 3 pages are devoted to SRM. Many methods for SRM are described and a range of risks and uncertainties deiscussed as well as the potential role for SRM in transformation pathways. This longer format was deemed necessary to appropriately cover this controversial issue. |
| 8513 | 6 | 81 | 22 | | | Section 6.9.2 deals with only one version of SRM namely injection of submicron aerosol into the stratosphere. It should be mention that reflection of a part of solar radiation can be provided by different surfaces in different locations. So, at least 4 types of SRM should be distinguished: space-based, stratospheric-based, cloud-based, ground-based. Shortly they are mentioned in sections 9.5.2 and 13.4.2. Besides, the text of 6.9.2 focused mainly on shortcomings of stratospheric-based SRM. Nothing is said about physical principles of SRM. The main part of the text of the section is devoted to discussion of shortcomings of SRM. It is one-sided approach. There is no ideal method to prevent global warming. Any conclusion about advantages and disadvantages of this or that method must be done on the basis of cost-benefit analysis. | Many methods of SRM are now described in this section and their limitations noted. |
| 8963 | 6 | 82 | 13 | | 16 | This is a very crude model at best. Too much emphasis given to it in the report. | text completely revised, comment no |
| 13695 | 6 | 82 | 20 | 82 | 20 | Add text after "productivity": "SRM may lead to unwanted changes in regional climate patterns such as the monsoons, with the potential of massive damage (Burns 2011, Keith et al. 2010)." References: Burns, W. (2011): Climate Geoengineering: Solar Radiation Management and its Implications for Intergenerational Equity, in: Stanford Journal of Law, Science & Policy, 4, p. 39-55; Keith, D.; Parson, E.; Morgan, G. (2010): Research on global sun block needed now, in: Nature, 463, 426-427 | The risks of SRM are raised and covered in more detail than in the earlier draft. |
| 9244 | 6 | 82 | 21 | 82 | 39 | SRM measures could change the precipitation patters and reduce direct solar radiation. The former has potential impacts to water resource. The latter has explicit impacts to solar thermal energy potential. | The text makes this point. |
| 5234 | 6 | 82 | 23 | | | At least two types of risks could be mentioned also. First, the risks related to the governance of SRM systems (refer e.g. to Chapter 13.4.2) and, second, the risk related to ocean acidification if the atmospheric CO2 concentration is not limited but the radiative forcing is compensated by SRM (see e.g. FOD of WG I or the IPCC Workshop on Impacts of Ocean Acidification on Marine Biology and Ecosystems, Okinawa, Japan, 2011). | It make sense to make some mention of the difficulties (or risks) associated with governance. If we mention ocean acidification we simply need to mention that SRM does not reduce its risk. It is |
| 8964 | 6 | 82 | 24 | | 25 | Ozone and, I would say hydrological impacts, which indicate reduced rainfall in Africa and India. | The risks of SRM are raised and covered in more detail than in the earlier draft. |
| 8522 | 6 | 82 | 24 | 82 | 25 | It would be too naïve to say that “Ozone depletion … is by far the best studied risk”. The experimental data obtained just after the Pinatubo eruption shown that ozone depletion within the volcanic cloud was significant (up to 20%). However, nobody proved scientifically that such depletion was caused by sulfuric acid droplets (used for SRM) but not by volcanic ashes (not used for SRM). It was evaluated that Pinatubo produced global ozone depletion on the level of 2.5% (Kinnison D.E., Grant K.e., Connell P.S., Rotman D.A., Wuebbles D.J., 1994. The chemical and radiative effects of the Mount Pinatubo eruption. J. Geoph. Res., Vol. 99, No D12, pp. 25705-25731, doi:10.1029/94JD02318). It is important to remember that Pinatubo injected into the stratosphere about 10 Mt of sulfur that is much more than would be needed for SRM purposes. | There are far more papers about the ozone depletion risk of solar geoengineering then there are about any other geoengineering risk. |

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| 8523 | 6 | 82 | 25 | 82 | 28 | The phrase “For sulfate aerosols…” is contradictory: (a) additional aerosol reduces NOx; (b) reduced NOx should produce less ClO; (c) reduction of ClO leads to preservation of ozone. The net result is: the higher aerosol concentration, the higher ozone concentration | The text has been revised and the ozone consequences of sulphate aerosol injections are discussed briefly. WG 1 |
| 8965 | 6 | 82 | 36 | | 38 | This reduced loading claim is very uncertain and is based on wishful thinking. | text completely revised, comment no |
| 8520 | 6 | 82 | 4 | 82 | 5 | “cycle” cannot decrease. Evaporation or precipitation amount can. | text completely revised, comment no |
| 17397 | 6 | 82 | 6 | 82 | 16 | The following study should be mentioned: Riche, K.L., Morgan, M.G., Allen, M.R., 2010. Regional climate response to solar-radiation management. Nature Geoscience 3: 537-541. | Other citations which address similar issues are cited in the report. |
| 8521 | 6 | 82 | 8 | 82 | 8 | Double “that” | text completely revised, comment no |
| 6298 | 6 | 82 | 21 | 82 | 39 | I would delete this as a stand alone paragraph and instead take the literature cited here and summarize it in a closing paragraph agbout unknowns and future research. This seems too detailed for this chapter. | The text has been completely rewritten and greater space is devoted to |
| 16762 | 6 | 83 | 11 | | 20 | This seems much more important when policymakers are trying to define what must happen via policy rather than when simply setting a carbon constraint with a price and letting the market figure it out. | Noted. |
| 13744 | 6 | 83 | 14 | 83 | 14 | Insert "The apparent availability of carbon negative or SRM technologies will also influence mitigation strategies." | Noted. We will consider including the treatment of SRM as a priority in the next draft upon consideration of the |
| 2230 | 6 | 83 | 21 | 85 | 16 | Those 3 questions are (the) essential questions the world asks the IPCC on mitigation. Hence, carefully considered answers are needed, which are as clear as possible on the answers. Do a cross check across all chapters to avoid any duplication of those FAQ (e.g, currently there is a Copenhagen Accord target question in chapter 7 which shoudl not be there (but is rather a duplication of this Q1 (6.11.1)) | Noted. |
| 2231 | 6 | 83 | 22 | 83 | 24 | The question should be reformulated, e.g. with respect to "chances to achieve the Copenhagen Accord, i.e. stabilizing at max 2 degrees warming). A phrase like "under control" is too vage. | Rejected. At present, we are comfortable with more general language that would |
| 11372 | 6 | 83 | 25 | 83 | 25 | This sentence needs to be reformulated to be clearer | Accepted. |
| 16763 | 6 | 83 | 4 | | 10 | It is important to highlight that economic response, in terms of technology choices, infrastructure development and so on will vary from place to place depending on current level of development. Price based policies allow for this and result in each country following the most efficient pathway via trade of emissions. It is extremely difficult for governments or analysts to pre-define the best pathway and then to build policies to make the future conform to the analysis. | Noted. |
| 16764 | 6 | 83 | 42 | | | Suggest inserting after "across countries" the following: "whether they rely on more or less costly or effective approaches," | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |
| 16765 | 6 | 83 | 44 | | | At end of paragraph, suggest inserting: "Research indicates that policies which use a carbon price to incentivize change are the most effective and least costly means to lower emissions of GHGs. The timing with which a market is developed that includes at minimum the largest emitting countries is a major determinant as to whether or not a 450 ppm or 500 ppm target can be realistically met." [It is generally realized that absent an agreement with trading of emissions between the major emitting countries that the goal of 2 degrees is impossible -- I think this should be said in the document or we can not expect policymakers to know it.] | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is being considered in the current draft. |
| 2232 | 6 | 83 | 45 | 84 | 7 | Can the stabilization target be expressed (also in) temperature warming. Radiative forcing values will just not be used and understood outside the climate scientists community. | Rejected. This chapter is focused on RF. We will note the link to temperature |
| 11373 | 6 | 83 | 45 | 84 | 2 | Also this sentence does not read well. Is there some part missing? Please consider to reformulate that. | Accepted. |
| 13746 | 6 | 84 | 10 | 84 | 10 | Rephrase: "There are many technologies that can contribute to reducing the carbon intensity of human activities. This means that no single technology can serve as a "silver bullet", … | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4211 | 6 | 84 | 11 | 84 | 14 | The term "risk" should appear in this sentence to clarify the relationship with 6.7. | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |
| 11758 | 6 | 84 | 14 | 84 | 17 | Good example. | Noted. |
| 9586 | 6 | 84 | 14 | 84 | 17 | Good comment and good for exective summary | Noted. |
| 6760 | 6 | 84 | 14 | | 17 | Good description. It's very important. | Noted. |
| 10652 | 6 | 84 | 14 | 84 | 17 | Appropriate statement. | Noted. |
| 5875 | 6 | 84 | 14 | 84 | 17 | I object. There is no such thing as a zero-carbon electricity source. Nuclear power installations cause emissions during construction, maintenance, running, intermediate and / or final waste storage, fossil energy with CCS just reduces efficiency to c&s C which "is there" (and this source also has emissions from construction, running and maintenance), and "renewables" of course also have C emissions! Low or "zero" emissions during the "electricity generating phase" have to be related to the life-cycle emissions of the "electricity generating device" to get the complete assessment. | Noted. It may be wise to move to a nomenclature on low-carbon technologies. |
| 13747 | 6 | 84 | 17 | 84 | 17 | Insert: "In addition to reducing the carbon intensity of energy systems the contribution of carbon negative technologies such as bio energy with carbon capture and storage (BECCS) will be invaluable to counteract diffuse sources of carbon such as land-use change induced emissions or emissions from transportation and to reach adequate emission reduction pathways despite upcoming implementation difficulties. …" | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |
| 11374 | 6 | 84 | 19 | 84 | 19 | Why mention here only technology? Also changed behavior (in not using too much energy) could be mentioned here, even the question adresses technology. This somehow implies that technology might be the 'sole' solution | Noted. The questiion of when to single out technologies as examples is being considered for the SOD. |
| 13748 | 6 | 84 | 19 | 84 | 19 | Insert after "… will": "also" | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |
| 13745 | 6 | 84 | 2 | 84 | 3 | Rephrase: " Indeed studies indicate a global emissions peak a requirement for this goal, … (den Elzen et al., 2012)" | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |
| 11375 | 6 | 84 | 23 | 84 | 25 | This statement implies that 'only' technologies would be able to overcome this issue; here again, changed human behavior (in theory) could be an alternativ. | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |
| 13749 | 6 | 84 | 23 | 84 | 29 | Delete | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |
| 8966 | 6 | 84 | 24 | | 25 | Analysis of technology is woefully lacking, since tech can be a two-edged sword and can generate its own dynamics. | Noted. |
| 16031 | 6 | 84 | 26 | 84 | 29 | i not agree with this argumentation. First: CCS is not enough prooved. And why is this the only way? What is with bioenergy and use of CO2 for other purpuses for example with algae. What is with the production of renevable energy per wind or solar and the production of hydro or methan with the electricity that is not used (Power to Gas-Technology) | Rejected. The literature on scenarios shows the potential benefits of CDR technologies. We do not assert here that the technology is available or proven, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8053 | 6 | 84 | 26 | 84 | 26 | insert 'is': 'The one possible exception to this is biomass coupled with carbon dioxide capture and storage.' | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |
| 9588 | 6 | 84 | 27 | 84 | 29 | Please, describe the reality of BioCCS here as it may have limitation to deploy and uncertainty as follows; Rhodes and Keith in a 2008 peer-reviewed commentary on biomass with capture noted that while the high end of estimates for potential biomass availability support the view that biomass could provide the central mechanism for managing global climate and energy challenges, it is doubtful because [1] of the deep uncertainty in the feedstock supply estimates; the environmental implications of maximizing production; the complex social and ethical issues arising from the required re-organization of global land use; and the potentially high costs of such a strategy.<br>They further note that [2] relatively large allocations of land in the developing world would be required to support the scales of bio-energy development implied by globally-aggressive biomass-based strategies. For example, land availability estimates indicate that 84% of arable land not in commercial use is in tropical regions of the world. Local food production capacity, which likely represents a more immediate concern in the developing world than carbon emissions, could be displaced. More generally, rural populations could be forced to adapt to radically changed local environments, including environmental consequences from large-scale biomass production. The notion that these disruptions should be absorbed by the developing world in order to mitigate carbon emissions in industrialized nations raises complex ethical issues of “biomass justice”.<br>[1] J.S. Rhodes and D.W. Keith (2008) Biomass with capture: negative emissions within social and environmental constraints: an editorial comment, Climatic Change, 87, p. 323, lines 9-14.<br>[2] J.S. Rhodes and D.W. Keith (2008) Biomass with capture: negative emissions within social and environmental constraints: an editorial comment, Climatic Change, 87, p. 323, lines 31-41. | Noted. This literature will be considered in the discussions of CDR technologies. |
| 2234 | 6 | 84 | 30 | 85 | 16 | Repeated comment from above which is true here as well: The IPCC should consider to contrast the sum of three cost elements to society when presenting this UNDER DIFFERENT SCENARIOS: 1) Mitigation, 2) Adaptation, 3) Damage cost. Then it will get obvious, that with more money invested in mitigation the TOTAL cost to society can actually be kept lowest. (Dentist analogy). The current representation of JUST showing cost for mitigation only, has of course the consequence that the more mitigation you are doing, the more cost you will incur. Consequently, mitigation is seen as MAIN cost to society, while the other cost elements will likely be bigger and will have much higher uncertainty. | Rejected. This is not the job of this chapter. This chapter is just focused on mitigation. |
| 11995 | 6 | 84 | 30 | | | I would suggest to compare the cost of mitigation to the cost of extreme weather events, rising sea levels etc. | Rejected. This is not the job of this chapter. This chapter is just focused on |
| 16766 | 6 | 84 | 31 | | 47 | Can you make point that these are costs only, not net cost or benefits. Presumably, we have made determination one way or another that the possible downsides are costly enough that we want to act. Policymakers and the public also interpret costs in terms of absolute loss, usually from what they have now. Suggest we help translate costs so people understand this is really a slight reduction in growth rates -- that economies still grow over time, and that people's welfare continues to improve. Can translate costs into additional time needed to achieve same level of GDP/capita in the no policy case. | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is being considered in the current draft. |
| 2233 | 6 | 84 | 8 | 84 | 29 | 1) It should be noted that the solution is very fragmented across sectors and technology options, thus clearly a "silver bullet" does not exist. 2) Do include some non-CO2 examples (too energy focused now), 3) Energy efficiency measures play a too small role in the answer (too much power supply), 4) Consider to systematically walk through all sectors with 2-3 examples of mitigation options each. | Noted. This section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10998 | 6 | 84 | 14 | 84 | 17 | Fossil energy with CCS might not be said as a zero-carbon electricity source. In the chapter 5, nuclear power is described as "near zero-carbon electricity source". The sentence of "nuclear power and fossil energy with CCS are not sufficient without technologies such as heat pumps and electric cars that can allow electricity to substitute for liquid and solid fuels" could lead to misunderstanding. To make use of nuclear energy and renewable energy instead of fossil energy contributes enough to mitigate greenhouse gas emissions. | Noted. It may be wise to move to a nomenclature on low-carbon technologies. |
| 17478 | 6 | 85 | 14 | 85 | 14 | should this say "increase costs" rather than "reduce costs"? | Accepted. However, this section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |
| 6543 | 6 | 85 | 14 | | | "increase cost" instead of "reduce cost"? | Accepted. However, this section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is |
| 6544 | 6 | 85 | 14 | | 15 | Modify the Description, taking into consideration that the chance to fail in meeting the 450 ppm CO2-equv target of models is high if some of the mitigation technologies are not available, according to the descriptions of P48 line 11-16 and Figure 6.29. | Noted. |
| 8054 | 6 | 85 | 14 | 85 | 15 | I read: 'Reductions in the availability of mitigation technologies can also reduce costs, more than doubling costs when key technologies such as CCS are not available'. I thought the opposite: reductions of the availability of technologies leads to an increase of costs: 'Reductions in the availability of mitigation technologies can also increase costs, more than doubling costs when key technologies such as CCS are not available'. | Accepted. However, this section is going to be substantially shortened for space, so very little will remain from what is currently there. Nonetheless, the point is being considered in the current draft. |
| 14406 | 6 | 85 | 3 | | | The missing figures (“xx%”) are crucial! | Noted. |
| 6542 | 6 | 85 | 2 | | 4 | Modify the description, taking into consideration that the macroeconomic costs to meet goals below 2.6W/m2 given here may have serious downward bias, as suggested in P48 line 11-16 and P56 line 25-28. | Noted. |
| 14034 | 6 | 9 | 1 | | 8 | The large-scale transformations in human society will undoubtedly involve much more than how we produce and consume energy and use land; it will involve both those large and visible changes in systems and structures, but it will involve also change in meaning making and in the way society relates to nature (see comment #37). It would be good if the introduction made it clear what changes the chapter focuses on and how this relates to the wider literature on social change and transformation. | Noted. |
| 11370 | 6 | 9 | 17 | 9 | 22 | Literature: Here references should be provided | Noted. Referencing will be improved in |
| 4191 | 6 | 9 | 17 | 10 | 6 | I agree these are important point. But I think this paragraph can be written concisely focusing on the variety of possible options including mitigation and adaptation and trade-offs among factors. | Editorial. |
| 3073 | 6 | 9 | 19 | 9 | 29 | Same comment as p. 5 lines 3, above | Noted. Could not find the previous |
| 13128 | 6 | 9 | 2 | 9 | 2 | Replace "will" with "would". Few things currently suggests that we are on that trajectory. | Noted. The introduction is being revised and the ordering and nature of points that it makes will be different in the |
| 16687 | 6 | 9 | 21 | | | after the word "choices", insert "made over decades" to as to reinforce that this is a long term process and choices and pathways evolve over time. It may help to make this explicit and state that pathways may evolve over time as we learn and as conditions change ... the path will be adjusted. This policy is unlikely to be set and then never adjusted -- we will have the option to go faster or slower. | Noted. |
| 14453 | 6 | 9 | 3 | 9 | 4 | CO2 emissions can never be zero, all animals respire CO2 and organic matter decomposes. Do you mean net fossil-fuel and LUC derived CO2 emission must be zero? This concept must be edited for accuracy. | Noted. The introduction is being revised and the ordering and nature of points that it makes will be different in the |
| 9279 | 6 | 9 | 33 | 9 | 43 | This paragraph is duplicative of Chapter 6, page 5 lines 17 - 27. | Noted. In the SOD, overlaps between the ES and the introduction will be |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16688 | 6 | 9 | 33 | | 43 | Redundant with previous paragraph? Delete? | Noted. |
| 14395 | 6 | 9 | 4 | | | Reiteration of zero emissions target is very unfortunate by giving the impression that it is impossible to achieve and tilting the policy mix toward (risky) geoengineering. | Noted. |
| 14035 | 6 | 9 | 40 | | | Add equity concerns | Noted. |
| 12624 | 6 | 9 | 41 | 9 | 43 | I see no reason to single out any technologies here. All technologies include trade offs, CCS, Nuclear, Wind, Solar, etc. | Noted. The questiion of when to single out technologies as examples is being |
| 12667 | 6 | 9 | 41 | 9 | 43 | I see no reason to single out any technologies here. All technologies include trade offs, CCS, Nuclear, Wind, Solar, etc. | Noted. The questiion of when to single out technologies as examples is being |
| 9566 | 6 | 9 | 42 | | | Please, remove coal-fired from coal-fired CCS as we need any types of CCS. | Noted. |
| 9565 | 6 | 9 | 42 | 9 | 43 | Please, delete examples of nuclear and CCS, or add examples of wind power and geothermal as they involve bird-strikes (wind power) and sources of mercury contamination (geothermal power). | Noted. The questiion of when to single out technologies as examples is being |
| 9837 | 6 | 9 | 45 | | | I think that this issue of "feasibility" is raised far too early in the chapter, and too much emphasis is given to it. You have not even described many other key results yet, and infeasibility is not very interesting as an issue since it is purely an artifact of the limited range of input assumptions used in some models. | Noted. There is some confusion between the notion of feasibililty in general and the concept of models not being able to produce particular scenarios. This will be |
| 8623 | 6 | 9 | 45 | | | I think that this issue of "feasibility" is raised far too early in the chapter, and too much emphasis is given to it. You have not even described many other key results yet, and infeasibility is not very interesting as an issue since it is purely an artifact of the limited range of input assumptions used in some models. | Please see the response to comment 9837, which appears to be a duplicate of this comment, despite being submitted |
| 15280 | 6 | 9 | 47 | 9 | 47 | "biogoephysical" to be "biogeophysical" | Editorial. |
| 12307 | 6 | 9 | 9 | 9 | 16 | Please consider to put this passage first in the introduction. | Noted. |
| 8973 | 6 | 90 | 7 | | | Add the following reference. Fleming, J.R. (2010) Fixing the Sky: The checkered history of weather and climate control. Columbia University Press, New York. 325 pp. | Noted. We will consider this reference. |
| 14539 | 6 | all | | | | No mention is made of '350 ppm' target which the Association of Small Island States is asking for. Although the Copenhagen agreement called for a 450 ppm target, it also said that '350 ppm' would be considered | Accepted. We will mention the 350 ppmv CO2-e goal in the SOD. |
| 11996 | 6 | all | | | | I strongly suggest to acknowledge the achievements of the CDM in this chapter, it currently is not mentioned even once. The success to date and potential cost mitigation potential, signalling effect, contribution to improved justice and perceived fairness as well as the training provided so far is all very well documented in the study commissioned by the UNFCCC's CDM Executive Board, overviewed by an independent High Level Policy Panel. The findings and underlying research can be found on cdmpolicydialogue.org. | Rejected. This is not the chapter for discussion of CDM. This chapter is considering long-term transformation pathways. CDM would be more appropriately discussed in the policy |
| 2185 | 6 | `65 | 28 | 67 | 36 | It would be useful to introduce some concepts here that the climate community may be unfamiliar with such as sustainability, sustainable development (as it pertains to all countries not just developing countries), wellbeing. Without these concepts it is hard to explain why integration of climate mitigation within broader sustainable development goals is important. Mention should also be made of the commitment at Rio+20 to develop a set of sustainable develpment goals by 2016, in which climate mitigation is certain to be included. | Noted. This section has been significantly restructured with the new draft. |
| 3403 | 7 | | | | | A major report on CCS cost has been published by the European Technology Platform ZEP, incorporating robust cost data from many industrial participants in Europe and elsewhere. | Taken into account - the cost data provided there are taken into account. |
| 3405 | 7 | | | | | Very poor section. Superfitial, simplistic, missinformative. Too many easywords ant too few numbers and solid references (emmision limits and legislation around the world for key contaminants?). Is the reference to SRREN correct when referring to a comprehensive assesment of nuclear energy health impacts?. Is the reference to CCS effects on human health (0-60% ¡¡¡) reliable (Singh et al 2011) ?. Is it really that serious at global scale the lack of cooling water (see lines 11-19 in page 60). This is one of the lowest quality sections in this FOD. | Noted. |

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| 3406 | 7 | | | | | As a lay citizen, I demand from the IPCC the highest possible rigour in handling this sensitive section. THIS IS POTENTIALY VERY EMBARASSING FOR THE IPCC PROCESS: numbers on casualties MUST BE SUPPORTED BY RELIABLE SOURCES, and conflictive numbers (if any) must be also reported in an IPCC report even if they do not fit with author´s prejudices. I am not an expert on these issues, but I strongly feel this FOD is very far from the objective of a balanced view of the state of the art in section 7.9.3. IT SHOULD BE TOTALLY REWRITTEN AND THE AUTHORS FROM THIS POOR FIRST DRAFT SHOULD CONSIDER RESIGNATION IN VIEW OF THEIR SUPERFITIAL, UNREFERRENCED FOD | Editorial comment. It would help us if the reviewer pointed what specifically appears unbalanced and in what way. |
| 17210 | 7 | | | | | It is not clear what the purpose of this table is. It contains a lot of numbers that are not fully put into perspective. Also, the table is difficult to understand and requires several explanations to make it understand. The LCAs may want to discuss whether the table could be skipped. | This table portraits the global energy picture in one table. This is the purpose of it. |
| 17223 | 7 | | | | | The y-axis scale is missing. This must be corrected. | Accepted. Figure has been corrected. |
| 17216 | 7 | | | | | The positive contribution of electricity per GDP is surprising. The authors are requested to check this. | Taken into account – Please note that the figure has been replaced and the analysis has been updated. The original figure was easy to misunderstand, and |
| 17217 | 7 | | | | | What is the data source for the growth of GDP? Is this IMF, Worldbank, or something else? | This is IEA data. See note to the figure |
| 17220 | 7 | | | | | The figure is not from the peer-reviewed literature. The CLAs are requested to use peer reviewed literature for such a figure. | Taken into account: GEA is peer reviewed literature - the in the figure data are GEA but the concept of presentation was 'borrowed' from Farrel. |
| 6417 | 7 | | | | | It would help to define TPES in the table, or to spell it all out where it is bold in the third row | Accepted. It has been spelled out. |
| 6416 | 7 | | | | | This figure seems odd. The top is difficult to interpret, given how the x axis is partitioned and not in order. | Design of the figure 7.1 was improved |
| 6430 | 7 | | | | | The "baselines" are confusing. Does it represent business as usual? If not, it seems as though BAU should be added. If so, some reference to BAU as a baseline would be helpful. | The baseline refers to the fact that there is no climate policy assumed in the scenario. There might be other aspects in the scenario, however, which are not |
| 16113 | 7 | | | | | This section as a whole is not balanced. There is presently no CCS industrial scale installation on a thermal plant, the main presumed market, as justly mentiond in lines 7-8 page 31. The paragraph should take more space to explain why, if the technology is as available as mentioned earlier in the section. Instead, it goes around a myriad of references as to please everyone, but gives no credible roadmap for cost-cutting in the short and medium-term is given. Then why allocate so much (2 pages) for a technogy that promises less in the medium term than, say, wave power or thermal recovery with new cycles? | Rejected. No scientific evidence or body of peer reviewed literature is offered in support of this observation .The totality of what is written about CCS in all parts of Chapter 7 seems balanced. But because it is broken up and scattered it |
| 15540 | 7 | | | | | This chapter could be shortened by having less text describing data already presented in graphs and tables e.g. material on p 13 describing evidiece presented in Table 7.1. Some of the material describing developments in energy use and supply is not particularly relevant for emissions and climate change. | Accepted - text revised. |
| 2352 | 7 | | | | | Reference to be assessed on transaction cost "Updated capital cost educates for Electricity generation plants, EIA, Nov 2010" (sorry, dont have report and page number) | Noted |
| 9260 | 7 | | | | | Excellent way of presenting the data! | Noted |
| 5737 | 7 | | | | | Probably this table considers just fuel used in agriculture/forestry/fisheries and this is why the energy consumptionof agriculture looks so low. Including indirect energy and electricity uses would change the scenario a lot (http://www.fao.org/docrep/014/i2454e/i2454e00.pdf) | Taken into account. It is not a scenario. It covers only direct consumption. |

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| 5743 | 7 | | | | | I cannot agree with the definition of modern/traditional bioenergy contained in the figure as too simplistic. Using fuel wood in an open fireplace is not 'modern' for example. Please use and include where appropriate the definition developed by GBEP (see the glossary of the GBEP sustainability indicators report: http://www.globalbioenergy.org/fileadmin/user_upload/gbep/docs/Indicators/The_GBEP_Sustainability_Indicators_for_Bioenergy_FINAL.pdf) | GBEP does not define traditional biomass. They define modern or traditional bioenergy services. "Modern bioenergy services are defined as modern energy services relying on biomass as their primary energy source. Modern bioenergy services include electricity delivered to the final user through a grid from biomass power plants; district heating; district cooling; improved cookstoves (including such stoves used for heating) at the household and business level; stand-alone or grid-connected generation systems for household or businesses; domestic and industrial biomass heating systems; domestic and industrial biomass cooling systems, biomass-powered machinery for agricultural activities or businesses; biofuel-powered tractors and other vehicles, grinding and milling machinery.<br>Modern bioenergy services do not |
| 13300 | 7 | | | | | For the UK, the most comprehensive MAC carve analysis was undertaken by the Committee on Climate Change in our report 'Building a low-carbon economy' in 2008. This report recommended the UK's 2050 target and 'carbon budgets' from 2008-22, which were then set in law under the Climate Change Act. It is available from http://www.theccc.org.uk/reports/building-a-low-carbon-economy | Taken into account - table 7.5. was deleted due to space constraints. Comment is obsolete. |
| 11873 | 7 | | | | | Can you expand on the "carbon neutral is not climate neutral" points? There is a long list of citations, but there is no explanation of what those studies said - include a list of some of those reasons. Similarly, the highlighting of bottom up analyses is equally vague - what are some of the relevant climate effects that are being considered? Also (and this is linked to the Forcings of Biogenic CO2 issue) it might be a good idea to (1) include a citation to PAS2050 which addresses/discusses some of these questions/points at least from an accounting perspective, and (2) there is a lot of literature on temporary carbon storage in biomass/forests that started in the 90s but only Cherubini's forestry work is cited (this is not to dispute the high quality of the cited work, but it seems important to reference the is a larger body of literature on the topic since other research has addressed different nuances of the issue). | Rejected - comment seems to be misplaced. Please clarify to which part of the text your comment actually refers. 7.14 is about frequently asked questions. |
| 11854 | 7 | | | | | This figure needs axis labels - in its current form it is impossible to interpret | Accepted. Figure has been corrected. |
| 11857 | 7 | | | | | This figure is not clear (both literally and figuratively). This figure needs improved explanation if it is to stay in. | Taken into account - figure has been |
| 11849 | 7 | | | | | This figure is difficult to interpret. While it is noted that the data will be updated, I believe the approach to labeling and discussing the figure must be changed as well. Perhaps have one pie chart with "energy related" and "non energy-related" emissions, then have break-outs of the composition of those section for each? Also, reporting CO2e emissions clearly requires that the GWP time horizon be stated (assuming 100-year, but should be explictly stated), as well as the GWP publication year (assuming that the GWPs reported in WG4's AR5 contribution will be used, but still worth reporting). | Taken into account. The section has been deleted. |
| 11871 | 7 | | | | | This figure requires a legend, the reader cannot interpret the data presented, what does the grey, red and blue mean? | The figure in question has been removed. New figures have been |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11858 | 7 | | | | | This section isn't exactly duplicative, but transmission (as well as resource availability) are also discussed with some overlap in concepts in subsections of 7.4. Can these sections be eliminated/combined with those in 7.4? This might be an opportunity to reduce length. | Rejected - the discussion in 7.4 only refers to a more extended here. |
| 9238 | 7 | | | | | Please update latest number (year 2010) if possible. | Accepted. Was done |
| 9241 | 7 | | | | | Please refer latest edition of the Red Book (2012) if possible. | Taken into account. The section has |
| 6803 | 7 | | | | | Overall, I found this chapter lacking in terms of describing the various carbon-free energy alternatives (with the exception of details provided on nuclear technologies). Solar energy is properly identified as the largest resource, but there is no description of the various PV and CSP technologies and their pros and cons. For example, capacity factors as well as capacity values can vary greatly. Also lacking is any description of the current R&D opportunities and targets. Finally, repeated studies have shown that energy efficiency has the largest carbon reduction potential and negative costs. Yet efficiency is only briefly mentioned in the context of transmission. | Rejected - renewable energies have been discussed in detail in the recent IPCC special report on renewable energies (SRREN). Space constraints do not allow to repeat all information on renewable energies given there in the AR5. Energy efficiency is not discussed |
| 6801 | 7 | | | | | For nuclear, the cost range is too narrow and the average cost is too low compared to some studies on the costs of new plants. Later on page 50, line 20, a cost range of 42 $/MWh to 137 $/MWh is given. Also, later comments properly point out that costs will likely escalate in the post-Fukushima environment. | Taken into account - the cost data have been updated. |
| 6802 | 7 | | | | | The various costs in the table are not comparable because they do not account for the varying subsidies given to each. And, of course, the costs associated with environmental externalities are not included. This report should reference the U.S. National Academy study on the true costs of energy. | Rejected - BNEF's LCOE analysis reflects the generation cost without direct subsidies, such as feed-in tariffs or green certificates. This is mentioned in the text. Space constraints do not allow |
| 6231 | 7 | | | | | a distinction must be made between capacity (GW) & energy (GWh) as the technologies have significantly diffeent utilistion capacities | Taken into account. The section has been deleted. |
| 6225 | 7 | | | | | This graph does not add any useful information | Rejected. The claim for an unbalanced treatment would need to be better substantiated. Here, additional material demand is discussed. There is no space |
| 6246 | 7 | | | | | Indications for the amount of the y axis? | Accepted. Figure has been corrected. |
| 6232 | 7 | | | | | a 10% IRR is not commercial and underestimates real costs, 15% would be more appropriate | Rejected - LCOE are highly dependent on various sensitiveness. In order to establish a common baseline for comparison 10% has been used. According to http://www.oxera.com/Publications/Reports/2011/Discount-rates-for-low-carbon- |
| 6233 | 7 | | | | | diagram does not add any message | Editorial. The figure presents a lot of information that is not repeated in the |
| 6234 | 7 | | | | | message lost in information overload | Accepted: We have extensively rewritten this section to try to sharpen our |
| 6235 | 7 | | | | | this graph adds nothing other than confusion | Taken into account - comment is obsolete. Figure has been deleted. |
| 6228 | 7 | | | | | The top graph is illegible | Taken into account. The section has |
| 16835 | 7 | | | | | Nice chart -- would be greatly improved if it also included Natural Gas/CCS, IGCC/CCS and Oxyfuel/CCS as these are all technologies that models indicate may be important parts of a mitigation set. | Accepted - CCS costs are shown in chart. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4318 | 7 | | | | | This table measures recent growth in renewable energy only in installed MW of capacity, rather than energy generated (MWh). This is seriously misleading. Firstly,wind farms generate more than about 85% of installed capacity for a very short time–probably in the region of 2%. It would be fair to say that the effective maximum capacity of a wind farm is about 80% of the installed capacity. So to compare the installed capacity of renewable energy with conventional power stations that will deliver 100% of installed capacity when needed, is seriously misleading. Secondly, the capacity factor of renewable energy technologies (apart from hydropower) is very low indeed. Few windfarms generate a capacity factor of more than 30%, and most are in the region of 20 to 25%. A well sited solar farm in a tropical area has a capacity factor of about 22% while those in Germany have a capacity factor of 9.5%. ( http://theenergycollective.com/willem-post/46142/impact-pv-solar-feed-tariffs-germany) With capacity factors like this, roughly 9,000 MW of solar power is required to produce the same amount of energy as a 1000 MW nuclear power station. But, because of solar cells will not be producing anything during peak demand times in winter, a 1000 MW backup plant would also be needed. According to http://www.pv-tech.org/news/it_cost_3.6_million_per_mw_to_purchase_solar_power_projects_in_2011 solar power plants cost €3.6 million per megawatt. So we can compare the cost of a €5 billion nuclear power plant (approximately US$6.6 billion) with €32 billion for 9000 MW of solar power plus €2 billion for the backup plant. So, on the equivalent basis, solar power cost is roughly 6.8 times higher. And that is without any allowance for the additional transmission. Even if the nuclear power cost was double the figure given, the difference is huge. I believe that it should be pointed out that the low capacity factor of solar and wind power brings additional costs that need to be taken into account | Table 7.4 is not on this page. It is on page 33. If table 7.1 is meant it speaks only on billion kWh |
| 10800 | 7 | | | | | The chapter is too long, improvement shall be made to enhance the coherence and focus. State clearly the pupuse of each section, scopes, gaps, and limitation in the information, data and conclusions presented. The chapter falls short of presenting potential risks (long-term) of nuclear accidents (man-made or caused by natural forces). In addition, it's important to compile/analyze/present data on the costs of renewables in consistent manner, in comparisons with tranditional energy sources. The relevant sections should include more data of RE costs (from material, transport, manufacturing, utilization, integration) as well as quantifiableof benefits. In general, every sections shall be shortened and shall try to avoid ambiguous statements. If in doubt or opinionated, authors shall point out what is the knowledge gap as of today and proactively acknowledge reseach areas to be expected and recommended in the future. Getting rid of ambiguous statements/paragraphs shall help truncating the chapter within 60 pages. | Accepted - text revised as far as space constraints allowed this. |
| 17283 | 7 | | | | | This figure is quite nice. However, I am missing Final Energy in the analysis. In my view, FE is more meaningful than TPES, because less ambiguities exist in its definition and accounting. I would suggest adding FE/GDP and PE/FE as indicators in the decomposition. | Thank you. Adding final energy to it will overloaded it and make it harder to read. For chapter 7 is important how much energy the energy sector has to deliver |
| 17391 | 7 | | | | | General comments. The chapter provides a very clear account of the major issues, and particular, the major changes since the last report. The writing team exhibit an excellent appreciation of the significance of the many relevant events since the last report, and exhibit sensible, pragmatic and informed assessments of their likely impact. Of particular importance here is the greater growth in GHG, which exceeded that of GDP per capita in the latest period (attributable largely to growth in economies and population) with a shift towards coal in generation (mainly reflecting China's and India's demands). There is a wealth of detail and many carefully balanced judgements are reported together with an indication of the extent of agreement and the quality of the relevant evidence. The overall impression is of a carefully considered, well-balanced report, which draws on the best available evidence. | Noted. Thank you. |

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| 17392 | 7 | | | | | In terms of detail a number of things occurred to me, though unfortunately I did not have time to go through the text in detail. Firstly, I think the draft status does show a little and the English needs a little tidying up throughout (though this is a minor issue – and I fear one that if it was fully met could only increase the length of the chapter). Secondly, I felt that there was a fair amount of repetition (perhaps because different sections were written by different individuals), which while useful for emphasis, might be pruned given the pressure on space. Thirdly, while the discussion of the carbon price was very sensible, I wondered if its fundamental importance gets a bit lost in the detail. Of course it is not the only policy, but frankly without the establishment of a credible long-term price of carbon (and I think that is going to require taxes – though these need to be "balanced budget" to be acceptable, and revenues targeted for "green" purposes - it is difficult to see how all the other policies can work. Fourthly, the authors quite rightly emphasise the externalities associated with RD&D and the importance for low carbon technologies, but it would be useful to have some indication of appropriate scale of intervention. Fifthly, while issues of policy coordination are raised and discussed I fear the problem is rather bigger than explicitly acknowledged here: and without the political will to do so it is difficult to see how this problem is going to be resolved. We have numerous overlapping policies (even in single countries) generating responses of unknown complexity, and numerous countervailing effects the net outcome of which is unclear. (The consequences of trading schemes for renewable generation technologies included in the traded sector is now a well-understood example, but only one iexample of the importance of multi-level governance here.) Sixthly, the discussion of the co-benefits was useful, and indeed it may be critical politically yet it seemed to lack a coherent unifying framework (and quantification) that might enhance the important main message here (perhaps "welfare" is problematic?). Finally, in terms of gaps, the absence of regularly updated input-output (and ideally social accounting matrix data) limit both our descriptive and modelling abilities. On the latter our understanding of the interdependencies of the energy-economy-environment subsystems remains rudimentary yet is crucial to a full understanding of, and ability to evaluation, energy and climate change policies. | Improved in SOD. For carbon prices, see 7.12. |
| 17393 | 7 | | | | | Peter McGregor, 14 September 2012. | Noted |
| 17812 | 7 | | | | | 1. Household energy insecurity in Europe is a combination of a problem of "supply" – where some households generally lack access to network energy for cooking or space-heating or temporarily lack access to electricity for hours or days at a time – and a problem of "demand" – where households cannot afford sufficient amounts of energy, energy-efficient housing or heating equipment. | That is more the subject of chapter 9. It could only be briefly mentioned in section 7.9.1.2 |
| 17813 | 7 | | | | | 2. The following policy priorities to improve household energy security emerge for the WHO European region: | That is more the subject of chapter 9. It could only be briefly mentioned in |
| 17814 | 7 | | | | | § Households in eastern Europe and Central Asia that currently cook with biomass fuels or coal should gain access to cleaner fuels and/or cleaner-burning and more fuel-efficient cookstoves. | That is more the subject of chapter 9. It could only be briefly mentioned in |
| 17815 | 7 | | | | | § Households that cannot afford to maintain health-protective temperatures during the winter months should be supported through a combination of appropriate social support, tariff measures and strategies to upgrade old housing stock to improve energy efficiency. | That is more the subject of chapter 9. It could only be briefly mentioned in section 7.9.1.2 |
| 17816 | 7 | | | | | § Households across the WHO European region that are at particular risk of experiencing heat distress – through their building design or the characteristics of their inhabitants – should be encouraged to improve thermal insulation and, where appropriate, to install air conditioning or electric fans. | That is more the subject of chapter 9. |
| 17817 | 7 | | | | | 3. Measures to increase household energy efficiency can bring substantial savings in CO2 emissions and thereby contribute to climate change mitigation (the building stock having the highest share of negative and low-cost greenhouse gas reduction potential among all sectors). | That is more the subject of chapter 9. |
| 17818 | 7 | | | | | Bettina, if I remember correctly EURO advised that Eastern in this context need to be written with a small ‚e' – to be corrected in the whole text. | Editorial |
| 17819 | 7 | | | | | I think this statement refers to Ref 88. | What statement? |

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| 17820 | 7 | | | | | 1. Household energy insecurity in Europe is a combination of a problem of "supply" – where some households generally lack access to network energy for cooking or space-heating or temporarily lack access to electricity for hours or days at a time – and a problem of "demand" – where households cannot afford sufficient amounts of energy, energy-efficient housing or heating equipment. | Noted. That is more the subject of chapter 9. |
| 17821 | 7 | | | | | 2. The following policy priorities to improve household energy security emerge for the WHO European region: | Noted. That is more the subject of chapter 9. |
| 17822 | 7 | | | | | § Households in eastern Europe and Central Asia that currently cook with biomass fuels or coal should gain access to cleaner fuels and/or cleaner-burning and more fuel-efficient cookstoves. | Noted. That is more the subject of chapter 9. |
| 17823 | 7 | | | | | § Households that cannot afford to maintain health-protective temperatures during the winter months should be supported through a combination of appropriate social support, tariff measures and strategies to upgrade old housing stock to improve energy efficiency. | Noted. That is more the subject of chapter 9. |
| 17824 | 7 | | | | | § Households across the WHO European region that are at particular risk of experiencing heat distress – through their building design or the characteristics of their inhabitants – should be encouraged to improve thermal insulation and, where appropriate, to install air conditioning or electric fans. | Noted. That is more the subject of chapter 9. |
| 17825 | 7 | | | | | 3. Measures to increase household energy efficiency can bring substantial savings in CO2 emissions and thereby contribute to climate change mitigation (the building stock having the highest share of negative and low-cost greenhouse gas reduction potential among all sectors). | Noted. That is more the subject of chapter 9. |
| 17826 | 7 | | | | | Bettina, if I remember correctly EURO advised that Eastern in this context need to be written with a small ‚e' – to be corrected in the whole text. | Editorial |
| 17827 | 7 | | | | | I think this statement refers to Ref 88. | What statement? |
| 17829 | 7 | | | | | References for page 59 | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17830 | 7 | | | | | Abbey DE, Lebowitz MD, Mills PK, Petersen FF, Lawrence Beeson W, & Burchette RJ 1995. "Long-term ambient concentrations of particulates and oxidants and development of chronic disease in a cohort of nonsmoking California residents". Inhalation Toxicology, vol. 7, 19-34. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |

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| 17831 | 7 | | | | | Abbey DE, N Nishino, WF McDonnell, RJ Burchette, SF Knutsen, WL Beeson and JX Yang 1999. "Long-term inhalable particles and other air pollutants related to mortality in nonsmokers". Am. J. Respir. Crit. Care Med., vol. 159, 373-382. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17832 | 7 | | | | | Abt 2000. “The Particulate-Related Health Benefits of Reducing Power Plant Emissions.” October 2000. Prepared for EPA by Abt Associates Inc., 4800 Montgomery Lane, Bethesda, MD 20814-5341. | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17833 | 7 | | | | | Abt 2004. “Power Plant Emissions: Particulate Matter-Related Health Damages and the Benefits of Alternative Emission Reduction Scenarios”. Prepared for EPA by Abt Associates Inc. 4800 Montgomery Lane. Bethesda, MD 20814-5341. | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17834 | 7 | | | | | Anderson HR, Atkinson RW, Peacock JL, Marston L, Konstantinou K. 2004. “Meta-analysis of time-series studies and panel studies of particulate matter (PM) and ozone (O3)”. Report of a WHO task group. World Health Organization. (http://www.euro.who.int/document/e82792.pdf; accessed November 2004). | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17835 | 7 | | | | | Bobak M, Leon DA. 1999. "The effect of air pollution on infant mortality appears specific for respiratory causes in the postneonatal period". Epidemiology 10(6), 666-670. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17836 | 7 | | | | | CAFE 2005. “Damages per tonne emission of PM2.5, NH3, SO2, NOx and VOCs from each EU25 Member State (excluding Cyprus) and surrounding seas”. Report for European Commission DG Environment, by AEA Technology, Didcot, Oxon, OX11 0QJ, United Kingdom. Authors: Mike Holland (EMRC), Steve Pye, Paul Watkiss (AEA Technology), Bert Droste-Franke, Peter Bickel (IER). March 2005. | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17837 | 7 | | | | | CEA 2006. “Catalog of Preference Scores”. Cost Effectiveness Analysis (CEA) Registry of Tufts-New England Medical Center. Downloaded 2 July 2006 from http://www.tufts-nemc.org/cearegistry/index.html | Rejected. We prefer to rely on peer reviewed literature where possible. |

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| 17838 | 7 | | | | | Chen H, Goldberg MS, Villeneuve PJ. 2008. “A Systematic Review of the Relation between Long-term Exposure to Ambient Air Pollution and Chronic Diseases”. Reviews On Environmental Health, Vol. 23 (4), 243-297. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17839 | 7 | | | | | Cohen AJ, Anderson HR, Ostro B, Pandey KD, Krzyzanowski M, K nzli N, Gutschmidt K, Pope CA, Romieu I, Samet JM, Kirk R. Smith KR. 2005. “Urban air pollution”, Chapter 17 of Global Burden of Disease. World Health Organization, Geneva. ü | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17840 | 7 | | | | | Crawford M & R Wilson 1996. “Low-dose linearity: the rule or the exception?”, Human and Ecological Risk Assessment, vol.2, 305-330. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17841 | 7 | | | | | Daniels MJ, Dominici F, Samet JM & Zeger SL. 2000. “Estimating particulate matter-mortality dose-response curves and threshold levels: an analysis of daily time-series for the 20 largest US cities.” Am J Epidemiol, 152(5):397-406. See also Comment in: Am J Epidemiol., 152(5):407-12 . | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |

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| 17842 | 7 | | | | | Daniels MJ, Dominici F, Samet JM & Zeger SL. 2004. National Morbidity, Mortality, and Air Pollution Study. Health Effects Institute report 94, Part III: Concentration–Response Curves and Thresholds for the 20 Largest US Cities. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17843 | 7 | | | | | EC 2001. Directive 2001/80/EC of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants. | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17844 | 7 | | | | | EC 2007. “Sustainable power generation from fossil fuels”. Commission Communication of 10 January 2007. Downloaded 3 May 2012 from http://europa.eu/legislation_summaries/energy/european_energy_policy/l27068_en.htm | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17845 | 7 | | | | | EEA 2011. “Revealing the costs of air pollution from industrial facilities in Europe”. EEA Technical report No 15/2011. European Environment Agency, Copenhagen. | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17846 | 7 | | | | | Ellenbogen JM, Grace S, Heiger-Bernays WJ, Manwell JF, Mills DA, Sullivan KA, Weisskopf MG. 2012. “Wind Turbine Health Impact Study: Report of Independent Expert Panel”. January 2012. Prepared for: Massachusetts Department of Environmental Protection, Massachusetts Department of Public Health | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17847 | 7 | | | | | Elliott P, Shaddick G, Wakefield JC, de Hoogh C, Briggs DJ. 2007. "Long-term associations of outdoor air pollution with mortality in Great Britain." Thorax 2007 (0), 1–8. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17848 | 7 | | | | | EURELECTRIC 2011. Power Statistics & Trends 2011 – synopsis. The Union of the Electricity Industry, Brussels. Downloaded 3 May 2012 from http://www.eurelectric.org/PowerStats2011/PowerStats2011.asp | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17849 | 7 | | | | | ExternE 1995. ExternE: Externalities of Energy. ISBN 92-827-5210-0. Vol.5: Nuclear (EUR 16524). Published by European Commission, Directorate-General XII, Science Research and Development. Office for Official Publications of the European Communities, L-2920 Luxembourg. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17850 | 7 | | | | | ExternE 2005. ExternE – Externalities Of Energy: Methodology 2005 Update. Available at http://www.externe.info | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17851 | 7 | | | | | Gauderman JM, Avol E, Gilliland F, Vora H, Thomas D, Berhane K, McConnell R, Kuenzli N, Lurmann F, Rappaport E, Margolis H, Bates D and Peters J. 2004. “The Effect of Air Pollution on Lung Development from 10 to 18 Years of Age”. N Engl J Med, 351:1057-67. | Rejected. We prefer to rely on peer reviewed literature where possible. |

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| 17852 | 7 | | | | | Hedley AJ, Chit-Ming Wong, Thuan Quoc Thach, Stefan Ma, Tai-Hing Lam, Hugh Ross Anderson. 2002. "Cardiorespiratory and all-cause mortality after restrictions on sulphur content of fuel in Hong Kong: an intervention study", Lancet, vol.360, November 23. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17853 | 7 | | | | | HEI 2001. "Airborne particles and health: HEI epidemiologic evidence". HEI Perspectives, June 2001. Health Effects Institute, Charlestown Navy Yard, 120 Second Avenue, Boston, MA 02129-4533. Available at http://www.healtheffects.org/ | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17854 | 7 | | | | | Holland M, Hunt A, Hurley F, Navrud S, Watkiss P. 2005. Methodology for the Cost-Benefit Analysis for CAFE: Volume 1: Overview of Methodology. Didcot. UK: AEA Technology Environment. Available: http://europa.eu.int/comm/environment/air/cafe/pdf/cba_methodology_vol1.pdf | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17855 | 7 | | | | | Hurley F, Miller B, Torfs R, Rabl A. 2005. "A set of concentration-response functions". Deliverable 3.7 - RS1b/WP3 of NEEDS project, available at http://www.needs-project.org/RS1b/NEEDS_Rs1b_D3.7.pdf | Rejected. We prefer to rely on peer reviewed literature where possible. |
| 17856 | 7 | | | | | ICRP 1991. 1990 Recommendations of the International Commission on Radiological Protection. Publication ICRP 60. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17857 | 7 | | | | | ICRP 2007. The 2007 Recommendations of the International Commission on Radiological Protection. ICPR Publication 103. Elsevier. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17858 | 7 | | | | | IEA 2008. World Energy Outlook 2008. International Energy Agency, 9 rue de la Fédération, 75739 Paris Cedex 15, France. | Rejected. Too little specific to our issue |

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| 17859 | 7 | | | | | Katsouyanni K, Touloumi G, Spix C, Schwartz J, Balducci F, Medina S, Rossi G, Wojtyniak B, Sunyer J, Bacharova L, Schouten JP, Ponka A, Anderson HR. 1997. “Short-term effects of ambient sulphur dioxide and particulate matter on mortality in 12 European cities: Results from time series data from the APHEA project.” British Med. J 314:1658–1663. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17860 | 7 | | | | | Laden F, LM Neas, DW Dockery, & J Schwartz 2000. "Association of Fine Particulate Matter from Different Sources with Daily Mortality in Six U.S. Cities". Environmental Health Perspectives - New Series, volume 108 - issue 10, Pages: 941 - 948 (2000). | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17861 | 7 | | | | | Leksell L and A Rabl. 2001. "Air Pollution and Mortality: Quantification and Valuation of Years of Life Lost". Risk Analysis, vol.21 (5), in press. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17862 | 7 | | | | | Levy JI, Hammitt, JK, Spengler JD. 2000. “Estimating the mortality impacts of particulate matter: What can be learned from between-study variability?” Environ Health Perspect 108(2):109–117. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |

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| 17863 | 7 | | | | | Lippmann M, Ito K, HwangJ-S, Maciejczyk P, Chen L-C. 2006. Cardiovascular Effects of Nickel in Ambient Air. Environmental Health Perspectives, 2006, vol.114(11), 1662-1669. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17864 | 7 | | | | | Lopez AD, Mathers CD, Majid Ezzati M, Jamison DT, Murray CJL. 2006. Global Burden of Disease and Risk Factors. Published by Oxford University Press, 165 Madison Avenue, New York NY 10016, and The World Bank, 1818 H Street NW,Washington, DC 20433, USA. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17865 | 7 | | | | | Markandya A, Bigano A and Roberto Porchia R, editors. 2010. The Social Cost of Electricity: Scenarios and Policy Implications. Fondazione Eni Enrico Mattei. Edward Elgar Publishing Ltd, Cheltenham, UK. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17866 | 7 | | | | | Mathers CD, Bernard C, Iburg K, Inoue M, Ma Fat D, Shibuya K, Stein C, Tomijima, N. 2003. The Global Burden of Disease in 2002: data sources, methods and results. Geneva, World Health Organization (GPE Discussion Paper No. 54). Downloaded from http://www.who.int/healthinfo/boddalysmphreferences/en/index.html. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |

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| 17867 | 7 | | | | | Miller BG, Hurley JF. 2003. Life Table methods for quantitative impact assessments in chronic mortality. J Epidemiol. Community Health, 57: 200-206. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17868 | 7 | | | | | Mitchell, R.C. and R.T. Carson 1989. Using Surveys to Value Public Goods: the Contingent Valuation Method. Resources for the Future. Washington, DC. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17869 | 7 | | | | | Murray, C.J.L., Acharya, A.K., 1997. Understanding DALYs. Journal of Health Economics 16(6) 703-730. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17870 | 7 | | | | | NRC 2010. “Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use”. National Research Council of the National Academies Press. National Academies Press, 500 Fifth Street, NW Washington, DC 20001. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |

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| 17871 | 7 | | | | | ORNL/RFF 1994. External Costs and Benefits of Fuel Cycles. Prepared by Oak Ridge National Laboratory and Resources for the Future. Edited by Russell Lee, Oak Ridge National Laboratory, Oak Ridge, TN 37831. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17872 | 7 | | | | | Pope CA, Hill RW& Villegas GM 1999. “Particulate air pollution and daily mortality on Utah’s Wasatch Front”. Environmental Health Perspectives, vol.107(7), 567-573. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17873 | 7 | | | | | Pope CA, RT Burnett, MJ Thun, EE Calle, D Krewski, K Ito, & GD Thurston 2002. "Lung cancer, cardiopulmonary mortality, and long term exposure to fine particulate air pollution ". J. Amer. Med. Assoc., vol.287(9), 1132-1141. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17874 | 7 | | | | | Rabl A 2003. “Interpretation of Air Pollution Mortality: Number of Deaths or Years of Life Lost?” Journal of the Air & Waste Management Association, Vol.53(1), 41-50. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |

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| 17875 | 7 | | | | | Rabl A, Thach TQ, Chau PYK and Wong CM. 2011. "How to determine life expectancy change of air pollution mortality: a time series study". Environmental Health, 2011, 10:25. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17876 | 7 | | | | | Reiss R, Anderson EL, Cross CE, Hidy G, Hoel D, McClellan R, Moolgavkar S. 2007. "Evidence of Health Impacts of Sulfate- and Nitrate-Containing Particles in Ambient Air". Inhalation Toxicology, 19:419–449. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17877 | 7 | | | | | Samet JM, Dominici F, Zeger SL, Schwartz J, Dockery DW. 2000. "The National Morbidity, Mortality and Air Pollution Study, Part I: Methods and Methodologic Issues." Research Report 94, Part I. Health Effects Institute, Cambridge MA. Available at http://www.healtheffects.org/ | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17878 | 7 | | | | | Schwartz J, Coull B, Laden F and Ryan J. 2008. "The Effect of Dose and Timing of Dose on the Association between Airborne Particles and Survival". Environmental Health Perspectives, vol.116 (1), 64-69 | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |

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| 17879 | 7 | | | | | Spadaro JV and A Rabl 2008. “Estimating the Uncertainty of Damage Costs of Pollution: a Simple Transparent Method and Typical Results”. Environmental Impact Assessment Review, vol. 28 (2), 166–183. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17880 | 7 | | | | | UNSCEAR 2000. REPORT Vol. II SOURCES AND EFFECTS OF IONIZING RADIATION United Nations Scientific Committee on the Effects of Atomic Radiation UNSCEAR 2000 Report to the General Assembly, with scientific annexes Volume II: EFFECTS, ANNEX G Biological effects at low radiation doses. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17881 | 7 | | | | | WHO 2003. “Health Aspects of Air Pollution with Particulate Matter, Ozone and Nitrogen Dioxide”. World Health Organization report EUR/03/5042688. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17882 | 7 | | | | | Wilson R and EAC Crouch, 2001. "Risk-Benefit Analysis". Harvard University Press, Cambridge, MA. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |

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| 17883 | 7 | | | | | Wilson R and JD Spengler, editors 1996. "Particles in Our Air: Concentrations and Health Effects". Harvard University Press, Cambridge, MA. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17884 | 7 | | | | | Woodruff TJ, Grillo J, Schoendorf KC 1997. "The relationship between selected causes of postneonatal infant mortality and particulate air pollution in the United States". Environ Health Perspect, vol.105(6), 608-612. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17885 | 7 | | | | | Zanobetti A, Schwartz J. 2008. "Mortality displacement in the association of ozone with mortality: an analysis of 48 cities in the United States". Am J Respir Crit Care Med;177(2):184-9. | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 17886 | 7 | | | | | Zmirou D, Balducci F, Dechenaux J, Piras A, Filippi F, Benoit-Guyod JL. 2007. "Meta-analysis and dose-response functions of air pollution respiratory effects". Revue Epidemiologie et Sante Publique 45(4):293-304 (1997). | Taken into account. This is a very well-meaning attempt to alert us to relevant literature. However, we cannot start by reviewing the epidemiological or toxicological literature on individual pollutants emitted by power plants. We have not found burden-of-disease type overviews that attribute DALYs to individual emission sources (rather, more abstract, urban air pollution). The main purpose of the work here is to |
| 18646 | 7 | | | | | The FAQs - clearer messages please. | Taken - into account. The frequently asked questions (FAQ) have been reformulated in order to address issues related to the energy supply sector only. |

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| 10795 | 7 | | | | | The chapter misses forest plantations in degraded soils of the tropics. As a renewable energy source, forest plantations can capture large amounts of CO2, while suppling woodchips for replacing coal in power plants and also replacing coke in ironmaking. Charcoal ironmaking is traditionally done in Brazil, with net CO2 capture, as compared to ironmaking with coke. Sources of reliable information: Brazil´Ibama, the national Institute for Environment and Nature; AMS, Associacao Mineira de Silvicultura, and Brazils Forest Service of the Ministry of Environment. | This is not the subject of this chapter. See Introduction. Forest issues are treated in chapter 11. |
| 3635 | 7 | | | | | Table 7.2 hardly readble. | Taken in to account - readability has |
| 3637 | 7 | | | | | Figure 7.11 hardly readble. | Taken into account. Figure has been |
| 3636 | 7 | | | | | Figure 7.9 hardly readble. | Accepted |
| 7478 | 7 | | | | | In urban areas, there is a choice of fuels and price of the various fuels determines what people buy. LPG is the most convenient fuel, but it has to be bought in bulk. Fuelwood, charcoal and kerosene can be bought in small or large quantities. Electricity is expensive and supply is unpredictable. Thus, the choice depends on price, availability, preference and the type of food/ beverage that is being prepared. | Noted. That is more the subject of chapter 9. |
| 15509 | 7 | | | | | Resources and resource availability - Very well presented. Suggestion to introduce somewhere a paragraph (introduction words) on “available” resources and “climate change patterns”. In another word, resources already well identified and other potential ones are already enough to go much over than a 450 ppm trend - see IPPC SRREN, IEA or others. | Noted. Thank you. Resources definitions which are in use in the chapter are given in section 7.4 |
| 5328 | 7 | | | | | The table hides that the high growth in some sectors is due to high subsidies (feed-in-tariffs). It would be interesting to know the growth of capacity per dollar of a feed-in tariff. | Rejected - the impact on policy on RE development is addressed elsewhere in the chapter. The statistic suggested by the comment is not available in the peer |
| 5235 | 7 | | | | | The legend of Figure could be more informative by giging the names of the source sectors. | Taken into account. The section has |
| 11158 | 7 | | | | | The grouping of countries e.g. Africa as a block is misleading. Further, regretably, China and India dorminates statistics on Developing countries and overshadows most other developing countries. In future, it might be worthwhile to consider distinguishing between BRICS (Brazil, India, China and South Africa) and other developing Countries. Data on Africa is sparse and where avaialable, is hugely over-aggregated. Understandably, it is difficult to present accurate regional data on specific regional initiatives. Recent discoveries of of oil, gas and coal in many of the Countries in Eastern Africa - Sudan, Somalia, Tanzania, Uganda, Kenya will impact on the regions CC mitigation efferts. It might be important to highlight/mention these discoveries, whatever the scale, because thay will impact on renewable energy initiatives that the countries were embarking on.. | Noted. We understand those concerns and tried to make this point clear. The WGIII has regional split we trying to stick to. In some cases separate countries are mentioned in the text. But significant detalization will overload figures and made them hardly readable. We are stressing the importance of China and India in sections 7.2 and 7.3. But there would be a battle for showing |
| 10540 | 7 | | | | | Question to ask for whole chapter is what is new since AR4. Seems to be mainly regurgitation of the same info (also the case for other chapters I realise - including Transport!). | Agreed - focus should be on what's new since AR4 with some allowance for covering key fundamental points to orient reader to a given topic (i.e., |
| 3008 | 7 | | | | | This table lacks the citation of a recent and comprehensive study undertaken by the World Bank in Brazil: Low Carbon Emission Scenarios in Brazil. Please see http://siteresources.worldbank.org/BRAZILEXTN/Resources/Brazil_LowcarbonStudy.pdf. | Rejected - There is no table 7.5 at this page. If figure 7.5 is referred to, then it just shows historical evolution with no |
| 3000 | 7 | | | | | Figure 7.10 is not clear. What is the label of axis-x? | Accepted. Figure has been corrected. |
| 5934 | 7 | | | | | assessment of the various technologies, and the LCA approach could be seen as uncertain and opaque. Is it necessary to base the IPCC work on life-cycle assessments? | Rejected - the methodological annex for details on the LCA method. |
| 5936 | 7 | | | | | The representation of uncertainty of resource assessments by height of columns seems to hide the large potential for hydropower, which due to a precise resource assessment is represented by an almost invisible line. | Accepted - new figure makes it somewhat more visible |

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| 2937 | 7 | | | | | It is not clear to this reader (and I daresay to many others) what the authors include and exclude in the "energy sector" which this chapter is supposedly about, and how that relates to the coverage of other chapters in this volume. Thus we read in the chapter summary (p5 lines 2-3) "the energy sector...provides only 45 % of energy-related GHG emissions". So where are the other 55% ? One is left to presume that the other 55% are attributable to transport, buildings, and industry (chapters 8,9,10) . Or do these only add up to 45% or 50%? This division between chapters both conceptually and numerically needs to be clarified, or readers will be very confused. Section 7.1.1 (where one might expect a clear and comprehensive discussion of these issues) has only one short and inadequate paragraph (p7 line 46- p8 line 3) , with no reference to how the related chapters fit in. The discussion in chapter 4 about "emissions measured by source" and "emissions measured by consumption" is also relevant here. | Accepted - a diagram in the introduction now clarifies the system boundaries. |
| 14895 | 7 | | | | | There is a substantial overlap between Chapter 15 and Chapter 7 section 11 on policies please align and refer rather than duplicate and contradict | Accepted - text revised. |
| 17201 | 7 | | | | | The chapter is densely populated with grey literature (incl. Conference papers) and non-peer reviewed articles. The CLAs are requested to make a thorough review of the material cited throughout the chapter. | Accepted - most of the literature is peer-reviewed. Beyond peer-reviewed journals, references are made to reviewed publications of IPCC, IEA and |
| 17235 | 7 | | | | | Publications in "Energy Procedia" are usually only conference proceedings that are not peer reviewed. | Noted. |
| 17280 | 7 | | | | | The scope of the chapter is not entirely clear. It would be valuable to frame the scope of the chapter in terms of the mitigation options that are taken into account. Are only emission reductions in the energy conversion sector (e.g. electricity production) considered? Or also the provision of alternative, low-carbon combustible energy carriers (such as biofuels for transportation)? It should also be clarified that any options related to fuel switch or energy demand reductions are discussed in the sector chapters. | Accepted - text revised. |
| 17205 | 7 | | | | | The sub-section is not really summarizing the AR4, e.g. there is a reference to IEA(2012). | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 3408 | 7 | | | | | This is a section discussing issues that seem to belong to other chapters and that are treated here quite superficialy. Incredibly poor text in pages 65 lines 9 to 30, from trivial statements (line 9-11) to random choice of a nice case example in Denmark, which is again poorly explained . Anohter example of extremly low quality rethoric is between lines 37 and 43 in page 65. Another example: we should agree that it is trivial to note that "...agriculture which is a seasonal activity" in line 1 page 66, followed by irrational, opinionated, rethoric. DELETE SECTION ? Section 7.10.5 is much better (factual and informative) and could be saved and put elsewhere. | Taken into account - text has been rewritten. |
| 17943 | 7 | | | | | An introductory sentence along the example of Chapter 9 referring to the agreement reached in Wellington (p. 36) might be helpful for readers: "Barriers and opportunities are referred to as conditions that hinder or facilitate the implementation of the analyzed measures." | Rejected - this is a matter of the glossary. |
| 3639 | 7 | | | | | Delete or massively reduce to save space as overlaps with chapters 4.3.5, 6.3.7, 6.7.1. | Accepted - text is reduced considerably. |
| 3640 | 7 | | | | | Delete or massively reduce to save space as overlaps with chapter 4.3.8. | Taken into consideration. Revised. |
| 17944 | 7 | | | | | The discussion provided in this sub-section should be linked to the section 2.4.4.2 that provides a number of important references. | Noted. |
| 3641 | 7 | | | | | Delete or massively reduce to save space as overlaps with chapter 3.4.2, 3.11, 4.3.3. | Rejected. This section is specific to the |
| 17951 | 7 | | | | | Further issues that might be discussed in this section are aesthetic perceptions of wind energy and grid technologies, infrastructure lock-in with respect to legal aspects, liability for accidents (as in the case of off-shore wind). | Taken into consideration. But the reviewer does not provide references. We have looked for further references. |
| 3642 | 7 | | | | | Delete or massively reduce to save space as overlaps with chapters 4.3.2, 4.1.2.3, 4.6. | Rejected. This is a cross-cutting issue, and we are addressing the specifics of capacity building in the energy sector |

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| 3409 | 7 | | | | | This is a section of overall good quality but I am not sure if it belongs to this chapter. In particular section 7.11.2 must be treated in much more details in other chapters of this AR?. Only one comment on text in page 68, line 32-34: is it sensible to rely on technologies to be deployed after the middle of the 21st century? | Taken into account - the description of the instruments and their economic justification is left to the policy chapter |
| 17232 | 7 | | | | | The study below shows that technology policies can help to overcome the negative effects of delayed carbon pricing. In this study technology policy is not a complement, but a temporal substitute for a missing carbon price. The study also analyzes the regional distribution effects. Bauer N, Baumstark L, Leimbach M (2012): The REMIND-R model: the role of renewables in the low-carbon transformation—first-best vs. second-best worlds. Climatic Change, online first. DOI 10.1007/s10584-011-0129-2 | Rejected - space constraints do not allow for a discussion related to the justification of single instruments. This is to be done in chapter 13-15 or 3. |
| 3410 | 7 | | | | | This is an excellent section for a FOD. Authors responsible for this section should be encouraged to read and critically comment on previous sections ¡¡ . | Noted. |
| 4465 | 7 | | | | | This section offers little in the way of sectoral policies. There is no balance in the discussion since most CO2-emitting sectors are omitted. The discussion on policies for electricity generation are general, rather than practical. There is no discussion of what works and what does not, across a range of countries and time periods. Therefore, there is little offered to the reader to inform decision making in the future. To illustrate, Table 7.6 offers a summary of policy options. However, the question remains on how effective any of these policies has been in the past, whether they should be continued and can deliver on the desired avoided CO2 volumes in the required time. Thus, a more analytical discussion is required, rather than repeating the generalizations and concepts that most readers are familiar with already. | Accepted - this section should not discuss policy issues in detail. This is done in 7.11. The policy discussion from table 7.6 has been removed. |
| 11544 | 7 | | | | | Why is this here? Chapter 6 is the place for it, this is why there is a chapter 6, right? | Reject - Chapter 6 aims at an integrated view of the transformation, while this section looks at the implications of the |
| 10688 | 7 | | | | | I can't understand the importance of this figure. It seems that it is only meant to show the diversity of technology utilization by country in different models and no further implication is not shown. | Taken into account - comment is obsolete. Figure has been deleted. |
| 3643 | 7 | | | | | Delete or massively reduce to save space. Overlaps with chapter 6.3. | Noted - but figure removed. |
| 11872 | 7 | | | | | This section seems to gloss over a lot of work that has been done to consider different methods for considering cumulative versus instaneous conditions/effects, and how they address (or don't address) the issue of irreversible climate change events/processes. Why are all of these considerations /alternatives seemingly ignored? | Rejected. The issue is already covered in detail in chapter 6 |
| 3644 | 7 | | | | | Delete or massively reduce to save space. Overlaps with chapter 6.3.2. | See comment 11872. Luckow (2012) should be replaced with a citation to Edmonds, J., Luckow, P., Calvin, C., Wise, M., Dooley, J., Kyle, G., Kim, S., Patel, P., Clarke, L., 2012. Can Radiative Forcing Be Limited to 2.6 |
| 3645 | 7 | | | | | Delete or massively reduce to save space. Overlaps with chapter 3.10.2., 6.3.4, 6.3.6.3. | Taken into account - comment is obsolete. Figure was removed. |
| 17236 | 7 | | | | | the issue of CO2 emission statistics is not only a gap in knowledge but a gap in preparation for poolicies. Emission policies with caps require national statistics of emissions. If these statistics are not made available and accepted by national institutions there might be a serious lack of institutional capacity building that will deply effective and comprehensive policies to reduce GHG emissions. | Noted. |

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| 3012 | 7 | | | | | I suggest including the discussion about gaps related to GHG metrics. Temporal issues are of fundamental importance in the evaluation of mitigation strategies dependent on multi-gas comparisons. First, it isn't clear which climate change impact the metric is a proxy for. The term "warming potential" is misleading, for the relationship between the radiative forcing which results from a pulse emission and its warming potential is not a simple one, as two gases with the same GWP will not necessarily cause the same temperature change and climate impact. Second, in spite of advances, much uncertainty remains regarding the appropriateness of GWP as a metric for determining equivalence of short-lived gases or a gas such as CH4, which may be regarded as short-lived relative to CO2. Studies show the dependence of the GWP for short-lived gases on geographic origin of emissions and on the effect of feedbacks. Also, there are two aspects of time which are not properly addressed when the fixed GWP metric is applied: the moment when an emission pulse occurs, and the choice of time-horizon and target year to be used for comparison of climatic impacts. This means that pulse emissions are weighted equally, regardless of how far the emission is from the target year, a clear disadvantage for mitigation policies with specific temporal objectives. The fact that GWP is time-invariant can cause the overestimation in multi-gas equivalency of short-lived such as CH4, particularly when shorter time-horizons are used. | Noted - the reviewer is right in emphasizing this, however, gaps related to GHG metrics are to be addressed in chapter 6 and the methodological annex. |
| 17209 | 7 | | | | | The issue of traditional biomass is not considered here. However, this is an important part of the energy sectors in developing countries. | Only two examples with highest penetration are taken for power generation - coal and gas. Biomass and |
| 17211 | 7 | | | | | The sub-section doe snot discuss the role of international energy technology markets. The availability of alternatives and the diffussion rates of new technologies this is very important, especially for the case of renewables and nuclear. The international spread of technology costs (e.g. Solar PV) is of great importance. This is important for the IPCC AR5 because this is a key for international technology policies to accelerate the diffusion rates of technologies. | Rejected - space constraints do not allow to go into the details here. |
| 17212 | 7 | | | | | The sub-section does not discuss the role of oil prices. This is important because the mitigation costs of CO2 from the energy sector very much depend on the price of oil because (i) CO2 abatment costs are the opportunity costs of not using fossil fuels in traditional ways and (ii) the oil price has a large impact on gas and coal prices. This is still true, though the link of oil and gas prices has been unlcoked in the US recently. | This introductory part of the chapter showing the present status in energy sector. Section 7.3.3 was removed |
| 17213 | 7 | | | | | The CLA may want to to consider the emissions of suplhur, black carbon, VOCs as well. Gas Flaring might also be interesting because it emits a lot of black carbon that influences albedo in the arctics. | Taken into account. The section has been deleted. |
| 11848 | 7 | | | | | The discussion of energy-related CO2 and GHG emissions is quite confusing. Does energy-related emissions refer to emissions from the total fuel cycle (or life cycle) emissions? If so, can this be stated more clearly and succinctly? | Taken into account. The section has been deleted. |
| 11850 | 7 | | | | | This section lists a lot of data and facts without providing a great deal of analysis or interpretation (e.g. section 7.3.2.2). Is it possible to provide these data in tables, or better, figures that are easier to digest and interpret? This could also shorten the text. | Taken into account. The text was shortened. |
| 2997 | 7 | | | | | All discussion misleads the fact that petroleum reserves (conventional or not) can increase not only by discoveries but also by EOR. This is an important issue, since CO2 capture and storage can either improve EOR or compromise it. | Noted Comment is valid, but space limitation exclude to go into the details here. |
| 2998 | 7 | | | | | Again, in all section 7.4 there is the need to better differentiate between shale oil and oil shale. Authors seem to not recognize this important distinction and use wrongly both concepts. | Rejected: The distinction can only be made where time and space permits. Use here is consistent with the purpose |
| 12916 | 7 | | | | | Residual heat from industrial processes (steel, refineries etc.) and power production constitute a large and untapped energy resource that could be used for district heating (and cooling). This resource could replace fossil fuels in district heating networks or biofuels which then could be used for other purposes. | This resource is widely used in some countries like Russia for example. As too industrial waste heat this is the subject for chapter 10. Here we may reflect that |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17219 | 7 | | | | | The section is not reviewing the most recent literature. The CLAs are strongly recommended to improve this section. The section should also comprise text and quantifications on EROI, co-emissions (includig deforestation and peat land loss for tar sands), policies like concessions and royalties. Regarding co-emissions a review of shale gas is required. | Rejected - not possible given space limitations. |
| 16097 | 7 | | | | | The beginning of this section could be shortened and clarified. The first paragraph is there for criticism and rebuttal in the next ones. Maybe a more direct approach would be clearer and shorter. | Accepted - text shortened |
| 16098 | 7 | | | | | The depletion issue is clear only in the end from the point of view of climate : p.26 line 17 it is explicit. But the section should precise who disagrees with the vision of that much available hydrocarbons, and if the difference between sources could be removed by more knowledge or research. | Rejected: This is extensively done in the GEA reference. |
| 16099 | 7 | | | | | A graph comparing these fossil reserves with the carbon budgets in order to limit global warming to 2°C or less is needed here, updated from AR4. This could be in addition to table 7.2 | Rejected due to space limitations |
| 16100 | 7 | | | | | Wouldn't ex-coal liquids be relevant in this section? | Rejected - no, this section is about resources not their eventual use |
| 6798 | 7 | | | | | When covering unconventional fossil fuel resources, it is extremely important to detail the additional carbon emissions associated with these resources and the large carbon emissions potential of these reserves if they are tapped. | Accepted- text revised. |
| 4080 | 7 | | | | | It would be nice to have a graph in this section representing carbon content of different fossil fuels and carbon emissions allowed by different stabilization scenario, e.g. an update of IPCC, TAR, 2001, SYR, Fig. 7-5 : http://www.ipcc.ch/ipccreports/tar/vol4/english/fig7-5.htm . Even better would be a « peak-oil » like graph presenting fossil-fuel use in the coming years allowed by stabilization scenarios. It could be something like http://www.peakoil.org.au/charts/world.oil.gas.coal.production.1965-2050.gif but taking the climate constrain into account. This should probably be done « all other things being equal » (i.e. no big modification in livestock, no CCS...). | Rejected: Space limits prohibit this detail. |
| 17221 | 7 | | | | | The sub-section does not consider the most reccent findings of WEC regarding the additional recoverable uranium at costs higher than 80US$ per kg Uranium | Accepted - and updated to reflect Red Book 2012 |
| 2999 | 7 | | | | | it would be interesting to mention that huge amounts of natural uranium equivalent remain in the military reserves of the USA and Russia. However, the Red Book cited in the report acknowledges that the uranium mining capacity numbers are higher than the possible real production from mining. | Rejected: Comment correct - but space limitations prohibit this level of discussion. |
| 16228 | 7 | | | | | I guess it'll be good to add a Matrix as a comparison between energy that could be obtained through the application of each type of new and renewable energies compared to the cost of financial investment, and by imposing a best suitable conditions for that and also impose worst, I suppose that comparison will be useful purely for developing countries and least developed countries | Rejected - though this would indeed be useful, it is simply not available in the peer reviewed literature |
| 16808 | 7 | | | | | Previous sections were helpful because of inclusion of costs -- this section omits any discussion of costs or economics and is therefore less helpful. Policymakers need some context. | Accepted - text has been amended to be clear that no overarching single cost metric has been used for RE potential studies. As we are forced to refer to the available literature we are unable to |
| 3392 | 7 | | | | | I do not have sufficient technical expertise in all subsections under 7.5 but I strongly feel that there is something wrong in the current draft. Generic text is mixed with disconnected pieces of valuable information. Obvious "text-book" ideas, that could be omitted, are mixed with highly technical excursions to detail, that are unnecessary in an IPCC report. In summary: a poor job by the drafting authors. Only some detailed examples below. | Noted. |
| 17749 | 7 | | | | | there is no discussion on behavioural aspects as the section heading suggests | Taken into account - the heading is used for all sector chapters. It fits to end use sectors, but does not really apply to |

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| 16109 | 7 | | | | | Consumption patterns -in French Sobriété- and even most of energy efficiency gains are absent in this section. They should be mentioned as an introduction or recall of the other chapters. Otherwise it is misleading for decisionmakers in terms of relative size. Energy efficiency has to be recongnized as a wider potential than all other options. | Taken into account - the system boundaries are described in chapter 7.1. Energy efficiency at the consumer level is discussed in the demand sectors. |
| 16810 | 7 | | | | | This section may be shortened -- it also lacks the very important discussion of relative costs … simply listing the technology options without showing how their costs compare to other technologies is not that helpful. | Noted. |
| 13294 | 7 | | | | | It is worth mentioning in this section that decarbonisation of the heat and transport sectors has the potential to require signficant additional distribution network capacity, as heat pumps and electric vehicles are adopted. It is also worth mentioning that the amount of additional capacity required will depend on the patterns of consumption from these new demands, which depend on whether smart infrastructure is introduced (e.g. smart EV charging overnight vs. charging at the early evening peak on returning home from work have an order of magnitude difference in their costs of electricity distribution) | Accepted - short paragraph added to the end of 7.5.2 |
| 16812 | 7 | | | | | While there is potential to squeeze out gains in transmission and distribution of electricity, these seem relatively small compared to costs -- why spend so much space on it in report unless these are indeed much less costly on a $/ton basis than other mitigation options in generation. | Noted. Actually, this is a fair comment - A possible answer is to demonstrate that savings won't come easily from this area |
| 7733 | 7 | | | | | The whole section gives the impression that CCS is a dominated technology, with risks under control and competitives costs. CCS is still to be develped in order to overcome a variety of barriers. Deep detailed studies are needed to correctly access the risk of CO2 leakage. Chosing an adequate site for CO2 storage has no methodological correct answer and this is a concern that needs to be adressed. Projects like the CCS with storage in saline acqufiers as the one in Wayburn in Canada, have been stopped, which is a clear sign that some important difficulties remains. | Rejected. No scientific evidence or body of peer reviewed literature is offered in support of this observation .The totality of what is written about CCS in all parts of Chapter 7 seems balanced. But because it is broken up and scattered it |
| 16038 | 7 | | | | | In this sectionthe the description of CCS can be shortend. But it has to include the discussion about the riscs and the uncertainties of CCS and the possibility of the use of CO2 after sequestration CCU (Carbon capture and usage) for example with algae. | Rejected. No scientific evidence or body of peer reviewed literature is offered in support of this observation .The totality of what is written about CCS in all parts of Chapter 7 seems balanced. But because it is broken up and scattered it |
| 16815 | 7 | | | | | This section would benefit greatly by inclusion of discussion re the relative cost of renewable energy vs. other low emitting energy technologies. Models show that renewable energy is a very important component of a low emitting technology set, but not the only part of a low cost solution. If restrict the future to only use renewable energy technologies, the models indicate the cost is several times greater than if we allow nuclear and CCS technologies to deploy. See chapt 6. | Rejected - very good points, but better addressed in the cost and scenarios sections of the chapter. Please review those sections in the next round to ensure that these important points are |
| 3003 | 7 | | | | | The manuscript summarized very well the current status of nuclear energy. However, the promise that Generation III designs could be safer, but simpler and cheaper has been shown to be inaccurate. Moreover, in spite of the optimism for the nuclear industry in China, there are still significant issues about whether this country will have as open and accountable processes for the nuclear industry as those in other countries. | Rejected - The reference to smaller modular reactors and potential for improved economics is conditional. Discussion of nuclear industry in China |
| 17224 | 7 | | | | | The sub-section does not discuss the issue of refurbishment costs of existing nuclear power plants for life-time extension up to 60 years. These costs are substantial. The CLAs are requested to include this into the review. See Schlesinger M, Lindenberger D, Lutz C (2010) Energieszenarien fr ein Energiekonzept der Bundesregierung. Project Number 12/10 (German Federal Ministry of Economics and Technology, Berlin | Rejected - not supported by available data. Life extension policies vary across regions. Life extension is common in the US, and 73 reactors in the US have had their operating license extended from 40 to 60 years (US NRC). Life extension is |

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| 17229 | 7 | | | | | The sub-section is not discussing the international dimensions of using nuclear power. This includes escpecially the issue of proliferation. Expanded use of nuclear power for climate change mitigation also requires a more stringent framework to avaoid proliferation. Heree international security and cliamte policies are strongly interrelated. | Taken into account - section 7.5.5 ends with "Continued use and further expansion of nuclear energy worldwide as a response to mitigating climate change require greater efforts to improve the safety, economics, uranium utilization, waste management, and proliferation concerns of nuclear energy |
| 17230 | 7 | | | | | regarding large scale integration of renewables for CO2 emission reductions the study by Haller et al.; Energy Policy, Vol. 47, pp282-90 is useful to consider here. The study shows that the same level of emissions in the EU-NorthAfrica region can be achieved at lower costs, if international grid integration is available. | Rejected - space constraints do not allow to go into every detail here. |
| 9243 | 7 | | | | | Please add the 'access to the electricity' itself in the developing regions if possible. | Rejected - the comment seems to be |
| 16826 | 7 | | | | | Could be significantly shortened. No context, not particularly useful in terms application or policy formation. Can you provide range for how costly potential improvements are on a $/ton basis so policymakers can know if these improvements are likely in a low carbon price environment or a high carbon price? | Accepted - content of the text has been improved. Cost issues are to be discussed in section 7.8.2.R1193 |
| 3399 | 7 | | | | | This is really superfitial again, and with too many references to support "text-book" generic ideas. Key figures from the key reports to highlight the existing infraestructure for fuel supply systems should be highlighted (a table?). May be delete the paragraph on H2 transport (line 23-34)... | Taken into account: Entire hydrogen paragraph has been revised. |
| 6432 | 7 | | | | | This section has a lot of references for large ocean vessel transportation and offshore transportation, but only a couple for onshore pipeline transportation. The reference to Johnson and Ogden is not the best work or most productive work. Here is some relevant and more thorough text, with more and more appropriate references:" A large and integrated network of dedicated CO2 pipelines will be needed to transport enormous volumes of CO2 between spatially distributed CO2 sources and CO2 storage reservoirs. For example, in the United States, this could require building a network to carry a larger volume of CO2 than domestic oil consumption (1). Large pipelines that can aggregate CO2 enjoy tremendous economies of scale (e.g., 2), enabling operators to build cheaper and more resilient CO2 networks (3), though networks will likely evolve over time starting with smaller unconnected networks (4) and progressing to cooperative systems involving multiple stakeholders (5). The pipeline network will be integral to a cost-effective and reliable CCS system, for example, being able to flexibly route CO2 sources and sinks with varying supplies (e.g., changes in electricity production) and reservoir performance (e.g., potential leakage) (6).<br><br>1. Middleton RS, Keating GN, Stauffer PH, Viswanathan HS, & Pawar RJ (2012) Effects of geologic reservoir uncertainty on CCS infrastructure. International Journal of Greenhouse Gas Control 8:132-142.<br>2. Kuby MJ, Middleton RS, & Bielicki JM (2011) Analysis of cost savings from networking pipelines in CCS infrastructure systems Energy Procedia 4:2808-2815.<br>3. Middleton RS & Bielicki JM (2009) A scalable infrastructure model for carbon capture and storage: SimCCS. Energy Policy 37(3):1052-1060.<br>4. Johnson N & Ogden J (2011) Detailed spatial modeling of carbon capture and storage (CCS) infrastructure deployment in the southwestern United States. 10th International Conference on Greenhouse Gas Control Technologies 4.<br>5. Middleton RS, Wei R, Kuby MJ, Keating GN, & Pawar RJ (2012) A dynamic model for optimally phasing in CCS infrastructure. Environmental Modeling and Software 37:193-205.<br>6. Middleton RS, et al. (2012) The cross-scale science of CO2 capture and storage: from pore scale to regional scale. Energy & Environmental Science 5(6):7328-7345. | Noted. The references provided by the reviewer are not inherently any better than those already included in the text. |

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| 3401 | 7 | | | | | Excess of references for simple ideas. Do you really need 9 references to support the obvious statement "Effect of climate change on overall energy demand will vary geographically". In general, this is a poor section 7.7, full of trivial and superficial ideas, combined with a pretencious use of references. Just one example: Lines 40-42 in page 44: do you need to refer to two papers to support this thermodinamic evidence?. These ideas are much better treated in section 7.8.1 which reads excellent. Delete most of this section? | Rejected - The IPCC decided upon the chapter sections, and this one must be included. The WGII report covers the issues covered here in depth, but we must nonetheless at least summarize the basics of the literature. With planned revisions, we believe that the text will accurately reflect the literature, and point readers to some of that literature. While it is true that one need not have an excess number of citations, one purpose of IPCC documents is to help the reader identify relevant literature to get started with, so we do not wish to severely restrain citation numbers. We will look to eliminate some citations, however, in |
| 3005 | 7 | | | | | I suggest including the following references. Pryor, S. C., R. J. Barthelmie, and E. Kjellström, 2005a. Potential climate change impact on wind energy resources in northern Europe: Analyses using a regional climate model. Climate Dynamics 25: 815−835. Pryor, S. C., J. T. Schoof, and R. J. Barthelmie, 2005b. Climate change impacts on wind speeds and wind energy density in northern Europe: Empirical downscaling of multiple AOGCMs. Climate Research 29: 183−198. Pryor, S. C., R. J. Barthelmie, E. Kjellstrom, and J. Mann, 2005c. Potential climate change impacts on wind energy resources in northern Europe. Geophysical Research Abstracts 7: 01544. Pryor, S. C., and R. J. Barthelmie, 2010. Climate change impacts on wind energy: A review. Renewable and Sustainable Energy Reviews 14: 430−437. | Rejected - These are all excellent citations, but the majority if not all of them are included in the IPCC SRREN, which is the source document used for discussion of possible wind energy impacts. That meta-study includes these citations by reference. |
| 17231 | 7 | | | | | The study below quantifies the emission reduction potentials in the energy sector. The authors might cite this. Luderer L, Pietzcker RC, Kriegler E, Haller M, Bauer N (2012): Asia's Role in Mitigating Climate Change: A Technology and Sector Specific Analysis with ReMIND-R. Energy Economics Special Issue on the Asian Modeling Exercise. Accepted for publication. | Rejected - space constraints do not allow to go into the details here. |
| 11549 | 7 | | | | | This subsection is not very well structured. Pls agree on a generic structure for how to deal with different technologies in which order and stick to it (first RE issues, then CCS, then… etc) - coordinate also with Ch 6. | Accepted - the text is revised accordingly. |
| 10053 | 7 | | | 48 | | The costs for new nuclear power plants are unclear and scientific literature should be quoted. Either the shown nuclear cost figure is based on a scientific publication (reference should be added) or this range must be much larger. In the UK the nuclear industry asks for a feed-in tariff for new nuclear power plants of approx 19cents/kWh. The current figure and the range is misleading. | Taken into account - the cost of nuclear power plants are reconsidered and based on IEA data. |
| 10054 | 7 | | | | | This section needs significant more work, as the current status does not provide the required level of information. Table 7.5 provides an incomplete overview from mostly grey literature. The curves should also be part of this section rather than only writing about the curves. | Taken into Account - This section gives context to the relative economic potential of energy supply options, and while the broader economic assessment in other chapters is referenced, these links will be made more comprehensive. The |
| 3638 | 7 | | | | | Concentrate on energy security issues. Massively reduce rest to save space as overlaps with chapter 5.10. | Rejected. There is virtually no overlap |
| 17933 | 7 | | | | | Introductory sentences like the ones in Chapter 10 might be a good idea to prepare the reader for the following discussions: "Besides economic cost aspects, several other aspects have implications on the final deployment of mitigation technologies. Co-benefits, co-costs, risks and uncertainties associated with alternative mitigation technologies as well as public perception thereof can affect investment decisions of companies and priority setting of governments." | Accepted. An introductory section has been inserted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9264 | 7 | | | | | The use of depleted oil/gas fields for CCS could extend the socioeconomic viability of oil towns/industries. | Rejected. No scientific evidence/publications provided to support suggested changes. This might be true but this seems like a minor nuance of a point. I'm also not aware of any literature on this point. Lastly, it is not clear (again there is no literature on this point) as to how large the rents would be from storing CO2 in a depleted oil field and who would share in those |
| 17936 | 7 | | | | | Please consider reviewing the following paper: Steckel, Jan, Robert J. Brecha, Jessica Strefler, Michael Jakob und Gunnar Luderer (in review): Development without energy? Assessing future scenarios of energy consumption in developing countries. Working Paper. Submitted to Ecological economics (http://www.pik-potsdam.de/members/steckel/publications/development_energy_new) | Noted. |
| 3002 | 7 | | | | | The manuscript emphasizes the issue of how integrating CCS-baseload plants into grids, but it does not emphasize the fact that:<br>a. Depending on the technology, CCS will increase the water demand of the plant, and can even undermine its application to some facilities. See Feeley, T.J., Skone, T.J., Stiegel, G.J., McNemar, A., Nemeth, M., Schimmoller, B., Murphy, J., Manfredo, L., 2008. Water: A critical resource in the thermoelectric power industry. Energy. 33, 1–11. Zhai, H., Rubin, AND., Versteeg, P., 2011. Water Use at Pulverized Coal Power Plants with Postcombustion Carbon Capture and Storage. Environmental Science and Technology, 45, 2479 - 2485.<br>b. Post combustion capture plants generate toxic residues. This can undermine the large scale application of this option. See THITAKAMOL, B.; VEAWAB, A.;AROONWILAS, A. Environmental impacts of absorption-based CO2 capture unit for post-combustion treatment of flue gas from coal-fired power plant. International Journal of Greenhouse Gas Control, v. 1, n. 3, p. 318–342, jul 2007. STRAZISAR, B. R.; ANDERSON, R. R.; WHITE, C. M. Degradation Pathways for Monoethanolamine in a CO2 Capture Facility. Energy & Fuels, v. 17, n. 4, p. 1034–1039, 1 jul 2003.<br>c. Given the energy penalty, it is worth estimating the life cycle emissions of power plants with CCS. This was proposed by FERON, P. H. M. Exploring the potential for improvement of the energy performance of coal fired power plants with post-combustion capture of carbon dioxide. International Journal of Greenhouse Gas Control, v. 4, n. 2, p. 152–160, mar 2010. HERTWICH, E. G.; AABERG, M.; SINGH, B.; STRØMMAN, A. H. Life-cycle Assessment of Carbon Dioxide Capture for Enhanced Oil Recovery. Chinese Journal of Chemical Engineering, v. 16, n. 3, p. 343–353, jun 2008. KOORNNEEF, J.; KEULEN, T. VAN; FAAIJ, A.; TURKENBURG, W. Life cycle assessment of a pulverized coal power plant with post-combustion capture, transport and storage of CO2. International Journal of Greenhouse Gas Control, v. 2, n. 4, p. 448–467, out 2008. | Taken into account. We added that CCS increases the cooling requirement with a reference to Zhai et al. Please note that the toxic emissions from amine-based CCS plants have been considered in the cited reference. |
| 3009 | 7 | | | | | An important issue very well documented in the literature is the tradeoff between oil products tighter specifications (especially for distillates and petrol) and GHG emissions from petroleum refineries (due to the increased fuel combustion and also the hydrogen requirements of hydrorefinery units). The section lacks this crucial discussion, which poses the challenges of matching energy security targets with high quality liquid fuels without increasing GHG emissions. Please see SZKLO, A. S., SCHAEFFER, R., 2007. Fuel specification, energy consumption and CO2 emission in oil refineries, Energy, 32(7): 1075-1092. JOHANSSON et alli. 2012. Assessment of strategies for CO2abatement in the European petroleum refining industry.Energy 42(1): 375-386. NORDRUM et alli 2011. Assessment of greenhouse gas mitigation options and costs for California Petroleum Industry facilities: The shape of things to come. Energy Procedia 4: 5729-5737. | Rejected. Please note that refining and transport are not addressed in Ch.7 |
| 17939 | 7 | | | | | It might be a good idea for the reader to cross-reference other health-related impacts in other other chapters - particularly Chapters 8 and 9. | Noted. |

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| 16848 | 7 | | | | | Listing the deaths associated with each source -- you need a timeframe please. Is it each year? The last 10 years? Since time began? | Editorial comment. This information is contained in the figure caption. |
| 3010 | 7 | | | | | I do recognize that the safety record of nuclear energy has been relatively fine and Generation III reactors have enhanced safety features compared to the 1970s-era Generation II designs like those at the Fukushima Daiichi facility in Japan. In addition, as the section indicates, the number of fatalities from the nuclear energy system is far smaller than the number killed or injured, for example, producing energy from coal or hydropower. However, the manuscript seems to minimize the fact that:<br>1. nuclear accidents pose threats for longer periods. Chernobyl nuclear power plant is now encased in a huge sarcophagus that will have to be maintained for hundreds of years to prevent radiation leakage.<br>2. relicensing of existing nuclear plants beyond their design lifetimes increases vulnerability and risk: most of the current fleet of reactors are not and won't be from generation III or even III+. Hence, chances for another disaster grow.<br>3. Finally, the long-term waste disposal problem has yet to be solved for nuclear power, and decommissioning costs are still highly uncertain. The minimum safety requirement for material leakage established by the US Environmental Protection Agency is 1 million years. This is a time very far beyond any possibility of social planning or even imagination. The manuscript, as it is, seems to compare the low social acceptability of nuclear with its low accident record, without acknowledging the reasons behind societies' preferences. | Reject. Please note that we do not have the opportunity for a longer discussion of these issues. It is correct that lifetime extension of existing NPP are not addressed in this report as a mitigation option. We have noted explicitly, now in a table, that the waste issue needs to be resolved. |
| 17941 | 7 | | | | | Please consider a broader discussion of risks and uncertainties along the classification of risks and uncertainties provided in Section 6.7. Please liaise with the other sector chapter LAs to discuss the process by which a more consistent approach can be reached. | Rejected - space constraints do not allow to go into the details here. |
| 11550 | 7 | | | | | The focus on fatality in the context of risk is too narrow and the section is not systematic enough. Instead of focussing on number of fatalities from Chernobyl, authors may want to explain more comprehensively the risks associated with different technologies (e.g. CCS leakage, risks related to intermittency ->security, health hazards etc); distinguish between mortality and morbidity for humans; but also risks to humans, vs risks to broader environment, etc. | Rejected. The treatment of risk suggested here would be worthwhile but cannot be taken in the short space available here. |
| 17942 | 7 | | | | | The title of this sub-section is not consistent with agreements reached in Wellington (p. 36), by which it should be named: 'public perception'. | Accepted - we have made the change |
| 17350 | 7 | | 2 | | 9 | Discussion of public acceptability of new technologies is missin, unless it is expected that it will be in other chapters in which case it needs to give cross-reference. Also cross-reference to concepts like willingness to accept chapter 3. | Rejected - Not clear what other new energy supply technologies are being referred to here, as we include CCS, |
| 11866 | 7 | | | | | It's not clear that this section really conveys particularly interesting information to the reader. Though it is interesting to consider trade-offs in local/regional electricity grids dependent on fossil fuels that may be imported, versus renewables that are local but not reliable on diurnal/seasonal cycles -this isn't really done in the section. Also, it seems to convolute issues of oil which (outside of oil-producing states where it may generate electricity) is really dominantly used for the transportation sector versus electricity grid reliability. | Rejected. The reviewer makes an interesting point. However, the suggestion made would require a lot more space than what is allocated in this section. Regarding the issue of oil, it is true that oil-importing states rely on the resource for electricity; but also many oil-importing developing countries also rely |
| 12912 | 7 | | | | | This section mainly focuses on the negative effects of bioenergy use. It would be appropriate to balance these negative effects with an up front description of the main beneficial effect, which is the replacement of fossil fuels. It is true that taking biomass out of forests can reduce carbon stocks and have a radiative forcing on climate. But the establishment of new forests may build up new carbon stocks and have a negative focing on climate, see further comment 4. | Agreed. : sure, as long as we note that the assumption of 1:1 replacement is atheoretical. |

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| 12913 | 7 | | | | | Again, the this section mainly focuses on the negative effects and criticism of bioenergy use. It would be appropriate to balance these with the main beneficial effect, which is the replacement of fossil fuels. As an example, in the section on Fossil fuel deplacement (page 91, line 26-), 20 lines (26-47) are dedicated to describing why bioenergy does not fully displace fossil fuels, while only two lines (47-48) mention the important fact that this can be avoided by appropriate cap and pricing instruments. | Agreed. Need to be balanced. RICH: Felix, please explain to me how policy instruments affect global fuel market effects. I believe this is incorrect. All sectors have challenges in achieving efficient substitution of current CO2 |
| 16879 | 7 | | | | | Sustainable development -- I'm not aware of a formal definition of this concept -- are we talking about ecological systems, human systems, populations? Can we be more precise? | Rejected - comment seems to be misplaced. Please clarify to which part of the text your comment actually refers. |
| 3381 | 7 | 0 | | | | I have been supporting and contributing to the IPCC work for many years. It is therefore a great disappointment to read this FOD on this key chapter on Energy Systems. Huge differences exist between sections: from embarrassingly poor, superficial, rhetoric and badly written to excellent pieces of work. I do not know any of the authors and have no prejudices towards them, but I strongly feel some of them have done a very poor job for the IPCC in this FOD and should consider resignation (including, or in particular, any CLA responsible for the overall editing quality of this FOD). Some examples of clear flaws are included in this review. Other minor but also important points/questions have to be left for a SOD. CROSS REVIEW BETWEEN LAs HAS TO BE ENCOURAGED FOR THE SOD. | Noted - no operational suggestion is given here. The chapter has been improved considerably. A detailed cross review of the entire chapter has been carried out. |
| 3382 | 7 | 0 | | | | It should be a very easy job to come down to 60 pages. Full subsections can be deleted because they repeat message better treated in other sections (see comments below). The number of references is huge and can be reduced by 1/2. Many of them are brought in to support obvious ideas or text with no new factual infomation. Also, when a major report by the IPCC, IEA, major database etc is referred to support certain data or piece of information, it is not be necessary to refer as well to a paper publication by an author or small group of authorsn (it may be even un-ethical if this reference is to your own group). | Noted - the reference list is not part of the page counting. The suggestion was taken into account where appropriate. We do acknowledge that the size has to be reduced. |
| 4428 | 7 | 0 | | | | The authors rely on IEA projections in the early part of the Chapter. Therefore, the Chapter reads more as a condensed IEA report and lacks the analysis and suggestions that we need to break the projected trends. The Chapter could be shortened by removing the background on oil reserves/resources on p23. The CCS discussion could be shortened and its nature as an end-of-pipe emphasized. That is, less use of carbon intense fuels means a decreased need for CCS facilities. The nuclear discussion could be shortened. The discussions on both nuclear and CCS are large disproportionately compared with the brief account of all other renewable energy sources. Similarly, the discussion on transporting natural gas and CO2 could be reduced. | Accepted - IEA projection has been removed from the early part of the chapter. The discussion of fossil reserves was shortened significantly. Rejected - CCS and nuclear play an important role in chapter 7 and therefore they have to be discussed in chapter 7. There has been a special IPCC report on renewable energies (RE) recently. The treatment of renewables energies therefore can be shorter than that of nuclear and CCS. Note that there is a biomass annex in chapter 11 in addition |
| 12313 | 7 | 0 | | | | General comment: The use of SF6 in high-woltage appliances, such as gas insulated switchgears should also be covered in this chapter. Rationale: Use and, in particular, leakage of this long lived and highly potent GHG might be mitigated in a relatively cost-efficient manner. New infrastructure projects on electricity transmission are potential new sources of significant emissions of this GHG. | Rejected - the SF6 issue is a very specific one. Space constraints do not allow to go into all possible options for GHG mitigation in the energy sector |
| 15353 | 7 | 0 | | | | Overall the document is comprehensive and has a good balance of pertinet climate change and energy issues pertaining to both developed and developing countries. A balance which is important for the global drive to comabting as well as adapting to climate change. | Noted - a balance is indeed important. |

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| 16946 | 7 | 0 | | | | I regret I have not had time to review the Sectoral chapters in depth. My only overall comment on this chapter is that whilst the Sankey diagrams are technically very valuable, their complexity may risk obscuring simpler messages about the underlying structures of the energy system. A simpler classification and flow diagram - along with quantification of both energy and carbon associated with each main block - is offered in Chapter 3, of Grubb, Hourcade and Neuhoff, Planetary Economics: the Three Domains of Sustainable Energy Development, Taylor & Francis forthcoming (Chapters 1 – 5 submitted, others in draft available on request).<br>As it happens, our flow diagram pinpoints precisely the structure that follows in the next three IPCC chapters - namely that the energy system is driven primarily by the demands of transport, Buildings and Industry - and elaborates on some of the structural characteristics. Whether or not using a diagram like this, I do think that Chapter 7 should help to set this structural context and placement for the subsequent three chapters. | Taken into account - a simplified graph now illustrates the relationship between the energy supply sector and the demand sector (see introduction). |
| 9409 | 7 | 0 | | | | When summarizing findings in the IPCC AR4 and discussing effects of energy system or energy intensity improvement, it may be useful to review the following paper.<br>Hanaoka, T. Kainuma, M., Matsuoka, Y. (2009) The Role of Energy Intensity Improvement in the AR4 GHG Stabilization Scenarios. Energy Efficiency, 2(2):95-108, DOI: 10.1007/s12053-009-9045-y | Taken into account - the comment is obsolete. The summary of the AR4 has been deleted due to space constraints. |
| 2819 | 7 | 0 | | | | I have three general comments on balance/comprehensiveness (which are reflected in detailed comments below):<br>1. Although the chapter is headed “Energy Systems” it gives insufficient attention to systems aspects. The largest part of the discussion is on low carbon resource availability and technologies – which is odd since, as the chapter acknowledges, this is not the main problem area. In my view, these sections (along with the scenarios section) could be shortened (including the discussion of bioenergy, which seems out of place here and should perhaps be relocated). Systems issues (such as infrastructure, investment, policies, institutions, regulation, market and pricing structures, systems operation and coordination, risk management and uncertainty etc) need more attention; demand in particular is inadequately treated. This may well be because some aspects of demand are discussed in other chapters, but the systems chapter is where things should be brought together.<br>2. The choice of references seems to privilege academic (in both senses) sources over empirical analysis. For instance, scenarios and modelling results are often cited as though they had evidential value, even when there is (often conflicting) evidence available from the real world. The text does not set the scenarios in context or expose their sensitivity to the underlying assumptions. Most of the models assume a world of perfect foresight and no uncertainty and so fail to deal with some major issues affecting choices in the real world.<br>3. In general, the discussion of specific issues is balanced. However, there are a number of points where the choice and treatment of sources seems selective. These are mostly relatively minor in themselves but they all point in much the same direction and leave an impression of bias in favour of certain options (renewables, CCS and carbon pricing) while other options are treated more neutrally (nuclear) or largely ignored (systems options).<br><br>While none of these problems is fundamental, in combination they have the result that the scale and nature of the problem is mischaracterised and the responses are only partly analysed. | Taken into account - 1.) A new diagram in the introduction now clarifies the relationship between chapter 7 and the demand sectors. As chapter 7 is constrained to the energy supply part of the energy system, low carbon technologies must be discussed here in detail. Demand aspects are discussed in detail in the demand chapters. The discussion of general system issues has been improved throughout the chapter (especially in section 7.11). 2.) Rejected- the models used to derive the scenarios in section 7.11 are introduced and discussed together with their weaknesses in chapter 6. Space constraints do not allow to repeat the discussion in our chapter 3.). Taken into account - there is now a detailed discussion of the relative importance of the various options in section 7.11. |
| 15016 | 7 | 0 | | | | The impact of shale gas must be discussed somewhere in this chapter. | Accepted - The discussion of shale gas has been extended in sections 7.4.1 |
| 15017 | 7 | 0 | | | | The discussion on the variation of CO2 emission factor from power generation will be useful to see the future reduction potential to electrification. | Taken into account - section 7.5.1. now provides a detailed discussion the CO2 |

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| 4083 | 7 | 0 | | | | The German Academy of Science (Leopoldina) recently issued a report named « Bioenergy, chances and limits », that can be downloaded here http://www.leopoldina.org/en/publications/detailview/?publication[publication]=433&cHash=6828ed4387801f3c1eeddaa5b636cf40 . This repport is less optimistic than previous IPCC publications on bioenergy mitigation potential. IPCC figures on bioenergy should probably be re-considered with care, especially now that we have more insight on previous errors on biofuel carbon accounting (see here, for example http://www.guardian.co.uk/environment/2011/oct/07/european-biofuels-target-us-scientists ). | Noted - bioenergy now has become an annex of chapter 11. The merits and shortcomings related to bioenergy usage are discussed there in detail. |
| 11918 | 7 | 0 | | | | Much space can be saved by removing redundancies, replacing text numbers with figures, and giving the text a good Engish edit.Also, order of text often does not seem logical. Why go from global markets (7.2.2) into Scale of GHG emission (7.2.3)?, especially in a section on Production, Conversion , and T&D? | Taken into account - text has been improved. |
| 18497 | 7 | 0 | | | | The presentation of mitigation options across the chapter is often inconsistent. This may only be limited to the order of technologies (e.g. in section 7.4 nuclear is presented before RE. In 7.5 this is reversed), but also varies quite substantially in the second half of the chapter (e.g. sometimes highlighting only one or two options, RE and CCS). Implementing a clear and consistent set of options (e.g. fuel switching, ee, RE, CCS, and nuclear) across sections 7.8, 7.9, 7.10 and 7.11 would be particularly useful to guide the reader. | Accepted - where it is feasible we discussed the options in the following sequence: fuel-switching, energy efficiency improvements, renewables, nuclear, CCS |
| 9220 | 7 | 0 | | | | The chapter 7 is the bigger importance. The date, technology and economy information, and the sources used in this chapter is the bigger relevant  The structure is well, but may be the chaptar can be shortened if Bioenergy Annex goes to Annex II Methods and Metrics. On the other ham, many titles of figures and tables includes some explanation that can send to foot page or the other place | Noted - the Bioenergy Annex was moved to another chapter. |
| 2990 | 7 | 0 | | | | In all document shale oil must be distinguish from oil shale. “Shale oil” is also referred to as “tight oil”, although they are not exactly the same thing. It is more important, however, not to confuse “shale oil” with “oil shale,” as often occurs. Put simply, “shale and tight oil” are conventional oils (light oils with low sulfur content) trapped in unconventional formations, which make it extremely difficult to extract hydrocarbons. By contrast, “oil shale” is a precursor of oil called kerogen, a sort of teenage-oil that constitutes the building blocks of conventional oil. Oil shale is trapped in rocks with low porosity and permeability, making the extraction of kerogen difficult. However, the oil shale rocks are closer to the surface than those containing shale and tight oil. Thus, both the oil shale formations that contain kerogen and the kerogen itself are “unconventional.” | Rejected - the usage of the terms is consistent with the scientific literature. |
| 3006 | 7 | 0 | | | | In the manuscript, CCS was mainly analyzed for thermal power plant. However, different studies have shown that CCS will probably be applied in oil refineries too, mainly in hydrogen production units and FCC units. Please see Gomes, G.L., Szklo, A.S., Schaeffer, R., 2009. The impact of CO2 taxation on the configuration of new refineries: An application to Brazil. Energy Policy, 37, 5519–5529. de Mello, L., Pimenta, R. Moure, G., Pravia, O., Gerahart,, L., Milios, P., Melien, T., 2009. A technical and economical evaluation of CO2 capture from FCC units. Energy Procedia 1 (1): 117-124. Kronberger, B.,  Johansson E., Löffler, G., Mattisson, T., Lyngfelt,A., Hofbauer, H., 2004. A Two-Compartment Fluidized Bed Reactor for CO2 Capture by Chemical-Looping Combustion, Chemical Engineering & Technology, 27 (12): 1318-1326. Miracca, I, Åsen, K., AssinK, J., Coulter, C., Curran, L., Lowe, C., Moure, G., Schalsner, S., 2009. The CO2 Capture Project (CCP): Results from Phase II (2004-2009). Energy Procedia, 1 (1): 55-62. Castelo Branco, D.A., Szklo, A., Gomes, G., Borba, B.S.M.C., Schaeffer, R., 2011. Abatement costs of CO2 emissions in the Brazilian oil refining sector. Applied Energy, 88, 3782-3790. LINDSAY, I. et al. Designing a climate friendly hydrogen plant. Energy Procedia, n. 1, p. 4095-4102, 2009. MAHONY, L. CO2 capture for refineries, a practical approach. Energy Procedia, n. 1, p. 179-185. 2009. | Accepted - CCS can be applied to many different kinds of large stationary CO2 point sources. This point is explicitly made in the first paragraph of section 7.5.5. |

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| 3007 | 7 | 0 | | | | The manuscript lacks discussion on the important subject of gas venting and flaring. Please see the World Bank Programme related to that (TheWorld Bank Group. GGFR – Global Gas Flaring Reduction.Washington, DC:World Bank. See also: http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTOGMC/EXTGGFR/0,contentMDK:22137498~menuPK:3077311~pagePK:64168445~piPK:64168309~theSitePK:578069,00.html; 2007); see also Castelo Branco et al. Co2e emissions abatement costs of reducing natural gas flaring in Brazil by investing in offshore GTL plants producing premium diesel. Energy 35 (2010) 158–167. | This is briefly mentioned in 7.5.1 |
| 10041 | 7 | 0 | | | | This chapter lacks up to date information about the current development of the RE sector and focusses only on a very limited amount of scenario which are neither representitive nor balanced. More informations of the previous IPCC report about Renewable energy (SRREN) must be incorporated. Currently the chapter is quite weak and too focused on IEA data, while the latest RE research results are not present. | Rejected - most of the discussion on IEA scenarios has been removed. The scenario results are based on a database which contains over 800 different |
| 3153 | 7 | 0 | | | | This chapter is so massively over limit it was almost impossible for me to review it. Delete the annex on bioenergy—why not just integrate it with the main text? | Taken into account - bioenergy annex has been moved to chapter 11. The size of chapter 7 has been reduced considerably. |
| 4317 | 7 | 0 | 0 | 0 | 0 | Wind power is now technically mature and it is not realistic to expect major reductions in cost apart from those following on from reductions in the cost of materials such as steel and material used to make the blades. Many manufacturers of wind turbines are no longer profitable and their share price is declining rapidly. (e.g Vestas) In the case of solar power, prices of solar cells are not likely to decrease much below $1/Watt because, at this level, most manufacturers are losing money. The cost of mounting the cells, providing the cabling from the cells to the inverters, the cost of the inverters and transformers and the connection to the grid are all things that form the major part of the cost and are not likely to decrease substantially in the future. Many manufacturers of solar cells are no longer making a profit and their share prices are declining rapidly. Both industries are entirely dependent on a very large amount of subsidy. This subsidy is added to electricity prices so, in effect, the poor are subsidising the rich who are able to "Invest" in subsidised projects.. This is not sustainable. This section needs to be expanded to explain the situation. | Rejected - Many of these issues are adequately addressed in the present text, in our view. In fact, there are expectations for wind energy costs to continue to decline. We have seen substantial turbine advancements just in the last couple of years, primarily focused on reducing LCOE in lower wind speed sites. There are many expectations for this to continue. Similarly, solar modules today sell at ~70 cents/W (well below $1/W), and the cost of production roughly matches this figure. While it is certainly true that both wind and solar manufacturers are currently operating on low margins, and in some cases negative margins, there is little indication that technological progress has ceased. Many industry watchers expect sub 50 cent/W modules in the next few years. Continued reduction in costs are especially possible if one considered non-hardware costs. In Germany, residential solar is installed at ~$2.5/W; in the US that figure is above $5/W - the difference comes in non-hardware costs. So even when hardware costs become static, there continue to be opportunities for overall cost reduction. As such, we |

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| 4319 | 7 | 0 | 0 | 0 | 0 | No one has been killed by the Fukushima accident and, because the radiation level experienced even by the workers at the site, was below the level that research has established as being dangerous, nobody will. (www.radiationandreason.com) In this respect, note that one dam failure in China (Banquio) ~26,000 people directly and many more from starvation. But the world did not stop building hydro schemes. I believe that, as the IPCC claims to be science-based, scientifically-based evidence like this should be pointed out. | Taken into account – Please note that there are many conflicting statements in the public about the risk of nuclear power and the consequences of the Fukushima accident. As a scientific body, the IPCC has to rely on peer-reviewed scientific publications. Utilizing research that has just become available, section 7.9.3 now includes following sentences: “The Fukushima-Daiichi accident resulted in much lower radiation exposure. 30 workers received radiation exposure above 100 mSv, and population exposure has been low |
| 4320 | 7 | 0 | 0 | 0 | 0 | In many–if not most–countries renewable energy generates the maximum amount of power at times when the seasonal and daily electricity demand is not at a maximum. It is true that, at some expense, pumped hydro can compensate for daily fluctuations and batteries and other things can, at great expense, cater for shorter term fluctuations. However, there is no method available or on the horizon for storing large amounts of electricity for weeks or months. Pumped storage schemes have a daily cycle and have sufficient storage for 6 to 10 hours of full load operation. There are a few schemes with larger storage. In order to store large amounts of energy for long periods, a pumped storage hydropower scheme would have to have 2 huge lakes with 500 to 800 m elevation between them. It would also need a substantial water supply to make up evaporation losses. There are very few suitable sites available around the world and even fewer within reasonable distance of a large load centre. So there is no chance of storing surplus electricity from renewable energy sources for periods longer than a day or so. This single fact means that renewable energy cannot make a contribution to energy supply much over about 20%. Therefore, it cannot substitute for fossil fuel plants or nuclear power. The conclusion is that if there was a need to reduce carbon dioxide, nuclear power is the only large scale technology that we have. (Hydropower cannot provide large amounts of electricity in most countries.) Given the wind and solar power are much more expensive than nuclear, the pursuit of large-scale renewable energy is a mirage. (Note that countries that have more than 20% of renewable energy such as Denmark, export much of it at a low price to Scandinavia and Europe when the wind is blowing and blow it back at a much higher price when the wind is not blowing.) I think what I have written needs to be covered in the report. If it is not covered, then the thrust of the report is seriously misleading. | Rejected. Please note that the issue of grid integration and balancing is addressed in 7.6.1. |
| 10440 | 7 | 0 | 0 | | | There is an excessive of citations of IEA report, please expand your reference base | Accepted - the reference base has been |
| 10441 | 7 | 0 | 0 | | | Why is the bioenergy in annex. This is very important and should be included in a chapter, eliminating some of the economic theory | Rejected - space constraints do not allow to go into the details of bioenergy in chapter 7. The annex has been moved |
| 3634 | 7 | 0 | 0 | | | Chapter 7 elaborates too much in CCS relative to other mitigation options, e.g. renewable energies. Chapter too much CO2-driven. Other GHG emission reductrion potentials not sufficiently discussed. | Taken into account - other gases (e.g. fugitive methane emissions are now treated in more detail. The discussion on CCS and nuclear is longer as there had |
| 4827 | 7 | 0 | 0 | 0 | 0 | The chapter would profit from short summaries at the beginning and end of each section to help the reader remember the focus and main line of the chapter given how long the chapter is | Taken into account - a new introduction clarifies the content of the entire chapter. In various occasions, pointers to other sections are used to facilitate readability and understanding. However, due to |

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| 4828 | 7 | 0 | 0 | 0 | 0 | The chapter should give more weight to affordability implications given the current economic crisis as this has an important impact on climate related policies. | Taken into account - sections 7.10.2 and 7.11 now contain a detailed discussion |
| 17745 | 7 | 1 | | | | 39 pages of references are far too many; several IEA reports are simply repetitive | Rejected- in order to provide a comprehensive assessment the underlying literature must be assessed. |
| 6255 | 7 | 1 | | | | Energy in itself is not important to consumers. It's rather the services that energy delivers that matter. This is particularly relevant in discussions of risk, behavioural patterns and new investment. The interaction with consumers is currently lacking in the chapter, meaning that the context or the reality grounding the chapter is weak. In addition, the notion of behaviour related to market segmentation should also be considered in relation to customer centricity. A holistic view must be taken since the decarbonisation of electricity is the key to decarbonising other sectors (transport. domestic) which whilst reducing total overall emissions could cause increased emissions from the electricity sector | Taken into account - This is a problem with the entire report setup. The electrification is now addressed all the way in the scenario selection. |
| 6256 | 7 | 1 | | | | thereis a lack of distinction in the chapter between energy systems in developing countries and those in developed countries | Taken into consideration - a box on this distinction has been provided. |
| 6257 | 7 | 1 | | | | Roadmaps from different sources are recommended for inclusion in the chapter, including the EU 2050 Roadmap, and scenarios from Eurelectric (Power Choices) , EPRI (Prism) and Greenpeace. | Rejected - space constraints did not allow to include these scenarios in addition to the 800 scenarios of the |
| 6258 | 7 | 1 | | | | The diagrams must be much clearer. At present they detract from the text. | Accepted - almost all diagrams has been improved or changed. |
| 6259 | 7 | 1 | | | | The language in the chapter is often inconsistent in its use of the terms energy, power, and electricity | Accepted - language usage has been |
| 6260 | 7 | 1 | | | | Additional sources of information should be used - suggested sources attached separately below | Taken into consideration - suggested sources have been reviewed and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6261 | 7 | 1 | | | | Withana, S., Núñez Ferrer, J., Medarova-Bergstrom, K., Volkery, A., and Gantioler, S. (2011) 'Mobilising private investment for climate change action in the EU: The role of new financial instruments', IEEP, London/Brussels.<br>Behrens, A., Colijn, B., The Socio-Economic Transition towards Sustainability and its Impacts on Jobs in Europe, Intereconomics, Volume 47, Issue 3, May/June 2012, pg. 146-151, Springer, Berlin/Heidelberg.<br>Behrens, A. et al., Escaping the Vicious Cycle of Poverty: Towards Universal Access to Energy in Developing Countries, CEPS Working Document, 2012.<br>Teusch, J., Behrens, A., Egenhofer, C., The Benefits of Investing in Electricity Transmission – Lessons from Northern Europe, CEPS Special Report, 2012.<br>Jul 2010 Behrens, A., The role of renewables in the interaction between climate change policy and energy security, Renewable Energy Law and Policy Review, Volume 1, Number 1, pg. 5-15, Lexxion, Berlin.<br>Behrens, A., The missing link: An integrated strategy to reduce greenhouse gas emissions from transport, in Notre Europe/Real Instituto Elcano/Egmont/GKI, Think Global Act European – The Contribution of 14 European Think Tanks to the Spanish, Belgian and Hungarian Trio Presidency of the European Union, 2010.<br>Eskeland, G., Jochem, E., Neufeldt, H., Traber, T., Rive, N., Behrens, A., The Future of European Electricity: Choices before 2020, ADAM-CEPS Policy Brief, 2008.<br>Giljum, S., Behrens, A., Hinterberger, F., Lutz, C., Meyer, B., Modelling Scenarios towards a Sustainable Use of Natural Resources in Europe, Environmental Science and Policy, Volume 11, Issue 3, pg. 204-216, Elsevier, Amsterdam, 2008.<br><br>Fujiwara, N. 2012, 'Sector-specific activities as the driving force towards a low-carbon economy: From the Asia-Pacific Partnership to a global partnership', CEPS Policy Brief, No.262, January.<br><br>Fujiwara, N., M. Alessi and A. Georgiev, 2012, 'Carbon market opportunities in Southern Mediterranean countries', MEDPRO Technical Report No.8, FP7, MEDPRO project, March 2012. NB: This report will be adapted and published in Carbon & Climate Law Review, Special Issue on carbon markets and developing countries before November 2012.<br><br>Fujiwara, N., and A. Georgiev, 2012, 'The EU Emissions Trading Scheme as a driver for future carbon markets', Report of a CEPS Task Force, March.<br><br>Egenhofer, C., L. Milford, N. Fujiwara, T. L. Brewer, and M. Alessi, 2007, 'Low-carbon technologies in the post-Bali period: Accelerating their development and deployment', ECP Report No.4, European Climate Platform, December 2008<br><br>Alessi, M & C Egenhofer, Space Observation Systems: an underused asset in EU and global climate change policy. CEPS Policy Brief 245, 28 June 2011<br>Nuñéz-Ferrer, J, C Egenhofer & M Alessi, The SET-Plan: From concept to successful implementation, CEPS Task Force Report, April 2011<br>Gros, D & C Egenhofer, 'The case for taxing carbon at the border', Climate Policy, 11 (5), Special Issue, 2011 | Rejected. The relevance of these papers is not explained. |
| 6247 | 7 | 1 | | 135 | | In general, the draft is a long and tedious piece. The chapter is 100 pages, much longer than the 60 page goal; huge cuts will be needed. | Taken into account - the text has been reduced considerably. |
| 6248 | 7 | 1 | | 135 | | There is a huge amount of data, but little insight. The chapter never really gets around to saying anything. Many parts of the chapter read like a laundry list, naming a bunch of things and giving a few sentences of summary for each one. | Taken into account - the storyline has been improved. |
| 6249 | 7 | 1 | | 135 | | Many paragraphs appear to be comprised of many sentences, each put together by a different author. And many sentences appear to be crafted to encompass the full range of the data, often at the expense of communicating the central points. | Taken into consideration - Improved in SOD. |
| 6251 | 7 | 1 | | 135 | | this chapter would be more effective in communicating mitigation potential if it were organized more along the following lines: | Accepted - Responses done along the lines. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6252 | 7 | 1 | | 135 | | 1. Establish, using historical and current data, an account of the state of emissions from the power sector. I say power sector because that's actually all we're really interested in here; transportation is probably its own chapter. Nowhere in this chapter is oil mentioned except to say that oil-fired plants aren't very common. | Taken into account. It is not just power generation. It is also : heat generation, fossil fuels extraction, transport and distribution (See IPCC inventory |
| 6253 | 7 | 1 | | 135 | | 2. Establish, using current research and development, the strategies available to mitigate emissions from the power sector. Strategies for mitigation can include technologies (CCS), economic measures (investments), and social programs (education). As the authors point out, no single strategy will work to fix this complex system. | Noted. Thank you. Those comments were kept in mind while developing SOD. |
| 6254 | 7 | 1 | | 135 | | 3. Using research, forecasting, and data modeling, make an argument about the viability of methods and techniques to mitigate climate change outcomes. | Accepted - Those comments were kept in mind while developing SOD. |
| 17390 | 7 | 1 | | 135 | | I am afraid that I did not appreciate the tight timescale here (relative to my pre-existing commitments) and so read through the material very quickly. My reactions should be weighted accordingly. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4638 | 7 | 1 | | 96 | | General comments on Chapter 7.<br><br>First some background information. I have had over 40 years experience in renewable energy, especially biomass energy. I have worked in over 50 countries on biomass energy surveys, wood consumption/timber trends studies, renewable energy supply & demand, biomass inventories and the environment. I have lived in Africa and Asia for 17 years.<br>Some of my recent publications, which are pertinent to this chapter, are:<br>Openshaw, K (2010a). Employment generation by biomass energy and its contribution to poverty alleviation in Malawi and other developing countries. Biomass and Bioenergy Journal 34, 2010. Elsevier, Oxford, England UK.<br>Openshaw, K (2010b). Can biomass power development? Gatekeeper Series 144, April 2010. The International Institute for Environment and Development (IIED), London, England UK.<br>Openshaw, K (2011a). Biomass as a benign energy source. Chapter 52 in Encyclopedia of Agrophysics. Eds. J. Glinski, H. Horabik, J. Lipiec. Springer.com/agrophysics. P.O. Box 17, 3300 AA Dorrdrecht, the Netherlands.<br>Openshaw, K (2011b). Supply of woody biomass, especially in the tropics: is demand outstripping sustainable supply? The International Forestry Review, Vol. 13(4), 2011. Ed. A.J. Potinger, the Crib, Dinchope, Craven Arms, Shropshire, SY7 9JJ UK. Published by the Commonwealth Forestry Association.<br>Barnes D.F., Priti Kumar, Keith Openshaw (2012). Cleaner hearths, better homes: new stoves for India and the developing world. Oxford University Press. The World Bank. ESMAP (energy sector management assistance programme). ISBN 0-19-807836-6.<br>Openshaw, K (2012). Remote sensing of biomass: principles and applications. Submitted for publication to the second sustainable world forum.<br>Biomass energy is the only energy form that is treated in two ways, namely 'traditional' and 'modern'. This separation infers that 'traditional' biomass energy is non-sustainable and has to be substituted as quickly as possible for 'modern' biomass and other forms of renewable energy (RE). For example, P. 18 line 14 states that biomass and waste (demand) are growing at 2% per annum including traditional and modern ---. P. 57, line 8. "Providing clean, affordable and reliable modern energy services is also at the heart of development challenges in many developing countries ---". P. 57 line 12 "over 3 billion people are estimated to lack access to modern fuels for heating and cooking ---". P 58 line 6 "The provision of access to clean, efficient, affordable and reliable energy services entails multiple co-benefits ---". Also, footnote 1 on page 9 talks about more comprehensive coverage of energy resources, including non-commercial ones (i.e. traditional ones).<br>Granted unprocessed biomass has a lower energy value per unit weight and is more difficult to control than liquid and gaseous fuels. But charcoal is lumped with fuelwood, residues and dung as traditional. Charcoal is a processed smokeless biomass fuel that has an energy value on par or better than most coals and has never been 'non-commercial'. To denigrate some biomass as traditional, infers that the people using it are handicapped! In my opinion, there should be no distinction with types of biomass as inputs for different end uses.<br>Chapter 7 keeps on mentioning energy access to modern fuels. But what it really means is access to electricity, for most people do have access to kerosene for cooking and lighting and many have access to LPG and even natural gas, especially in urban and peri-urban areas. However, for the rural population, if biomass is available within a reasonable collection area, most will use it in preference to fossil fuels. Kerosene is used sparingly for | Noted |
| 3384 | 7 | 10 | | 12 | | Space saving: Figure 7.1 top, can be deleted or the full Figure 7.1 can be deleted because the key numbers are in the text. The choice of categories reflect some prejudices in favour of geothermal: geothermal (0.06% of electricity) deserves a single colour/category, while wind (1.4% of electricity) is aggregated together with solar and mentioned only "after" solar. The same applies to Table 7.1: why "Geothermal, Solar etc" ? It is obvious from real numbers that it should be "Wind, Solar etc". Is this flaw also present in the IEA 2011 report used as a reference ?? | Disagree. This figure does illustrate very important point - that in last decade, fuel mix was evolving in favour of fossil fuels. It was modified in SOD. |
| 4639 | 7 | 10 | | 10 | | . Percentage use. For 2009, solar, wind, etc. should be 0.5% not 0.0%. | Numbers were eliminated. |
| 4640 | 7 | 10 | | 10 | | Figure 7.1 Incremental growth in China. Between 1999 and 2010, biomass energy increased by about 25% or over 2% per year. No growth is shown in the graph. (Total growth increased 2.6 times). | There are no statistical sources supporting this statement. IEA reports |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15942 | 7 | 10 | | 10 | | why use 2009 data when 2010 data has been available for nearly a year…? And all such comparisons are invidious anyway, unless your energy source of choice happens to waste up to 2/3 of its energy as heat. I suggest you treat heat, transport and electricity separately. | Data was updated to 2010. |
| 18502 | 7 | 10 | | | | It would be useful to have the same colors for the same technologies in the top and bottom panels. | Agree. We improved the design of figure |
| 18503 | 7 | 10 | | | | Top panel: Having 2009 as an individual year to the left of a ten year increment beginning with 1991 is difficult to digest. It might be more useful to have an annual continuum from 1991 to 2009, rather than 10 year increments. | Not clear why. This section is mostly on evolution for the last decade. |
| 18504 | 7 | 10 | | | | Lower panel: Note that it may be politcally problematic to single out China in this graph, as there are no other individual countries highlighted. | China was removed from the figure and included in Asia. |
| 10498 | 7 | 10 | | | | This is showing trends and is also referred to on page 18 - so suggest move from here to section 7.3. | The scale is presented by the table. This figure allows to see what energy sources |
| 6174 | 7 | 10 | 12 | 11 | 2 | This seems like one of the most important points to be made with respect to TPES – that supplying energy consumes more energy than anything else. Emphasize this point more strongly. | Text says "The energy supply sector is itself the largest energy user". So we |
| 2991 | 7 | 10 | 12 | | 16 | Text is not clear: First, it is hard to understand the meaning of populated in the sentence. Second, the causality is spurious here: it is not true that a site that provides different energy vectors is more complex than one that is based on a highly-sophisticated and selective process to optimize one major fuel. This is easily seen in oil refineries. Hydroskimming refineries may provide different fuels (from fuel oil to petrol), while hycon refineries are able to optimize their outputs in a few high value added products. | The meaning relates to the table 7.1. The part of the table related to energy sector has less empty sells today as it was 10-20 years back. |
| 17207 | 7 | 10 | 15 | | | The text is misleading, since the conversion losses come with the production of higher value final energy carriers. This is especially the case for electricity, which is clean at the point of use and usually has a high marginal product. | Point is not taken. All energy is used to produce services we need. We do not need energy per se. So energy sector losses are just an energy price for higher |
| 12320 | 7 | 10 | 2 | | | Please consider to add a figure (before figure 7.1) that shows energy consumption per source per region for 2009. This would complement the regional figure (second part of figure 7.1). | The task for figure 7.1 is to show what had happened in last decade. Adding new figures would be nice, but space |
| 9632 | 7 | 10 | 2 | | | the charts are confusing and the one legend for two charts is also confusing - consider labelling them a and b | We improved the design of figure 7.1 |
| 11917 | 7 | 10 | 2 | | | Figure 7.1 is confusing. Are the "increments" added increments? Would perhaps show better as a line diagram. | We improved the design of figure 7.1 |
| 16120 | 7 | 10 | 39 | 13 | | These sentences seem to imply that curtailing some wind in part of the year is a "last resort" strategy. In reality, it can be much more economic or practical than new power lines or other flexibility improvements. For example this is official policy in Ireland. The sentences imply also we need synchronized implementation of flexibility measures, adding unnecessary burdens to an already complex path. Suggestion for the last sentence : "indeed curtailment of wind power is common practice where and when transmission contraints prevent full utilisation of available wind, [and increase of transport capacity may be suboptimal]." | There is no line 39 on this page. |
| 9222 | 7 | 10 | 2 | 10 | 6 | To integrate both Figures and send the "note" to foot page | We improved the design of the figure 7.1 where figures were integrated |
| 10065 | 7 | 12 | | | | Instead of using the Header "Geothermal, Solar, etc." classify this as "Non-Combustible Renewables" | We use headings taken from the |
| 15015 | 7 | 12 | | | | Although these data are useful, but too much detailed. | Noted. The global energy balance is complex. This table shows end-use sectors by one line each and illustrate what energy carriers are needed for such sectors, It shows energy sector with |
| 10439 | 7 | 12 | | | | The entire table looks very similar to IEA world report tables, please change colors, orientations etc | It is more detailed than in IEA key world energy statistics. So colour scheme is |
| 10499 | 7 | 12 | | | | Change "bln kWh" to TWh. Need to explain why negative values in caption or footnote. Confusing as it is and needs greater explanation in the caption | Accepted - Negative numbers are explained in the footnote. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4429 | 7 | 12 | 14 | 12 | 15 | Is the large room for efficiency improvement the difference between average efficiency and best practice or the difference between average/best practice efficiency and the thermodynamic upper limit (exergy) of the process? | Practically speaking between present and best available technology efficiencies. That is a regular way to |
| 17383 | 7 | 124 | 1 | | | S.C. Pryor and R.J. Barthelmie (2010): Climate change impacts on wind energy: A review. Renewable and Sustainable Energy Reviews 14 (2010), pp 430-437. | Rejected - This reference is included in the IPCC SRREN, which is the source document used for discussion of possible wind energy impacts. That |
| 17384 | 7 | 124 | 4 | | | K. Rademaekers et al. (2011): Investment needs for future adaptation measures for EU nuclear power plants and other energy generation technologies due to effects of climate change - Final report. ECORYS Nederland BV, Nuclear Research & consultancy Group (NRG), Energy research Centre of the Netherlands (ECN), 2011. | Rejected - Good citations, but grey literature and not essential to support the points being made. |
| 17385 | 7 | 124 | 4 | | | http://ec.europa.eu/energy/nuclear/studies/doc/2011_03_eur24769-en.pdf | Rejected - Good citations, but grey literature and not essential to support the |
| 3385 | 7 | 13 | | | | Several examples of unnecesary autoreferences (Rogner et al) when major international data bases and reports are used to support data. Do you need a reference to ( MIT 2011) in line 35 to support and obvious, school-text, sentence ? . | Taken into consideration. The references are needed to reflect the diversity of the literature. |
| 12587 | 7 | 13 | 1 | | | The levels of waste heat from thermal power stations could be mentioned in contaxt of total space heating demands, which I feel puts things in perspective. For example, in the UK the waste heat from thermal power stations is roughly equivalent to the total space heating demands in the UK. For evidence, please see http://www.decc.gov.uk/en/content/cms/statistics/publications/flow/flow.aspx | The heating sector is mentioned. CHP plants are reflected in the table. There are some limitations for their deployment based on heat demand and the |
| 9633 | 7 | 13 | 1 | 13 | 7 | The message in the first paragraph is not clear - hard to understand what is being said. | Accepted. The message was made clearer in the new first paragraph. |
| 2823 | 7 | 13 | 1 | 13 | 3 | The reference to “relatively low average global efficiency” is unclear. Relative to what? Efficiencies have been steadily increasing over time. If the reference is to some theoretical potential, citing only fossil sources is misleading; conversion efficiencies of renewable sources or nuclear are generally much lower (in terms of the amount of potentially available energy which they convert to useful work). | Relative to the best available technologies. See paragraph below. |
| 11846 | 7 | 13 | 1 | 13 | 7 | This paragraph is quite confusing, particularly lines 4 through 7. It seems quite clear that converting primary energy into energy carriers is inefficient - but it is not clear what this paragraph is saying beyond that - what is meant by "large own energy use in energy sector," for example? If it simply means it takes energy to make energy, and on average a lot of energy is lost as waste heat, it seems like this can be said simply and concisely. This is one of many spots in the chapter where text can be eliminated without losing content. | Disagree. It is not that simple. Energy transformation technologies require energy and bring some losses. Both arte substantial. Some comments stress importance of this message (see |
| 5943 | 7 | 13 | 1 | 21 | | There is an issue of objectivity (use of language which could be considered pejorative) which does not reflect the age of investments and economic factors | There is no such flavour in those paragraphs. They just fix present low efficiencies and potential for |
| 16782 | 7 | 13 | 1 | | 32 | Could be significantly shortened. No context, not particularly useful in terms application or policy formation. | Some cuts were made. It brings present status picture as a departure point for |
| 16783 | 7 | 13 | 1 | | 7 | These numbers do not address the "quality" or usefulness of the energy -- the more relevant metric to discuss is the delivered cost of the useful energy. | The issue of energy costs is dealt with later in the chapter. Here only the energy |
| 6226 | 7 | 13 | 12 | 13 | 15 | Mention should be made of thermodynamic limitations on efficiency (Carnot/Kalina cycles) | Rejected - the thermodynamic limits are of limited use as long as the temperature conditions are not fixed. In addition, fuel cells might use fossil fuels with a |
| 16784 | 7 | 13 | 12 | | 15 | The implication is that there are large improvement opportunities possible, but these are only really true if we build completely new plants -- most can not be modified to produce these efficiencies. Do you want to leave reader with impression that modification can do the job or that we might just build new plants and that will help when building a new plant with only slightly better tech will lock in emissions for 40 years? | Those issues on what technically is possible and by when are dealt with later in the chapter. This is just an introduction to those sections. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2992 | 7 | 13 | 14 | | | It is not true that gas fired plant efficiency is only related to best practices. It depends on the environment conditions of the operation (temperature and pressure) and also it depends on the integration of these plants into the power grid. | There are many factors like capacity load and others. The comparison is made keeping other factors equal. |
| 16785 | 7 | 13 | 15 | | 21 | It is not clear to me what the point is of citing thermal efficiency numbers without any context. How is this meaningful to the issue at hand? | Those issues on what technically is possible and by when are dealt with later in the chapter. This is just an |
| 16786 | 7 | 13 | 22 | | | Suggest perhaps that you qualify statement by inserting at start of sentence: "In some cases," -- the statement as it stands now is not a universal condition. | There is "often" in this sentence to reflect this concern. |
| 4102 | 7 | 13 | 25 | 13 | 25 | Here, and at many other points, the 'Global Energy Assessment' is referenced as 2011. As of September 5, 2012, I await my copy from Cambridge University Press as a reviewer. | Noted. The correct reference details of the GEA were updated. |
| 9634 | 7 | 13 | 26 | 13 | 27 | Please clarify - is this 82% of what is used by industry, not including electricity generators? | The final use means that all energy transformation sectors are excluded. It is |
| 5151 | 7 | 13 | 26 | 13 | 26 | what is the intent of this sentence? | Intent is to show what sector demands what energy, which energy supply sector |
| 10500 | 7 | 13 | 3 | | | Does the 37% include T&D? References needed in this para. | It is for power generation as it is written. |
| 5948 | 7 | 13 | 33 | | | Section 7.2.2 does not describe energy markets per se (rather it describes traded volumes). It is not clear what the value of this section is. A more relevant aspect may be to highlight the differences in fuel prices between regions and its influence on demand | Taken into account - text has been shortened. Space constraints do not allow to go into the details of price |
| 16788 | 7 | 13 | 33 | | 37 | This seems to imply that trade creates more problems than benefits -- evidence suggest this is not true. The problem is not trade, but end use efficiency and energy technologies. | Taken into account. The text was reformulated to avoid this impression. |
| 16787 | 7 | 13 | 33 | 15 | 4 | This section could be significantly shortened and still make the useful points. The usefulness of this section is not clear -- if wish to discuss problems of oil dependence, perhaps ref peer reviewed lit exploring links of energy price volatility as trigger for economic recessions or something of this nature. You should check how well this is regarded in economics profession, but you might begin with Oil Price Uncertainty by Elder and Serletis in the Journal of Money, Credit and Banking. | Taken into account. The inclusion of this section is agreed by authors to be important to bring the message of regional variations in the development of technologies. The section has been |
| 5944 | 7 | 13 | 34 | 37 | | The paragraph lacks clarity. Is international trade being presented as a risk or opportunity? What is the role of markets? | Taken into account - comment is obsolete. Underlying text has been |
| 6418 | 7 | 13 | 36 | 13 | 36 | I suggest using a word other than "price". It implies financial issues, but here it is being used more as "the expense of" | Accepted. The editing replaced it by "at the expense of" as suggested by the |
| 10502 | 7 | 13 | 5 | | | Footnote 2. ….. of "the" direct equivalent method, "as used here, gives lower losses." | If power generation efficiency is just 37% that means losses are 63%. For CHPs losses are 41%. Why you think |
| 17361 | 7 | 13 | 6 | | | high potential indirect multiplication effects… | Accepted - It has been fixed. |
| 6175 | 7 | 13 | 8 | 13 | 21 | No need to summarize the chart so directly. The large number of detailed staistics actually impairs comprehension. Instead, highlight the numbers that are striking, unexpected, or relate to future arguments and ideas. | Some text which repeated the table data was eliminated. Paragraph on low heat and power generation efficiencies are |
| 15943 | 7 | 13 | 8 | 13 | 12 | Why use 2009 data, when 2011 data is available for RE sources, at least, although it may have been published just after this draft was prepared, i.e., July 2012 - see IEA 'Renewables Mid-Term Market Report' which has production numbers for RE sources for 2011 http://www.iea.org/w/bookshop/add.aspx?id=432 | Data was updated. |
| 13288 | 7 | 13 | 9 | 13 | 21 | When citing conversion efficiencies, it should be clear whether they are on a gross or net calorific value basis (also known as higher / lower heating value) - this makes a difference of around 5 % points, which is pretty significant | Rejected. The title of table 7.1 says that. |
| 10501 | 7 | 13 | 9 | | | with "total" generation losses. These data could be more clearly shown in a pie chart figure. 28.7% plus 4.4% = 33.1% of TPES has losses of 16.7% of TPES - meaning there are around 50% losses. Seems high - but maybe not. See TS Fig 8.2 of the SRREN for graphical representation. | If power generation efficiency is just 37% that means losses are 63%. For CHPs losses are 41%. Why you think |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13454 | 7 | 13 | 6 | 13 | 7 | Text: "Those low efficiencies and large own energy use in energy sector result in a high potential indirect multiplication effects of energy savings from end users" This point cannot be stressed enough - reducing final end point consumption has a more-than-equivalent impact on energy waste at all stages in the energy supply chain - it can even remove the need for replacement energy plant on lifecycle turnover, in some cases. | Noted. |
| 17386 | 7 | 131 | 19 | | | R. Vautard et al. (2010): Northern hemisphere stilling partly attributed to an increase in surface roughness. Nature Geoscience Letters, 17 October 2010. | Rejected - Good citation, but cannot easily place this within the quote |
| 17746 | 7 | 135 | | | | there should be a page of FAQ | Taken into consideration. FAQs are now presented through boxes in the text. |
| 15542 | 7 | 14 | 1 | | | Increased trade should reduce the volatility of prices | Taken into account - comment is obsolete. Underlying text has been |
| 5945 | 7 | 14 | 1 | 3 | | Ditto | Please clarify what you mean. |
| 17215 | 7 | 14 | 16 | | | In the list of countries the US is missing. | Taken into consideration. The text has |
| 5947 | 7 | 14 | 17 | 19 | | Clarity lacking. What is the intent of this statement? | Rejected - the sentence is based on a |
| 16033 | 7 | 14 | 17 | 14 | 19 | to much sources | Rejected. Not harmful to have many |
| 6419 | 7 | 14 | 20 | 14 | 20 | Without policy limiting CO2 emissions, natural gas does not penetrate due to its low CO2 emissions relative to coal. As written, this sentence implies that it does. It penetrates because of its high energy density, transportability, and fungibility for end-uses... not because it burns efficiently. | Accepted. The sentence has been deleted. |
| 12321 | 7 | 14 | 20 | 14 | 21 | Market penetration depends on pricing - not GHG emissions. However, lower GHG emissions gives natural gas a competitive advantage in markets with CO2 pricing. Please consider to reflect this fact. | Taken into consideration. The text has been deleted. |
| 13289 | 7 | 14 | 20 | 14 | 20 | The combustion GHG emissions from natural gas are not 'low' as stated, merely lower than coal and oil - suggest replacing with 'relatively low' | Agreed. The text has been modified. |
| 18045 | 7 | 14 | 20 | 14 | 20 | Replace "low" with "lower GHG emissions than coal". The term "low" is very subjective and ambigious. | Agreed. The text has been modified. |
| 16789 | 7 | 14 | 20 | | 34 | The beginning of the paragraph suggest that transport of nat gas is expensive -- this is not universally true -- pipeline transport can be relatively inexpensive and exists in several places as you note later in paragraph. | Rejected - for most countries this is the case. |
| 2824 | 7 | 14 | 23 | | | This overstates the regional nature of gas markets. There is significant inter-regional trade and some inter-regional price transmission so it is not true that markets are limited to regional scales, though of course the regional markets do all have different characteristics. | True but don't see relation with the lines quoted |
| 7119 | 7 | 14 | 27 | | | "...reached 32% with special concern for almost 650 mln." Missing units after 650 million. | Accepted - text revised. |
| 9635 | 7 | 14 | 35 | 14 | 42 | Include that: Coal was only to renewables as the fastest growing fuel in 2011 (BP, 2012) | Rejected - the text discusses the different fuels and sources in sequence |
| 2825 | 7 | 14 | 35 | | | While it is often claimed that coal is widely distributed, the claim appears to have no foundation. Occurrences of coal are of course widespread, but that is true of other fossil fuels and not of any particular significance. In terms of proved reserves, BP lists 55 countries with natural gas reserves, of which the largest has 23.7% of the global total; for coal the equivalent numbers are 33 and 28.9%. Production of coal is even more concentrated (the largest coal producer, China, accounts for 45.6% of the world total while the largest gas producer, the US accounts for only 20%), as is trade. | Rejected - the text discusses the different fuels and sources in sequence not in comparison. |
| 16790 | 7 | 14 | 35 | | 42 | You may want to include point that export of coal from North America is increasing as lower coal demand (from competition with cheap natural gas) is dropping prices, making North American coal competitive on the global market. | Taken into account - the US now are mentioned as a big producer |
| 11847 | 7 | 14 | 36 | 14 | 37 | Please tell the reader the top importing countries - it is strange that the top exporting country is listed (Australia) but that importing countries are not identified. | Taken into account - comment obsolete. Underlying text has been deleted. |
| 5946 | 7 | 14 | 4 | 8 | | Clarity lacking. The global oil market is not driven primarily by fuel transportation costs | Taken into account - it is now driven, but |
| 10503 | 7 | 14 | 40 | | | Here and elsewhere needs past tense | Accepted. "Was" used instead of "is" |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9468 | 7 | 14 | 43 | 15 | 1 | I have a doubt about the description that trend for uranium production to expand is challenged recently by the Germany's decision to phase out its nuclear program and Fukushima accident, as in many countries other than Germany and some countries there are movements of building new and additional nuclear facilities, from the standpoint of energy security.<br>In September 2011, J. Steyn and T. Meade published an article in Nuclear Engineering International about the uranium supply capasity and requirements in the world after the Fukushima accident [1]. It concludes that "One repercussion of the recent events at Fukushima Daiichi in Japan was an immediate drop in uranium requirements in Japan and Germany. But, over the long term, uranium requirements are expected to grow steadily."<br>They note that it is clear from the data, that current mine capacity and capacity under development, plus total already mined uranium (AMU), are projected to be adequate to meet reference requirements through the early 2020s. They also note that if needed, projected supply can be augmented by prospective mine capacity, of which there is a significant amount.<br>[1]J. Steyn and T. Meade (2011) "Demand down, for now," Nuclear Engineering International, September 2011, pp. 22-26<br>See online article at http://www.neimagazine.com/story.asp?storyCode=2060839 | Taken into account - comment is obsolete. Underlying text has been deleted. |
| 6420 | 7 | 14 | 43 | 14 | 43 | "About 433" is quite specific. If it is 433, then that should simply be stated. Or perhaps something like, "Approximately 430" | Agree, editing. "About" has been deleted. |
| 18200 | 7 | 14 | 43 | | 47 | Add to paragraph: About 433 nuclear reactors worldwide require annually 77,000 t of uranium oxide concentrate (U3O8). Uranium mines supply about 60,000 t of U3O8 with the rest supplemented by secondary supplies from ex-military materials and other inventories (World Nuclear Association, 2011). Trend for uranium production to expand by 52% observed in 2000-2010 is challenged recently by the Germany's decision to phase out its nuclear program by 2022 and the Fukushima major accident in Japan. The number of uranium exporters is limited to a few countries - Kazakhstan, Uzbekistan, Namibia, Niger and to a lesser extent South Africa, as well as Australia and Canada ((World Nuclear Association, 2011). Markets for other energy carriers (combustible biomass, waste, electricity, and heat) are mostly domestic, because they don´t need any with very limited amounts of cross-border trade (Table 7.1). | Taken into account - comment is obsolete. Underlying text has been deleted. |
| 18201 | 7 | 14 | 43 | | 47 | About 433 nuclear reactors worldwide require annually 77,000 t of uranium oxide concentrate (U3O8). Uranium mines supply about 60,000 t of U3O8 with the rest supplemented by secondary supplies from ex-military materials and other inventories (World Nuclear Association, 2011). Trend for uranium production to expand by 52% observed in 2000-2010 is challenged recently by the Germany's decision to phase out its nuclear program by 2022 and the Fukushima major accident in Japan. The number of uranium exporters is limited to a few countries - Kazakhstan, Uzbekistan, Namibia, Niger and to a lesser extent South Africa, as well as Australia and Canada ((World Nuclear Association, 2011). Markets for other energy carriers (combustible biomass, waste, electricity, and heat) are mostly domestic, because they don´t need any cross-border trade (Table 7.1). | Taken into account - comment is obsolete. Underlying text has been deleted. |
| 5926 | 7 | 14 | 43 | 44 | 1 | Suitable references to nuclear policies after Fukushima are: 1. Globally: P. Joskow, J. E. Parsons, The Future of Nuclear Power After Fukushima, Econ Ener Env Pol 1(2) (2012) 99-113, and 2. Concerning EU countries: Syri S., Kurki-Suonio T., Satka V., Cross S., Nuclear power at the crossroads of liberalised electricity markets and CO2 mitigation - case Finland. Energy Strategy Reviews (accepted with minor rev.) Concerning the EU, all Eastern European MS still see nuclear power as viable option, whereas mainly Germany, Italy and Switzerland have chosen to abandon nuclear power (production/ plans). | Taken into account - comment is obsolete. Underlying text has been deleted. |
| 9503 | 7 | 14 | 45 | 15 | 4 | This texts may cause the misunderstanding of the uranium supply shortage, and should be deleted. Because the supply of uranium have been enough, and effects for the uranium supply by the Germany's decision and Fukushima accident are temporary. Smallness of the number of supply country cause no problem. | Taken into account - comment is obsolete. Underlying text has been deleted. |
| 16034 | 7 | 14 | 47 | | | Germanys and Japons decission to phase out there nuclear programs (2022, 2030th years) | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9223 | 7 | 14 | 10 | 14 | 10 | Delete "Figure 7.1") because in Figure 7.1 can see this detail | Accepted. The figure has been deleted. |
| 13456 | 7 | 14 | 20 | 14 | 23 | Text: "Natural gas penetrates many markets because it burns efficiently with low GHG emissions, and requires limited processing to prepare for end use. But it is disadvantaged in terms of transmission and storage, because of its low energy density, which makes transportation costs a large fraction of the total supply chain costs. This limits the development of gas markets to regional scales." Gas fuels are likely to become increasingly sought after for a number of reasons, including low combustion carbon emissions, and oil supply questions. This makes it imperative for gas capture, storage and distribution networks to rise up the agenda, for both climate change and energy security reasons. It may be that gas prices will need to rise to accommodate these extra costs. | Agree with addendum but issue of space |
| 3448 | 7 | 14 | 35 | 14 | 42 | It should be mention the importance of USA in the coal consumption worldwide | Taken into account - the US are now mentioned as a large coal producer. |
| 13457 | 7 | 14 | 39 | 14 | 42 | Text: "Australia dominated the list of coal exporters (IEA, 2011a). China is responsible for nearly 90% of additional global coal use in 2000-2009 (Figure 7.1). India also plays an increasingly important role. Power generation remains the main driver of global coal demand (US DOE, 2011a)." With the disruption in the global economy, it is possible that China will not be able to keep up its current rate of economic growth as its trading partners have worsening deficits. | Rejected - the section is about historic trends not future expectations. |
| 13455 | 7 | 14 | 6 | 14 | 8 | Text: "Most prominent oil supply security concerns relate to over 3 bln. people living in 83 countries (including all of the world's low-income countries) importing more than 75% of the oil and petroleum products they consume." It is critical that the issue of energy access be addressed, because many of the countries dependent on energy imports are at risk of paying ever-increasing prices for those energy supplies. Some countries are consistently in GDP deficit over energy imports, and a worsening situation, either in terms of fuel scarcity, or fuel cost increases, will lead to these countries being unable to achieve development goals. | Agree with addendum but issue of space constraints. |
| 7118 | 7 | 14 | 7 | | | "relate to over 3 bln". Missing units after 3 billion | Accepted - text revised. |
| 3386 | 7 | 15 | | | | Section 7.2.3 should be rewritten. Explain clearly what sectors are included in the "Energy related GHG emissions" (Energy sector, trasnport, industry, buildings… to add 100%), and make figure 2 consistent with the text (at present it is not using the same categories mentioned in the text (around line 17). | Taken into account. The section has been deleted. |
| 3449 | 7 | 15 | | 15 | | Include in this figure the total amount of GHG emissions | Taken into account. The section has |
| 6796 | 7 | 15 | | | | This is a useful figure, although there is a lot of uncertainty in some of these numbers, such as the Chinese emissions. The problem with this graph is that many readers will interpret this to mean that China is the biggest cause of climate change. It would be better if you also included a graph showing the accumulated energy emissions to date of the various countries. It is the sum of all the added CO2 to the atmosphere since pre-industrial times that causes climate change. Absent an additional figure, the text (and, perhaps the figure caption itself) should provide some explanation. | Taken into account. The section has been deleted. |
| 6177 | 7 | 15 | | | | The coloring here renders this chart difficult to read. Suggest using more contrasting colors and/or patterns. | Taken into account. The section has |
| 5152 | 7 | 15 | | 15 | | unclear - is it meant that the 33028 comes from th energy sector and the rest do not ? | Taken into account. The section has |
| 10506 | 7 | 15 | | | | Could leave transport and industry CO2 data in the pie chart and not in the box which then really becomes an "energy sector" box. CO2 "other" I assume is deforestation - so why not call it that - also CH4 and N20 "other" are maybe mainly Agriculture | Taken into account. The section has been deleted. |
| 10507 | 7 | 15 | | | | Does top graph include transport emissions too? Another example of where the chapter boundaries are unclear. | Taken into account. The section has been deleted. |
| 4103 | 7 | 15 | 1 | 15 | 3 | Although thorium is mentioned later (p. 24) this would be an appropriate place to mention thorium also. | Rejected - space constraints do not allow to go into the details here. |
| 6227 | 7 | 15 | 11 | 15 | 11 | Coal combustion does not produce Nitrous oxide (N2O) emissions but does produse Nitric oxide (NO) & Nitrogen dioxide (NO2) emissions which have difereen GWPs | Taken into account. The section has been deleted. |
| 10505 | 7 | 15 | 17 | | | Can add chapter numbers 8,9 and 10 here | Taken into account. The section has |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2969 | 7 | 15 | 18 | | | In the legend it is written “energy sector” but it should probably be “power sector” as in figure 7.3. This is in line with the previous comment. | Taken into account. The section has been deleted. |
| 12323 | 7 | 15 | 18 | | | Please improve the colour coding/caption as it does not seem to be coherent. It is also difficult to see how this ties with the percentages given in the text above. | Taken into account. The section has been deleted. |
| 17214 | 7 | 15 | 23 | | | The CLAs may want to discuss the issue of national CO2 statistics and the global aggregate here. | Taken into account. The section has |
| 13291 | 7 | 15 | 23 | 15 | 24 | Where this says 'As is the case with energy...' it should probably say 'energy consumption' | Taken into account. The section has |
| 16791 | 7 | 15 | 23 | | | Rather than a disagreement, could it perhaps be a range of values or estimates? | Taken into account. The section has |
| 10504 | 7 | 15 | 4 | | | Table 7.1 doesn’t show this as is stated in the text. | Taken into account. The section has |
| 13290 | 7 | 15 | 5 | 15 | 17 | As per the first sentence of the Executive Summary, it is essential to define here what you mean by the 'energy sector' (presumably heat and power generation) - otherwise this section is very confusing | Taken into account. The section has been deleted. |
| 12322 | 7 | 15 | 6 | 15 | 9 | Please define what is included in the energy sector. It is also unclear what percentage of emissions are the result of fugitive methane emissions etc. Please consider to include this and rephrase. | Taken into account. The section has been deleted. |
| 6176 | 7 | 15 | 6 | 15 | 6 | See comment #1. The "energy sector" would be less confusing if it were renamed as "the energy supply sector". | This name is set in IPCC Inventory Guidelines. There it is called energy industries. A new figure in section 7.1 |
| 18505 | 7 | 15 | | | | This section can be shortened substatially (e.g. removing much of figures 7.2 and 7.3) by referring to the discussions in Chapter 5, which provide overarching information on emission trends across sectors. This section should focus more strictly on energy. | Taken into account. The section has been deleted. |
| 9224 | 7 | 15 | 18 | 15 | 21 | To improve the legend,it is very confuse | Taken into account. The section has |
| 3387 | 7 | 16 | | | | Consider deleting paragraph and even the Figure 7.3-top as there is no statisitical correlation to report beyond what the numbers stata in Figure 7.3-bottom. | Taken into account. The section has been deleted. |
| 16095 | 7 | 16 | | | | The trend as drawn is not very convincing | Taken into account. The section has |
| 6178 | 7 | 16 | 1 | 16 | 2 | References to large ranges of variability, experessed here as 1-99%, are not improved by adding numbers to such an open-ended range. | Taken into account. The section has been deleted. |
| 5949 | 7 | 16 | 3 | 4 | | Lacks clarity. It is not clear wht the purpose of including the analysis in this paragraph is other than to say that the extenf of the agriculture and forestry sector in each country determines where the upper bound on the contribution of energy related emissions lies. | Taken into account. The section has been deleted. |
| 3777 | 7 | 16 | 4 | 16 | 6 | "the energy sector emissions contribute more than 60% to total national GHG emissions. I understand this doesn't apply to all countries. See as example, Brazil. | Taken into account. The section has been deleted. |
| 3778 | 7 | 16 | 6 | 16 | 7 | Power generation dominates emission in all 15 major emitting countries. I understand this is not the case for Brazil. | Noted. Right, Brazil is an exception. This figure was removed. |
| 9636 | 7 | 16 | 7 | | | Label charts a and b | Taken into account. The section has |
| 4641 | 7 | 17 | | 17 | | . Difficult to follow. Bar column colors not explained. | See legend in low left corner. |
| 3388 | 7 | 17 | 1 | 22 | 8 | Is this section necessary in view of other chapters dealing in more detail with the same issues?. In particular: section 7.3.3 is too small, generic, superfitial and somehow rethoric if the topic is treated just in this subsection. It unnecessary here, as this important issue is treated somewhere else in the AR. | This introductory part of the chapter shows the present status in energy sector. Section 7.3.3 was removed |
| 3154 | 7 | 17 | 1 | | | Section 7.3 overlaps with other drivers discussion. Should all this be done in chapters 4 or 5? | Those two chapters provide much material on drivers. In energy supply chapter there is only brief discussion on drivers to follow approved by IPCC |
| 9637 | 7 | 17 | 14 | 17 | 14 | Reference for slower population growth - is this global population growth? | It is on p. 16. Yes, it is global. |
| 17362 | 7 | 17 | 17 | | | evolution was much… | Editorial. |
| 9638 | 7 | 17 | 25 | | 29 | Energy demand grew and CO2 emissions increased in spite of efficiency improvements, owing to the electrification programme in China | Noted. It is not clear what LAs are requested to do. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6179 | 7 | 17 | 25 | 17 | 26 | "Rates of global energy intensity decline were not sufficient to compensate for GDP growth, thus leaving room for energy demand to expand." As phrased, this suggest that growth in energy demand found an opportunity, when as described it was a tautological outcome. Rephrase as "Rates of global energy intensity decline were not sufficient to compensate for GDP growth, thus energy demand inevitably expanded." | The suggested phase express the inevitability of energy demand growth. First, we do not meant this, second, it is not simply true (see fig. 7.1). |
| 6446 | 7 | 17 | 25 | 17 | 26 | This sentence refers to the rebound effect and I suggest mentioning rebound effect at this point. | There is no text on rebound effects in this section. This is an issue mostly for final use sectors which are dealt with |
| 11919 | 7 | 17 | 25 | | | This sentence can be dropped - it does not add anything and is confusing in any case, i.e., energy demand can arise for a number of reasons, not just intensity decline. | Disagree. This sentence does not say this. It just say that EE progress was not sufficient to compensate for economic activity growth globally, while in some regions it did compensated and there |
| 11920 | 7 | 17 | 26 | | | Begin with "Energy demand growth" | The phrase is wider and we prefer to keep it as it is. The chapter is on energy |
| 5950 | 7 | 17 | 4 | | | Is there evidence to support the statement that natural resource availability is a factor in influencing the growth in energy supply and demand? | Text says "for energy demand and supply". It is hard to argue against that resources availability is a key driver for |
| 4807 | 7 | 17 | 4 | 17 | 4 | "Major drivers for energy demand and supply" you should mention demand drivers first and they supply drivers | They are different. Supply drivers include also resources availability. |
| 13458 | 7 | 17 | 10 | 17 | 13 | Text: "The interplay between the drivers in 2001-2010 was very different from that in the previous decades (Figure 7.4).Global total primary energy supply (TPES) expanded by 27%, or by 2.4% per annum (2% in 2011), which is much faster, than in 1980-2000, when energy prices were significantly lower." The globalisation of trade has been a major economic goal of the World Trade Organisation and other bodies. It is logical that when industry relocates to countries where there is little infrastructure, that solid fuels are the choice for the power generation that manufacturing needs. In order to lessen the carbon intensity of globalised production, it is necessary to provide more sophisticated energy systems, through technology transfer, and through the building of grids, storage and plant needed to operate more carbon-efficient electricity and gas systems. | All those issues are covered by chapter 7 in following sections. |
| 9225 | 7 | 17 | 22 | 17 | 22 | Add "Note" after (2011 a) | This is IEA data. See note to the figure |
| 13459 | 7 | 17 | 25 | 17 | 26 | Text: "Rates of global energy intensity decline were not sufficient to compensate for GDP growth, thus leaving room for energy demand to expand" China, for example, is attempting to initiate strong renewable energy growth, whilst at the same time continuing with policies for strong economic growth. As in more developed countries, renewable energy sector growth is slower than fossil fuel use growth. | Taken into account - comment is obsolete. Underlying text has been deleted. |
| 13460 | 7 | 17 | 27 | 17 | 29 | Text: "Global energy consumption per capita after stabilization in 1991-2000 started growing as fast as it was back in 1971-1980." This partly reflects an economic shift - energy-intensive manufacturing was transfered, under globalisation policy, from energy-efficient economies to energy-inefficient economies. | It mostly reflects the growing share of China and India in global energy use and growing per capita consumption in those |
| 6180 | 7 | 18 | 1 | 17 | 1 | "The slow trend to diversification of energy sources away of fossil fuels was blocked in last decade." is misleading. As worded, this sounds as if there was an active thwarting of policy, when several other explanations are possible. Suggest rephrasing as "The trend to diversification of energy sources away from fossil fuels slowed in last decade." | Taken into account - comment is obsolete. Underlying text has been deleted. |
| 16792 | 7 | 18 | 1 | | 18 | May be able to delete this section -- or significantly shorten and replace with ref to IEA pubs, or replace with a graph. | Disagree. This is the only section on recent trends in energy supply in energy supply chapter. Trends for primary |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16096 | 7 | 18 | 17 | 18 | 18 | This association of RE and nuclear is misleading also because the development and decline of nuclear was associated in the US or in France by an increase of costs (see Grubler A. 2010 “The costs of the French nuclear scale-up: A case of negative learning by doing, Energy Policy 38 (2010) 5174–5188 ). RE is also much more market driven with many actors, when states dominated the process of nuclear expansion. | This phrase is only on the fast development of the RE contribution, but not on the whole cycle to its evolution. |
| 10509 | 7 | 18 | 17 | | | Not Fig 7.4 - not clear which figure it refers to | Taken into account - comment is obsolete. Underlying text has been |
| 3155 | 7 | 18 | 19 | | | I would keep figures 7.5 and 7.6 and pare back the rest | Figures were modified or replaced. |
| 6421 | 7 | 18 | 26 | 18 | 30 | "was marked by the failure to decarbonize the global fuel mix" is a very strong statement, and I doubt that anyone expected to decarbonize in a decade. Figure 7.5 shows CO2 emissions, and nothing about policy. There needs to be support for the statement about "strongest ever carbon emission mitigation policies" | Accepted. Text revised: Failure to do progress in decarbonizing. |
| 4430 | 7 | 18 | 26 | 18 | 30 | Could this irony be attributed to policies which promote low gCO2/kWh instead of low gCO2 absolute? It is the issue of normalized measures concealing the real trends (illustrated in Fig 7.4). Indeed, climate change is affected by absolute amounts of CO2, even if we become more efficient at extracting energy services per mass CO2. | Very good guess. Irony was initially in the text, but then was removed through editorial process. The commitments for many countries are expressed in |
| 4104 | 7 | 18 | 26 | 18 | 30 | The impacts, causes and sources of 'embedded emissions' should also be mentioned here. | Chapter 5 deals with this issue. There are grounds to speak on this subject in |
| 6181 | 7 | 18 | 26 | 18 | 30 | The comment that the last decade has seen both the highest growth in emissions and the greatest political will to curb them seems really critical to the story being told here. it would be valuable to unpack why this might be – where is the increase coming from? Is this unique to the energy sector? | Agree. New figures 7.3-7.4 provide visual images for causes with accompanied some text. They all show the origins for increase both by sectors |
| 10508 | 7 | 18 | 4 | | | Is this OECD demand for transport or for oil? - ambiguous as written. If oil, it has declined due to lower demand for heating oil - maybe worth clarifying. | The statement is correct. The OECD oil consumption by transport both in 2009 |
| 6797 | 7 | 18 | 5 | 18 | 6 | When mentioning coal, it should be pointed out that recent advances in directional drilling and hydrofracturing of shale gas reserves has caused natural gas prices in the U.S. to plummet and that for the first time recently US electricity production from natural gas exceeded that from coal. This is a dramatic shift with significant carbon emissions consequences. | Taken into account. Sorry. But we can not discuss the situation for each country in detail in this section. At fig. 7.1 it is visible that in North America the coal use comes down with some |
| 9639 | 7 | 18 | 6 | 18 | 7 | On what basis is coal's share in the energy mix expected to decline after 2010-2011? Reference? Evidence? | The references to the future were |
| 13461 | 7 | 18 | 1 | 18 | 11 | Text: "The slow trend to diversification of energy sources away [from] fossil fuels was blocked in last decade (BP, 2011a; IEA, 2011a; US DOE, 2011a). Oil continues to suffer a long run decline in global energy market share. Nonetheless, despite energy security and climate concerns, oil demand was growing by 1% annually driven mostly by non-OECD transport with OECD demand likely peaked in 2005 and expected to decline (BP, 2011a; IEA, 2011a). Coal demand was growing by over 4% per annum and accounted for nearly half of the increase in global energy use in 2001-2010. The share of coal in the global energy mix after peaking around 28-30% in 2010-2011 is expected to decline. About all coal demand growth originated from non-OECD countries (Figure 7.1) with China pivotal in determining the future of global coal market (IEA, 2012a). With 2.7% per year consumption growth natural gas lost the status of the fastest growing fossil fuel to coal in the last decade. It is expected that its share will be back to the increase trajectory after flatting (IEA, 2012a)." Although BP analysts and others have suggested that there will be "peak oil demand", this is not conclusive. Most of the drop in oil demand over the period 2006 to 2010 could be viewed as a direct result of economic stress, and the downturn in oil consumption was reversed as soon as there were signs of economic recovery. If the economic flows are disrupted again, and if the global economy contracts permanently, this still may not signal "peak oil demand", as even in the contracted economy, there could still be strong demand for oil. | Taken into account - comment is obsolete. Underlying text has been deleted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13462 | 7 | 18 | 17 | 18 | 18 | Text: "The rate at which modern renewables penetrate the global energy market is similar to the emergence of nuclear power in the 1970's and 1980's (BP, 2011a)." It is interesting to note this, and it is also interesting to note that the underlying financial support for this is of a very different form. Nuclear power required intensive centralised state financial and framework support, but renewable energy technologies are more quickly profitable, so do not require more than an initial "hand hold", such as widely used feed-in tariffs. | Taken into account - comment is obsolete. Underlying text has been deleted. |
| 13463 | 7 | 18 | 19 | 18 | 30 | Text: "7.3.1.2 Evolution of global energy-related GHG emissions : According to the EDGAR 4.2 FT 2008 dataset, global total greenhouse-gas emissions increased by 27% during the 1990-2008 with CO2 emissions from fuel combustion (+40%) drove much of this increase accompanied by CH4 emissions from fossil fuel production (+43%) (EIA, 2011). CO2 emissions trajectory partly mirrors the story of the global economic cycle and after decline in 2009 by about 2% regain over 5% in 2010 and by another 3% in 2011 reaching historical maximum of 31.4-33.2 Gt CO2- eq. (BP, 2011a; Enerdata, 2012; IEA, 2012a). In addition to the strong TPES growth, the last decade (2001-2010) was marked by the failure to decarbonize global fuel mix (Figure 7.5). The decade with the strongest ever carbon emission mitigation policies will be remembered as the one with the highest in last 40 years emission growth (2.6% per annum) driven mostly by additional coal use (by two thirds) and by growing power and heat generation (Figure 7.5)." The failure of global carbon policy, up until now, to start significant decarbonisation, suggests that it is unviable. Renewable energy capacity is being added, but this does not displace carbon energy in many cases. The efforts to make high carbon energy relatively more expensive than low carbon energy are not effective because the policies are based on microeconomic behaviour models - it does not trigger low carbon energy investment - whereas significant targeted capital is required to leap this hurdle and create an energy market with deep renewable energy penetration. | This is just comment without clear suggestion. Does reviewer want we add the proposed text? There are some discussion along those lines in section 7.3.3 and later in the chapter. |
| 7121 | 7 | 18 | 19 | 18 | 33 | This section should be merged with section 7.3.1.2 as they have a common theme | The table of content for the chapter is fixed. So those two subjects are related |
| 18643 | 7 | 19 | | | | Page 19: Studies do not support the leapfrogging hypothesis that developing countries would shift towards isgnificantly less carbon-intensive energy use patterns while bridging income gaps with developed ones.<br>If so, what is the conclusion? | At this section historical emission is described. Conclusions and long -term options are covered in section 7.12. |
| 6422 | 7 | 19 | 19 | 19 | 20 | "Global picture masks significant regional disparities." is an awkward (incomplete?) sentence. | The following sentence clarifies it. |
| 2826 | 7 | 19 | 19 | | | At some points, as in this sentence, a little more precision would be helpful. Income is probably the main determinant of demand for energy services but demand for energy is also a function of the equipment in use, and there is at least some evidence of an S-curve leading to a levelling off of energy demand at higher income levels. | The detailed description of drivers is the subject for chapter 5 which comes before chapter 7. They discuss this issue there. |
| 18046 | 7 | 19 | 24 | 19 | 24 | New formulation needed. | From the comment, it is not clear what |
| 16794 | 7 | 19 | 25 | | 26 | What drove this -- why were they different? Unclear. | More explanation of this is presented in |
| 12031 | 7 | 19 | 25 | 19 | 26 | Isn't this the reflection of poor energy efficiency at the beginning? | At the beginning of what? It is a reflection of very good structural reforms, which made such deep reductions possible (see fig. 7.6). Those countries had high energy intensities for decades, but under command economy failed to reduce them. So the issue is not the starting point. Today the US and Canada |
| 18047 | 7 | 19 | 27 | 19 | 29 | Unclear formulation | From the comment, it is not clear what |
| 16795 | 7 | 19 | 27 | | 35 | List of percentages is not that helpful. For the paragraph, hard to readily see meaning -- what is the significance of this? Could a graph with quick explanation be better? | It reflects dynamics. More on this issue is presented in chapter 5. |
| 16793 | 7 | 19 | 3 | | 8 | Was this hypothesis based on the "no policy" scenario, or on scenario with a global CO2 price? The development of the energy sector will be very different with a long term, robust and durable CO2 price on emissions. | All this page is on historical evolutions, not on scenarios. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12032 | 7 | 19 | 36 | 19 | 41 | The change of carbon intensity very much depends on the period you choose. If you choose 1980, OECD Europe is not the fastest area. Comparison of absolute intensity should be discussed together. | This is not true. In 1981-1990 the OECD still was doing much better then the rest |
| 17218 | 7 | 19 | 41 | | | the authors are requested to check the reference. To my knowledge this reference is not dealing with the devleopment of carbon intensity, but with energy potentials and endowments. | We did double check, but this statement is referred appropriately. |
| 4431 | 7 | 19 | 5 | 19 | 8 | What explanations are offered for developing countries not leapfrogging? | Here this is only presented as a fact. The explanation should be available from |
| 2583 | 7 | 19 | 5 | 19 | 8 | Other studies (mainly made by Dan Kammen) scientifically proofed that Renewable energy creates more jobs than conventional energy (between 3.5 and 5 times). So, It would be an opportunity, beyond the finding, for the developing countries, specially those lacking fossil energy resources, to invest in renewable energy | Chapter 7 has special section on it (see section 7.10.4) |
| 11921 | 7 | 19 | 5 | | | Think you mean "data do not support" rather than "studies …." | The wording is "Studies do not support" |
| 6229 | 7 | 19 | 6 | 19 | 30 | The lines 6-8 and 27-29 are contradictory | They are not. GDP energy intensities in developing nations are moving down faster than in OECD countries thus converging in the long-term but mostly |
| 5951 | 7 | 19 | 9 | 18 | | Should energy efficiency improvement not also be considered as a driver of energy demand in addition to population and economic growth. This also contributed to the stable demand in OECD Europe | It is considered and plotted at fig. 7.2 |
| 9640 | 7 | 19 | | | | Why is data to 2009 and not 2010/2011? Surely there is more recent data available? | As more recent data appear they will be |
| 13465 | 7 | 19 | 14 | 19 | 15 | Text: "Population and income growth are the two most powerful (but not the only) driving forces behind the demand for energy and energy related CO2 emissions." A significant driving force that should be mentioned is "state direction" - in other words, the intentions of governments, who are the leaders in plans for the built environment, transport and industry. | The intention of the section was not to list all drivers. This is a subject for chapter 5. Here only Kaya like identity factors are reflected to see how slow we |
| 6547 | 7 | 19 | 15 | | 18 | Explain more in detail or give a reference paper, as the description here is not clear enough partly because of the indicators not found on Figure 7.6. | Taken into account. Cannot do this within page limits. See chapter 5 for |
| 13466 | 7 | 19 | 19 | 19 | 20 | Text: "Income evolution is the most influential determinant on the overall demand for energy. Global picture masks significant regional disparities." Income is not directly causally related to demand for energy. Changing lifestyle aspirations for consumption are constructed by corporate marketing mechanisms, and state leadership on urban development and manufacturing creates an energy-hungry environment. | More discussion of driving forces interplay are reflected in chapter 5. Here only Kaya like identity factors are used. Income make possible acquiring |
| 10045 | 7 | 19 | 2 | 19 | 41 | The regional data for the demand trends should include graphs for a better overview - especially the TPES trends and the energy intensity trends by region | Those are to be provided by chapter 5 |
| 13467 | 7 | 19 | 25 | 19 | 26 | Text: "This region was the only one that managed to decouple economic growth with energy use: its GDP in 2009 being 6% above the 1990 level while TPES declined by 32% over the same period." The reasons why total primary energy supply (consumption) dipped in the Non-OECD Europe and Eurasia region are not necessarily to do with improved energy efficiency of productivity or a greater use of low carbon energy - the collapse of the former Soviet Union saw Russia and its former satellite states experience considerable economic hardship. Thus, it may not be reasonable to claim that economic growth was decoupled from energy use. | That opinion reflect shortage of literature on this subject. The facts are: many of those countries rebuild there 1990 GDP in 2000-2008 using 30-50 energy less and emitting 30-40% less. This is EE contribution. See fig. 7.6 and compare 1991-2000 and 2001-2009 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13468 | 7 | 19 | 33 | 19 | 41 | Text: "Besides technical improvements, falling energy intensities reveals structural changes away from industry toward less energy intensive activities – first in rich and then in newly industrialized economies…most developing countries show little or no de□-carbonization. Historical trends reveal that rising carbon intensity is a common feature of many developing nations in early industrialization stage in which heavy use of fossil fuels for power production plays a key role (Rogner et al., 2011)." Falling energy intensities as countries move their economies away from industry towards a service/knowledge/finance economy indicates that carbon dioxide emissions from energy use have been outsourced to other countries through the process of the globalisation of industry. There is a natural stop point to this process - those developing countries that have taken on the manufacturing burden will not be able to outsource their energy use commitment to completely undeveloped countries - who simply do not have the infrastructure to do this. A counterpoint to this argument that falling energy intensities resulting from high levels of development (known in some circles as the "Kuznets Curve"), is that countries like the United States of America are considering re-starting some of their manufacturing at home - to create jobs. It is to be expected therefore, that the USA, and other countries who re-home their manufacturing, will see rising energy intensities. | Just to make this point clear. Structural change contribution in Chinese economy was responsible for about 50% of energy intensity reduction, while in many EU economies only for 20-30%. The faster economy develops the larger is the contribution of structural factors. In last two decades energy intensity was declining faster in developing nations mostly due to higher contribution of the structural factor. The exception is when economic growth becomes over 10% per year. At that point structural changes are providing no or negative contribution due to the fact that such growth and |
| 13464 | 7 | 19 | 5 | 19 | 8 | Text: "Studies do not support the leapfrogging hypothesis that developing countries would shift towards significantly less carbon-intensive energy use patterns while bridging income gaps with developed ones (Jakob et al., 2012)." Carbon-intensive energy vendors, and those selling high carbon energy power plant and high carbon fuels, may be doing less business in developed countries, and so have turned their attention to markets elsewhere. A parallel can be found in the health policy to reduce smoking - more cigarettes end up getting sold in China for example. This suggests there should be obligations on energy companies to diversify their portfolios. | So, what is the comment? Does reviewer agree or disagree with the statement? |
| 6237 | 7 | 2 | 10 | | | Long-term price trends are missing | Rejected - comment seems to be misplaced. Long-term price trends |
| 6238 | 7 | 2 | 13 | | | integrated coal and still integrationg global gas market should be dealt with in more depth since a sustainable global price trend supports cliamte cahnge mitigation. | Rejected - comment seems to be misplaced. It is not clear what the |
| 13024 | 7 | 2 | 11 | 2 | 11 | […but also because we measure now emissions more accurately, and are focusing all our attention on these processes.] | Wrong page references. It is page 5. If more accurate data appears the emission for previous years is adjusted. |
| 13025 | 7 | 2 | 21 | 2 | 21 | Therefore, constraints | Taken into account - comment is obsolete. Statement has been deleted. |
| 13026 | 7 | 2 | 22 | 2 | 22 | limit global GHG concentrations to the agreed levels | Taken into account - comment is obsolete. Statement has been deleted. |
| 13027 | 7 | 2 | 30 | 2 | 30 | energy supply sector is high, despite their limited widespread deployment. | Taken into account - comment is obsolete. Statement has been deleted. |
| 13028 | 7 | 2 | 42 | 2 | 42 | efforts to overcome most of | Taken into account. Overcome does not |
| 13029 | 7 | 2 | 43 | 2 | 43 | proliferation risks. | Accepted - text revised |
| 13030 | 7 | 2 | 44 | 2 | 45 | reactor technologies and the management of the fusion reaction, trying to reduce the unsolved problems of nuclear energy use. | Taken into account. There is no much on fusion in the chapter to put it in the |
| 13031 | 7 | 2 | 45 | 2 | 45 | It is argued that the capture and storage | Chapter provides practical examples for CCS implementation, which confirm this |
| 13023 | 7 | 2 | 9 | 2 | 9 | rationalize the energy sector [Failure to rationalize the energy sector, i.e., to implement a better fuel use in transport, industry, etc.; driving a progressive rational and efficient use of energy, diversification of energy sources, technologies and system configurations (including ICT, DG, smart grids, etc.). In this framework, decarbonization is at best a piece of the whole picture of energy and development.] | Noted |
| 10510 | 7 | 20 | | | | Once again does "energy-related" include transport? | No. It is only energy supply sector |
| 3156 | 7 | 20 | 1 | | | I would keep figures 7.5 and 7.6 and pare back the rest | All figures were modified in SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 9641 | 7 | 20 | 14 | 20 | 20 | This paragraph would be better shown in a chart | Such chart is included in the SOD. |
| 4432 | 7 | 20 | 17 | 20 | 19 | Repetition of sentences from p xx, line xx illustrating how China has become the world's largest emitter of CO2. | Taken into account - comment is obsolete. Underlying text has been |
| 16035 | 7 | 20 | 5 | | | unclear: de-carbonization progress from -0,3% per annum is a rise of carbon??? | This comment is not clear. |
| 16796 | 7 | 20 | 7 | | | Suggest insert after "… below the 2000 level." the following sentence: "This is consistent with analysis that suggest that end use energy efficiency improvements are likely to occur before large changes in energy supply technologies." This helps the reader understand a plausible sequence of deployment in a transition to a low emitting future. | Here we just are dealing with historical data. So we may say that it happened leaving for section 7.11 to say what is likely for the future. |
| 6182 | 7 | 20 | | | | Consider taking the two main points of this section – that despite some countries' progress towards decreased carbon intensity of energy, the massive growth of China and India more than make up for this and that the US has been eclipsed as the biggest emitter – and weaving them in to the previous section. | Taken into account -text revised. |
| 13471 | 7 | 20 | 22 | 20 | 26 | Text: "The relatively few studies that undertook ex post verification of energy model baselines (e.g., Pilavachi et al., 2008; Strachan, 2011), or the US DOE's review of its energy forecasts (US DOE, 2011b), showed the evolution and inclusion of current policies was a key determinant of projected energy supply, demand, and prices." This re-emphasises the point that energy consumption management needs to be subject to organisational administration - countries and regions need strong leadership, regulatory mandates and verification processes. | Wrong page reference. Within the new sectoral policy subsections, regulation, verification, and organisation administration are now covered in 7.11.3 |
| 7122 | 7 | 20 | 4 | 21 | 5 | See comment number 5 | Should be already dealt with |
| 13469 | 7 | 20 | 5 | 20 | 6 | Text: "Energy de-carbonization progress in OECD countries (-0.3% per annum) was smaller than in three previous decades" This low figure indicates that current decarbonisation policies are not producing a sustainable gradient of change in the general economic context. It also suggests a lack of organisation of energy use. Whilst it is becoming evident that companies and corporations are beginning to consider their Energy Management, by contrast public sector administration and household consumption are not being subjected to the same kind of targetting. Whilst it is perfectly possible to implement strong energy conservation measures on homes, offices and public buildings, and transport systems, there needs to be political and social organisational will to make it happen. Without new energy saving management services, the GDP/GNP cannot become more decarbonised. | We agree with this statement. Much of these issues are to be discussed in chapters 8-10. |
| 7120 | 7 | 20 | 5 | 21 | 5 | Comparison of energy related emissions between OECD and non-OECD countries does not give a better picture. It is being proposed that comparison of energy related GHG emissions be based on International Comparison Program (ICP) Regions Groups developed by world bank. Information on this aspect could be found on the website; http://siteresources.worldbank.org/ICPEXT/Resources/ICP_2011.html | Rejected - space constraints do not allow to go into the details here. |
| 13470 | 7 | 20 | 7 | 20 | 10 | Text: "In non-OECD countries, average annual increase of energy-related CO2 emissions exploded from 1.1% in 1990-2000 to 4.7% in 2001-2010 due to the expansion of TPES accompanied by growing carbon intensity of energy of 0.6% per annum, driven to a large degree by coal demand in China and India (IEA, 2011a)." From the point of view of economic and social development, an increase in the use of energy in a country is a positive signal. Energy enables capacity. | We do not share this opinion. Recent experience shows that energy services rather than energy resources do promote growth, but they can be produced using much less energy (see discussions on E |
| 9642 | 7 | 21 | 1 | 21 | 5 | This paragraph would be better shown in a chart | With given page limit is it not possible |
| 18048 | 7 | 21 | 1 | 21 | 2 | Add the figure for OECD Europe | Figures for SOD were modified. |
| 10511 | 7 | 21 | 10 | | | Need references, not just database names | Taken into account - comment obsolete. Underlying text has been deleted. |
| 16798 | 7 | 21 | 11 | | | Suggest add at end of paragraph: "Many consist of technology standards, subsidies for preferred technologies and simple admonitions to "be green." Some regions have used CO2 pricing mechanisms." | Taken into account - This section has been merged with 7.12, with pricing technology and enabling policies explicitly addressed in these 3 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18051 | 7 | 21 | 15 | 21 | 15 | Add "and nuclear energy" after "fossil fuel" | Taken into account - the point here is that fossil fuel subsidies removal benefits all low carbon technologies. A discussion of nuclear (and indeed wind) |
| 7727 | 7 | 21 | 16 | 21 | 18 | First of all, there is just on Copenhagen Accord, therefore the plural in meaningless. Secondly, The Copenhagen Accord is not even listed in the UNFCCC main website as a significant milestone in multilateral Climate Change negotiations. Please, refer to the Kyoto Protocol as the main accomplishment and whose GHG emission targets should be met. | Taken into account - Refer to Cancun Agreement / Copenhagen Accord as per Co-Chair's recent guidance letter |
| 16799 | 7 | 21 | 19 | | 29 | Not apparent how this is useful for discussion -- suggest delete. | Taken into account - comment obsolete. Underlying text has been deleted. |
| 3779 | 7 | 21 | 26 | 21 | 26 | Spell RCP in full the first time it appears. | Taken into account - comment obsolete. Underlying text has been deleted. |
| 7728 | 7 | 21 | 30 | 21 | 31 | Emission reduction pledges have no importance in the UNFCCC negotiations. Countries are not obliged to go by the and they will not be charged for it. Kyoto Protocol emissions reductions pledges are the ones that should be mentioned in the text. I fail to understand why the main agreement on multilateral climate change negociations has been left out of the text. | Taken into account - Refer to Cancun Agreement / Copenhagen Accord as per Co-Chair's recent guidance letter |
| 16800 | 7 | 21 | 30 | | 40 | This is very important point and should not be significantly changed. | Taken into account - comment obsolete. Underlying text has been deleted. The important part was moved to the intro of |
| 10512 | 7 | 21 | 30 | 21 | 40 | Most of this covered in Chapter 1. Suggest check first - then delete | Taken into account - comment obsolete. Underlying text has been deleted. The important part was moved to the intro of |
| 18049 | 7 | 21 | 5 | 21 | 5 | France is not an appropriate reference, since its power sector is close to carbon free (nuclear and renewables) | Taken into account - comment is obsolete. Underlying text has been |
| 16797 | 7 | 21 | 5 | | | Suggest add at end of paragraph: "this reflects the stronger linkage of emissions per unit of economic activity rather than emissions per capita. As discussed in chapter 6, changes in energy technology choices can change this linkage." | Taken into account - comment obsolete. Underlying text has been deleted. |
| 4642 | 7 | 21 | 6 | 21 | 6 | Current policies and GHG reduction. As pointed out above, the use of more biomass seems an obvious goal. | Taken into account - this section does not discuss specific mitigation option but the role of biomass is discussed in detail in chapter 11, and here in Chapter 7 in |
| 18050 | 7 | 21 | 7 | 21 | 7 | It seems odd to refer to the EU in a sentence that descibes climate policies as poorly coordinted across national bounderies. 27 nations agreed on the climate and energy policies unanimously. | Taken into account - in new section 7.12.3 word editing makes clear EU policies are not as well coordinated with |
| 6183 | 7 | 21 | | | | The points made in this section are strong and should be continually emphasized throughout this document. The notion that despite our inability to stop trying to “talk the talk,” we've really been unable to apply policy tools to reduce GHG emissions in a meaningful way. | Noted |
| 18506 | 7 | 21 | | | | As the chapter is so far over its allocated pages, this section could be merged with the policy and scenario discussions in 7.11 and 7.12. This additional text is unnecessary. | Taken into Account - this section has been merged with 7.12, with pricing, technology and enabling policies |
| 6787 | 7 | 21 | 6 | 22 | 7 | It may be helpful to move and merge contents under section 7.3.3 to section 7.10. Policy may be discussed as a topic under "Barriers and Opportunities" and retain the flow | Taken into account - Co-chairs recommendation and chapter decision was to merge 7.3.3 with the sectoral |
| 11922 | 7 | 21 | 6 | | | Why is this section not in Ch 15? | Taken into account - comment obsolete. Underlying text has been deleted. |

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| 10046 | 7 | 21 | 6 | 22 | 7 | This section should include the results of the scenario analysis of the SRREN report. The entire section is almost exclusively based on IEA projections. | Rejected - for reasons of space the IEA scenarios were used as an exemplar here. A full discussion of the SSREN listed scenarios will be elsewhere in AR5 |
| 16801 | 7 | 21 | | | | Why lead with what seems to be tacit agreement with peak oil theory and then explain it away after the 1st paragraph? Please state at the beginning that peak oil theory fails to account for what you very well describe later in the section. The reader who is pressed for time will stop after the 1st paragraph and leave with incorrect views. | Taken into account - comment obsolete. Underlying text has been deleted. |
| 12324 | 7 | 21 | 6 | | | Please consider to use a different title for the section. An example is "GHG emission projections", as it might better reflect the text. | Taken into account - comment obsolete. Underlying text has been deleted. The important part was moved to the intro of |
| 2970 | 7 | 22 | 1 | | | Starting the y-Axis at 20 Gt is misleading since reader on a first glance think that emissions have to be reduced nearly to zero already by 2040 to reach the 450 ppm scenario. Better show full y-Axis but extend projection to 2050 or beyond. | Taken into account - Figure has been deleted; comment is obsolete. |
| 7729 | 7 | 22 | 10 | 22 | 12 | This is not completely true. It is hard to tell how "rapidly" demand will lead to exaustion of remaining supplies, since technologies advance, making supplies that could not be extracted at present available in the future. This could expand supply, postponing a possble exaustion. | Taken into account - combined with other comment: See response to comment 3389. Text deleted |
| 6184 | 7 | 22 | 10 | 22 | 12 | "Oil, natural gas and coal are finite resources that cannot be reproduced in human time frames. Any extraction depletes the stock, and demand growth will rapidly lead to the exhaustion of remaining supplies." This theory of depletion vastly oversimplifies economic reality and history. As stated in line 21 on p. page 22, "Resources, therefore, are not fixed things." Conclusions of exhaustion, scarcity, and depletion cannot be justified from the information presented. | Taken into account - simplification a necessity given space allocation. Text deleted. |
| 5346 | 7 | 22 | 11 | 22 | 11 | Exhaustion will not necessarily be "rapid" - depends on the stock and rate of demand growth | Accepted. Text deleted. |
| 2993 | 7 | 22 | 11 | | | Please, withdraw rapidly from the text. The rhythm of the depletion cannot be defined in a such simplistic manner. | Accepted - text revised: Simplification a necessity given space allocation. Text |
| 6185 | 7 | 22 | 15 | 23 | 24 | While this section makes some great points, it seems as though it could be condensed. The main point – that our use of fossil resources has varied historically depending on market forces, technology changes, and social factors – should remain, but its current length could be decreased. | Accepted - text revised. |
| 10513 | 7 | 22 | 15 | 22 | 20 | Better shown as bullets and remove "first" "second" etc. | Text shortened. First, second etc. no |
| 7730 | 7 | 22 | 18 | 22 | 19 | Not to consider technological progress is a strong hypothesis and not very realistic. | Taken into account - Technology change |
| 6423 | 7 | 22 | 21 | 23 | 9 | I believe that there is significant agreement on the definitions of resources and reserves. This text articulates that distinction on page 23, beginning in line 3. The description of the changing "stocks" of resources is actually about reserves. I like the articulation, but the "resource" and "reserve" description seems to need tightening, which comes at the top of page 23. I suggest that the definitions be stated upfront and then have the articulation of the changing stocks (from prices, technology, demand, etc.) | Accepted - text revised. |
| 18202 | 7 | 22 | 21 | | 29 | Add to paragraph: Resources, therefore, are not fixed things. What matters is the timely availability of a resource in the market place at competitive costs. Changing market prices for a mineral may expand or contract the economically recoverable quantities. If a resource becomes too expensive the market responds in two ways: consumers tend to shift to alternative resources (demand reduction); and producers seek additional supplies through enhanced exploration activities and innovative production methods, thus enabling production from previously inaccessible deposits. Moreover, technology change and improvements in knowledge push the frontier of exploitable resources towards deeper, more remote or lower concentration occurrences, making resources a dynamically evolving rather than a 'fixed' quantity. Nevertheless, this "dynamics" is not an endless process; it depends also from other changing variables. | Rejected: There is insufficient space for these observations. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18203 | 7 | 22 | 21 | | 29 | Alternative paragraph: Resources, therefore, are not fixed things. What matters is the timely availability of a resource in the market place at competitive costs. Changing market prices for a mineral may expand or contract the economically recoverable quantities. If a resource becomes too expensive the market responds in two ways: consumers tend to shift to alternative resources (demand reduction); and producers seek additional supplies through enhanced exploration activities and innovative production methods, thus enabling production from previously inaccessible deposits. Moreover, technology change and improvements in knowledge push the frontier of exploitable resources towards deeper, more remote or lower concentration occurrences, making resources a dynamically evolving rather than a 'fixed' quantity. Nevertheless, this "dynamics" is not an endless process; it depends also from other changing variables. | Rejected - text needed shortening. Suggested alternative text still too long. |
| 10514 | 7 | 22 | 21 | | | Suggest "Resource availability therefore is not fixed." Change "of a resource" to "of an energy resource" | Accepted - text revised: Text no longer |
| 2994 | 7 | 22 | 21 | | | The meaning of resource is not correct. Resource does not change with costs, but reserves do. | Rejected. The reviewer is wrong. Occurrences do not change with costs resources do (see shale oil and gas in the US which previously were |
| 2995 | 7 | 22 | 28 | | | Again, the meaning of resource is not correct. What evolve with costs are reserves and not resources. This is a big error in the manuscript. Please fix it. | Rejected. See previous comment 2994 ("Rejected. The reviewer is wrong. Occurrences do not change with costs resources do (see shale oil and gas in |
| 3389 | 7 | 22 | 8 | 28 | 15 | This is an example of a very poor section. Full of rethoric paragraphs with little and disperse interesting information. Author prejudices about the debate on peak production are obvious in the first paragraph: "...rapidly lead to the exhaustion of remaining supplies" ..."inevitable decline"....followed by a superfitial second and third paragraphs (should be deleted? between page 22 lines 15-20). Unfortunatly for the climate system of this planet, reserves scarcity is not really a problem....Very long introduction of simple concepts in page 23 between lines 12 and 37 (delete?). This is a missed opportunity to present in a consitent manner the problem of the huge reserves of fossil carbon: the important numbers on carbon reserves in page 23 line 36-37 and 38-39 do not get a single reference ¡¡ (while this chapter used 38 pages for references¡¡¡). Figure 7.8 also contains very important numbers (that are indeed very, very large and relevant in a report about energy and climate change): therefore this figure cannot the supported by a grey looking reference like Farrel (2008) when there are major databases (IEA?, BP?) reporting these type of numbers. The same applies to line 25-26 in page 24. Delete rethoric paragraph in page 25 lines 6-13. Page 25, Table 7.2 on fossil reserves (missing) may be very important and should be based in major international organization reports. The emerging concept of "carbon bubble" (associated to the huge market value of carbon reserves and the financial bubble that would burst if these reserves are not exploited), should be discussed somewhere in this section or elsewhere in this chapter. | Taken in to account- text revised. Reviewer seems to be unaware that the GEA reference is based on BP, USGS, BGR, WEC and other databases. "grey looking" reference to Farrel is preposterous - the data are GEA but the concept of presentation was 'borrowed' from Farrel. Carbon contents calculated from GEA energy resource data using IPCC intensities. Finally text changed and the "peakist" touch detected (wrongly so) by the reviewer deleted. |
| 4808 | 7 | 22 | 9 | 26 | 26 | This section can be shorter | Accepted - text revised. Text made |
| 13472 | 7 | 22 | 5 | 22 | 7 | Text: "This need for a radical break in current trends and the challenges of GHG reduction policy implementation illustrates the absolute scale of the GHG mitigation challenge." Since most things in economies seem to happen as a result of monetary reward, it would be tempting to suggest that policy could better be implemented by offering financial incentives. However, the changing climate and energy insecurity may prove quite sufficient in creating incentives for change - based on the financial implications of actuated risk. | Taken into Account - This section has been merged with 7.11, with pricing technology and enabling policies explicitly addressed in these 3 subsections. |
| 10047 | 7 | 22 | | | | This graph does not reflect the text above. Other than only IEA scenario projections should be included (see SRREN, Chapter 10) | Taken into account - comment obsolete. Underlying text has been deleted. |
| 15484 | 7 | 22 | | 28 | | (part of the text is not visible in the Excel block) - Resources and resource availability - Very well presented. Suggestion to introduce somewhere a paragraph (introduction words) on "available" resources and "climate change patterns". In another word, resources already well identified and other potential ones are already enough to go much over than a 450 ppm trend - see IPPC SRREN, IEA or others. | Accepted - text revised. Emphasis on climate implications added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13474 | 7 | 22 | 23 | 22 | 24 | Text : "If a resource becomes too expensive the market responds in 24 two ways: consumers tend to shift to alternative resources (demand reduction)..." This is not necessarily so. It is a tenet of microeconomics that this is so, but much energy use is inelastic, regardless of the price, and without deliberate regulation, policy, targeted investment focus and stimulus, alternative energy resources will continue to play a minor part in energy markets. Because we are so dependent on energy, energy price rises will only serve to create inflation, which will be followed by re-equilibration of the economy, having zero net effect. Energy price rises will not necessarily precipitate energy conservation or energy efficiency, in fact, it may make it more difficult for people to choose to do energy conservation and energy efficiency. Most energy efficiency of production is likely to be driven by regulation and policy, rather than the cost of energy. Most end-use consumer energy conservation is likely to be driven by subsidies, grants, loans and other monetary assistance. Most energy vendors will wish to increase energy sales, regardless of obligations to sell energy services such as conservation. | Noted. We talk here long-term. In the short-run demand is relatively in elastic - but not necessarily over a period of 20-30 years. Text deleted due to space limitations |
| 13475 | 7 | 22 | 24 | 22 | 29 | Text : "...producers seek additional supplies through enhanced exploration activities and innovative production methods, thus enabling production from previously inaccessible deposits. Moreover, technology change and improvements in knowledge push the frontier of exploitable resources towards deeper, more remote or lower concentration occurrences, making resources a dynamically evolving rather than a 'fixed' quantity..." This is also not necessarily so. It may not be possible to generate a healthy return on investment by going after harder-to-reach fossil fuel deposits - in which case, despite good new technology, innovation would fail. | Rejected - harder to reach deposits precisely means different technology - hence innovation |
| 6788 | 7 | 22 | 8 | 28 | 14 | It may be helpful to shorten, move and merge contents under section 7.4 to section 7.2. This move may be helpful to reduce the number of pages and yet retain the flow. Section 7.2 may be further renamed to appropriately reflect the revised contents. | Rejected: text revised and shortened and 7.2 emphasis and topic is separate to this section. |
| 3157 | 7 | 22 | 8 | | | Section 7.4 is way too long. Is anything needed here but one figure and a brief discussion focusing just on what's new since AR4? For most folks, it will be striking to have as much discussion of liquid and fissile reserves and relatively less on gas. | Accepted - section shortened |
| 7123 | 7 | 22 | 10 | 23 | 14 | These paragraphs may be deleted as they do not add much value to the section | Taken into account - text revised: Text shortened, but definitions have to be |
| 9226 | 7 | 22 | 8 | 22 | 8 | Change title by "Reserves, resourses and occurrences" | Rejected - section titles cannot be |
| 13211 | 7 | 22 | 9 | | | This part could be shortened and the main conclusion relevant to mitigation contained in the last sentence (page 25,line 17/18 ° should be emphazised "Fossil reserves alone contain two to four times that amount of carbon - a daunting outlook for climate stability." | Accepted- text revised: We talk here long-term. In the short-run demand is relatively inelastic - but not necessarily |
| 12325 | 7 | 22 | 9 | | | This section seems a somewhat unbalanced. Fossil fuels are getting a lot more attention and details than renewable resources. We recommend shortening chapter 7.4.1 significantly and emphasizing the point being made on page 25 line 14-18. | Accepted - fossil resource section reduced. Emphasis added. |
| 4433 | 7 | 23 | | 25 | | These pages contain background reading of a related topic. They should be omitted to maintain the focus of the chapter and reduce its length | Accepted - text revised: Text shortened. |
| 10515 | 7 | 23 | 1 | | | As above | Rejected - essentially applies to all |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2996 | 7 | 23 | 1 | | | There is a consensus about the meaning of reserves and resources. Hence, I disagree with the text. Please see SPE, BP, and IEA, only to cite few references. SPE in the 1990s established the probability ranges related to all kind of reserves (P, 2P, 3P). Indeed, the fact that the meaning of reserves and resources is well established does not imply in a precise application of it. This is another question, which involves the bias when stating petroleum reserves. | Rejected - reviewer is wrong. There may be some consensus within various resource sectors, e.g. oil - but not universally (Russia has a different definition, etc.) There is certainly NO consensus between coal, oil/gas and uranium. BP, IEA O&G etc. use the same info source for conventional oil and gas reserves (no resources in BP) - no consensus there really. See Reference: Nick A. Owen, Oliver R. Inderwildi, David A. King, "The status of |
| 4105 | 7 | 23 | 10 | 23 | 14 | The political nature of 'proved reserves' data for conventional oil should be explained and the underlying facts set out. Saudi Arabia's ~ 260 billion barrels has scarcely changed over the past 20 years, nor has Kuwait's ~ 100 billion, nor UAE (Abu Dhabi's) ~ 98 billion since 1985. The late Matt Simmons and Hans Jud have taken an extreme position. Sadad Al-Husseini and Obaid Nawaf (both ex-ARAMCO senior geologists) quoted a figure of 140 billion barrels for Saudi Arabia over five years ago. The January 2007 issue of PIW Weekly reported its sight of a confidential report placing Kuwait's proved reserves at 48.5 billion barrels. The UAE has produced over 24 billion barrels of oil since 1985. Thus the current Saudi position is likely to be about 190 billion barrels; Kuwait 43billion barrels; and UAE 74 billion barrels. In none of these countries have there been significant new finds in recent years. | Rejected. No space here for the politics of oil. |
| 16802 | 7 | 23 | 14 | | | before end of last sentence, perhaps add: …"demonstrating that as current sources are depleted and price moves to higher levels, more costly sources are developed." | Rejected: Although the reviewer is correct, space limits prohibit a detailed |
| 10516 | 7 | 23 | 14 | | | Add …"estimated" oil reserves | Rejected: text deleted due to space |
| 9261 | 7 | 23 | 15 | 23 | 20 | The concepts are changing too, in that shale gas is now becoming conventional/common. The techniques for shale gas are not new - horizontal wells and fracking - so they are extractable using techniques for conventional hydrocarbons, though you do qulaify the staement with "generally". | Rejected: Although this true, the term generally still applies. |
| 2827 | 7 | 23 | 18 | 23 | 20 | The definition of “unconventional” is unclear and seems to mix together geological, economic and engineering considerations – how does EOR, for instance, fit in? It is not normally regarded as unconventional but appears to be covered by the definition here. (Admittedly, there is no standard international definition, but the text does not clarify anything). | Rejected. There is no universally accepted definition of unconventional - EOR is a borderline issue. Due to space limitation clarification cannot be |
| 10517 | 7 | 23 | 21 | 23 | 24 | Could add an example of fracking here. | Accepted - but text changed due to |
| 16803 | 7 | 23 | 23 | | | Suggest you add after the word "development" the following "and cost relative to prevailing market prices." | Accepted: Text revised. |
| 9643 | 7 | 23 | 28 | 23 | 28 | Additional quality criteria does not impact on the reserve statement - but means that the cost for environmental controls increases | Accepted. No change required. |
| 9239 | 7 | 23 | 30 | 23 | 30 | Rogner' instead of 'Wagner'? (check bibliography section also) | Accepted - text revised: Wagner is |
| 16101 | 7 | 23 | 35 | 23 | 37 | On coal reserves a reference could be useful | Accepted. Reference of summary table |
| 11924 | 7 | 23 | 37 | | | Need reference | Taken into account: Reference is same |
| 10518 | 7 | 23 | 38 | | | Data don't match those in Table 7.2. need to be consistent. Also for line 41.<br>ZJ not commonly used so define in a footnote | Rejected - reviewer confuses Gt of oil in the text with Gt C (carbon) in the table |
| 6424 | 7 | 23 | 41 | 23 | 42 | This statement about peak oil is speculative. | Rejected: Data ranges reflect the uncertainty found in the literature. |
| 6186 | 7 | 23 | 41 | 23 | 42 | "When compared with cumulative past production of 162 Gt (6.8 ZJ), “peak oil” production is imminent or has already been passed." This is very misleading. The paragraph is referring to conventional oil production, but concludes that overall oil production is peaked. Peak oil for conventional reserves is misleading, much as a discussion of declining Nintendo sales -- without consideration of other systems and online gaming -- would suggest an overall declining in entertainment. | Rejected: As noted the text, without resource & unconventional, the peak is imminent - but with those resources this in not the case. |

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| 5347 | 7 | 23 | 41 | 23 | 42 | Not clear you can infer peak oil (a peak and subsequent decline in annual production) is imminent based on ratio of past production to conventional reserves. The right economic conditions could deliver increasing annual production despite declining reserves. This paragraph really refers to "peak conventional oil", the economic significance of which is debatable given the size of the unconventional oil resource discussed in the next section. This section does not discuss the important implications of declining conventional resources and increased exploitation of unconventional resources (i.e. a persistently high oil price and higher lifecycle emissions of oil extraction). | Rejected: Peak is relative to currently known reserves only - and text is quite clear about the potential role of resources (in addition to reserves) and unconventional reserves and resources. |
| 16804 | 7 | 23 | 42 | | | Suggest you insert between "production" and "is" the following: "within current price ranges" | Rejected: peak as presented by the peakist school is independent of prices |
| 13476 | 7 | 23 | 12 | 23 | 14 | Text: "For oil, the R/P ratio has fluctuated around 40 years for more than a century, while production has steadily increased. The quasi-constant R/P ratio could only be the result of an equivalent increase in oil reserves." This is also not necessarily so. It seems that the oil and gas companies have deliberately tried to keep their R/P at 10 or more years, in order to satisfy their shareholders. However, this does not mean that the level of reserves has increased overall. There appears to be a process of slowly adding already discovered and lower quality reserves to company or regional totals as needed to keep the R/P ratio at the desired level. For example, the enormous increase in proved reserves of South American (Venezuelan) oil reported in June 2011 by BP compared to June 2010 (http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2008/STAGING/local_assets/2010_downloads/statistical_review_of_world_energy_full_report_2010.pdf, http://www.bp.com/assets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/statistical_review_of_world_energy_full_report_2011.pdf ) "Reserves growth" may be the explanation given for this phenomenon, but it may not represent a true expansion of a reserve. | Accepted - text revised: Text deleted. |
| 13477 | 7 | 23 | 21 | 23 | 24 | Text: "Unconventional resources require different logistics and cost profiles, and pose different environmental challenges. Their future accessibility is, therefore, a question of technology development, i.e. the rate at which unconventional resources can be converted into marketable fuels at competitive costs." I would suggest that although engineering technology can show and has shown strong development in the ability of energy production companies to exploit unconventional fossil fuel resources, that this has not improved the net energy return on exploiting hard-to-reach and complex resources, nor has engineering prowess been accompanied by an equivalent improvement in environmental protection owing to the more complex nature of those resources. I would therefore wish to see some statement about the possibility that much unconventional fossil fuels will remain "uneconomic". | Rejected. Statement was in the ZOD text, but was unfortunately deleted due to space limitations. |
| 13478 | 7 | 23 | 25 | 23 | 28 | Text: "Assessments and comparisons of global coal reserves and resources are subject to uncertainty and ambiguity, especially when reported in physical unit (tonnes) and without a clear distinction of their specific energy contents, which can vary between 5 GJ/t and 30 GJ/t." I would suggest that all reports of coal reserves, resources/occurrences should be treated to a matrix assessment, tabling their accessibility/cost profile, their likely energy content, and their co-factors such as sulphur compounds and associated gas. There are some coal seams that profit-making energy producers are simply not going to go after, but some of these may still be exploited if states develop national energy companies to do so. This means that the likely method of exploitation - either publicly or privately financed - is important in assessments of "economically recoverable" coal. I think an assessment of this should be included in this report. | Rejected: Although these are important points space limitations make this impossible. |

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| 13479 | 7 | 23 | 35 | 23 | 37 | Text: Coal occurrences are plentiful with reserves estimated at 13.3 to 21.0 ZJ (or 446 to 542 Gt C) and resources at 291 to 435 ZJ (or 7500 to 11,200 Gt C) globally." There is no reference here. I assume it is a reference to Rogner et al. 2011 (IIASA GEA Global Energy Assessment), summarised in Table 7.2. If so, there are two typographical errors, as the table shows reserves at 17.3 to 21.0 ZJ (not 13.3 to 21.0 ZJ as in the text) and resources as (7,510 - 11,230 GtC) not as (7,500 - 11,200 GtC) as in the text. As the Global Energy Assessment has only just been published (June 2012, launched at the Rio+20 Energy Day http://www.iiasa.ac.at/Admin/INF/PR/2012/2012-06-19.html; published July 2012 http://www.iiasa.ac.at/Research/ENE/GEA/report.html), the chapters are not yet available on the IIASA website, so I cannot know if the work referenced researchers with different methodologies on coal reserves and resources, such as Professor David Rutledge of CalTech. He published in 2011, "Estimating long-term world coal production with logit and probit transforms", International Journal of Coal Geology, Volume 85, Issue 1, 1 January 2011, Pages 23–33, http://dx.doi.org/10.1016/j.coal.2010.10.012, http://www.its.caltech.edu/~rutledge/DavidRutledgeCoalGeology.pdf. Rutledge's contribution is to calculate that the total of past and future coal production will amount to the order of 653 - 749 Gt, and that since 309 Gt has already been produced, that leaves 344 - 440 Gt left to produce. This amounts to the production of further reserves of = 9.98 - 12.76 ZJ (at 29 GJ/t), which is significantly lower than the reserves calculated by the IIASA GEA (GEA historical production is in terms of carbon emissions, and at 192 GtC gives an average of 62% carbon in the emissions from all the coal burned if Rutledge's historical production figure of 309 Gt is accurate. The energy value of the historical coal production is given in Table 7.2 is 7.426 ZJ, whereas at 29 GJ/t, Rutledge's historical production figure would be 8.961 ZJ). Others working on coal reserves and resources : "Validity of the fossil fuel production outlooks in the IPCC Emission Scenarios", Mikael Höök, Anders Sivertsson and Kjell Aleklett, in Natural Resources Research, Volume 19, Issue 2, June 2010, Pages 63-81, doi:10.1007/s11053-010-9113-1, (http://uu.diva-portal.org/smash/get/diva2:301406/FULLTEXT01); Hook, M., Zittel, W., Schindler, J., and Aleklett, K., 2010. "Global coal production models based on a logistic model", Fuel 89, 3546–3558 (http://www.diva-portal.org/smash/get/diva2:329110/FULLTEXT01); Mohr, S.H., Evans, G.H., 2009. "Forecasting coal production until 2100", Fuel 88, 2059–2067 (http://dancass.com/static/files/assets/cced3021/GME__2009__J85.pdf) [702 Gt = 20.36 ZJ]; Patzek, T., Croft, G., 2010. "A global coal production forecast with multi-Hubbert cycle analysis", Energy 35, 3109–3122 (http://xa.yimg.com/kq/groups/20593576/885722944/name/Patzek+and+Croft+2010+-+Peak+Coal+2011.pdf) [630 Gt = 18.27 ZJ]. All of this work points at lower recoverable reserves of coal than the World Energy Council 860 Gt coal at energy density of 29 = 24.94 ZJ (http://www.worldenergy.org/documents/ser_2010_report_1.pdf) and the BP 2012 report - 860938 Mt, which at 29 GJ/t = 24.97 ZJ (http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/pdf/coal_section_2012.pdf) The US Energy Information Administration (EIA) International Energy Outlook (IEO) gives total recoverable reserves of coal at 948 billion tons = 862.68 Gt (coal) at an average energy density of 29 = 25.01 ZJ (http://www.eia.gov/forecasts/ieo/pdf/0484(2011).pdf) | Accepted - text revised: Coal reserves corrected. GTC data rounded. |

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| 13480 | 7 | 23 | 41 | 23 | 45 | Text : "When compared with cumulative past production of 162 Gt (6.8 ZJ), “peak oil” production is imminent or has already been passed. Including resources extends oil availability considerably - essentially doubling reserves (Figure 7.8). Even the higher range of reserves and resources would only postpone the peak by about two decades (depending on demand) before global conventional oil production starts its inevitable decline." To call the current oil production situation "peak oil" is an important and potentially controversial statement. I would hope to see a development of this argument in order to shield it from attacks from the cornucopians who believe that the appliance of geopolitics can ramp up supply. I do not accept that unconventional oil resources will double reserves, for two reasons. First, the accessibility problems of large unconventional oil fields are to my mind an order of magnitude larger than conventional crude exploitation. Not only is access more complicated, and require special rigging and boring equipment, but the risk of interruptions in supply from problems such as well blowout, pipeline blockages, breakages and production spillages is so much greater. It will be found that some resources are not worth the attention. Secondly, I think that the rate of production from some unconventional resources is going to be so slow as to render them "uneconomic" by any value assessment. I think that the unconventional fossil fuel resources should be treated to an "exploitability assessment" rather than be grouped together in one number, which offers an unrealistic appraisal of availability. Figure 7.8 goes some way to addressing this demand, but the text does not offer a breakdown of what this figure implies. The point about extending the peak by about two decades is a very important point to stress. I would hope to see some modelling of this as demonstration of potential. Some people still believe that "putting off" or delaying peak oil is equivalent to maintaining current production for a very long time - this view needs to be addressed, in my opinion. | Taken into account-text revised: The reviewer makes some important points regarding the complex nature of non-conventional fuels, however space limits make it difficult to include these. The two decade time scale is made clear. |
| 9644 | 7 | 23 | 36 | 24 | 8 | The units used: Gt C for coal are different to oil which is just Gt - are these meant to be the same? For comparative purposes it would help if they were. | Taken into account: Gt C reflect carbon content - the C does not stand for coal. |
| 9235 | 7 | 23 | 6 | 23 | 24 | May be is possible send the definitions of Reserve, resources, convetional and un conventional to Anexl Glossary | Rejected - some basic knowledge is needed to provide the context here. |
| 11923 | 7 | 23 | 9 | | | need to add "believed to be present in the earth's crust based on current geological information". Also don't need fossil line 8, as this applied to any valuable material. | Accepted- text revised. |
| 5133 | 7 | 24 | | | | the legend "tar sands" should be changed to 'oil sand" | Rejected: Both are used in the literature - however if the figure has to be redrawn |
| 16805 | 7 | 24 | | | | Excellent! Don't delete. Highlight if possible earlier in discussion to demonstrate how peak oil theory is not quite helpful. | Noted |
| 6447 | 7 | 24 | | | | Spelling error: than (not 'chan') | Editorial |
| 3780 | 7 | 24 | | | | Be clear regarding definition of production cost. Does it include exploration, exploitation costs? What about transportation cost up to refineries? | Taken into account- text revised: Production costs are all the costs getting the material to the surface - rest is not |
| 18507 | 7 | 24 | | | | Please note the agreement in the AR5 to use 2010 as the base year for currency. | Taken into account - the currency will be |
| 10519 | 7 | 24 | | | | Hard to decipher this figure. A) Conventional oil and EOR labels relate to two bars - so add arrows to show that. B) Convert x-axis labels to ZJ as used in text OR, preferred, convert text to EJ as used elsewhere in chapter. C) Implies all oil produced to date was produced for $4-10/bbl. Is this true? Not according to Fig 7.4 - though this is the oil price - not the cost I guess. Perhaps needs clarifying in caption. D) Suggest caption start "Liquid fuel reserve and resource supply potentials..." E). Only one reference fopr what is a contentious issue. Suggest an assessment of the literature be made and a new graph produced. | Rejected: The one reference is based on a comprehensive literature review including peak oil debate. These are production costs that cover 90% of production. Reviewer's reference to Fig 7.4 is not clear - no prices or costs there. |
| 11925 | 7 | 24 | 10 | | | WEC 2007 should be updated to WEC, 2010. | Accepted - Done |
| 3781 | 7 | 24 | 25 | 24 | 26 | What is the meaning of "Approximately 17% (135 million m3 or 5 EJ) is currently flared". It is easy to understand the 17% figure, but what is the meaning of 135 billion m3 as currently flared? Probably the last figure is obtained assuming the annual amount flared will remain stable in the future, until gas reserves already in exploration will be over. Please, confirm this interpretation. | Taken into account- text revised: text deleted due to space limitations |

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| 10521 | 7 | 24 | 25 | | | 5 EJ / yr I assume | Editorial, however text deleted |
| 17363 | 7 | 24 | 33 | 24 | 34 | Compare Chapter 1, page 9, 46: Conventional oil reserves will eventually peak, but it is uncertain exactly when and what will be the nature of the transition to alternative liquid fuels. Conventional natural gas reserves are larger by scale, but less evenly distributed across regions. | Taken into account-text revised: Text no longer exist in Chapter 1 (and conventional nat gas are also more evenly distributed across regions) - text |
| 10520 | 7 | 24 | 8 | | | Have "oil sands" been omitted on purpose from the list? Either include or provide info separately | Accepted - done |
| 13481 | 7 | 24 | 13 | 24 | 16 | Text: "Oil prices in excess of $80 per barrel are probably needed to stimulate investment in unconventional oil development." The possibility is that if oil prices remain as high as they have been, that the economies as a whole will suffer inflation, because of the high dependency on oil (inelastic demand). This will then make the relative cost of exploiting unconventional resources that much more expensive - and large sections of the unconventional resource will remain uneconomic to produce. | Taken in to account: Could well be - hence "in excess of 80$ - e.g. see shale oil in the USA. |
| 13482 | 7 | 24 | 21 | 24 | 34 | Text: "Conventional natural gas can be found as “associated gas” accumulated as a gas cap above an oil pool or, with high reservoir pressures, dissolved in the oil or as non-associated gas. Recovery of associated gas is generally a by-product of oil production...Non-associated natural gas reservoirs are much more abundant than reservoirs with both oil and gas. When there are no significant liquid hydrocarbon components, a larger part of the in-place gas can be recovered by dropping reservoir pressures...Unlike oil, natural gas reserve additions have consistently outpaced production volumes and resource estimations have increased steadily since the 1970s [...]. The global natural gas resource base is vast and more widely dispersed geographically [t]han oil." I would suggest that it is important to explain a little about the change in the profile of hydrocarbon species the further down in the lithosphere fossil fuel drilling takes place. Deeper in the crust, the temperatures and pressures are higher, so there will be a tendency for fossil fuel fields to contain more gas (or more gas in solution). Natural Gas Liquids (NGL) could form a much higher proportion of some deepwater, subsea/submarine, deep pocket production than that from large oil fields nearer the Earth's surface. This higher overall availability of light hydrocarbon gases (and liquids) could mean that Natural Gas becomes one of the most valuable products from unconventional fossil fuel mining. This naturally leads on to a discussion about venting and flaring as these practices will need to be curtailed if the energy economy moves its preference from oil to gas products. It will also mean more expense at the wellhead - to capture, store and distribute the gas products. Capturing formerly vented or flared Natural Gas offers climate change protection, perhaps an order of magnitude higher than improving vehicle fuel efficiency over the course of the next decade - owing to the high global warming potential of methane. The increase of Natural Gas from deeper oil drilling, and the attempts to make use of this capacity, also means that unconventional gas resources will become progressively less attractive and likely to be abandoned, much as they were decades ago. | Rejected: This is a valuable comment, but space limitations do not permit further elaborations on NGLs etc. |
| 3450 | 7 | 24 | 7 | 24 | 20 | Include tight gas and tight oil among the list of unconventional hydrocarbons listed | Accepted - tight gas included |
| 3783 | 7 | 25 | | | | Check carefully data in table. It is hard to believe that the amount of unconventional oil produced by 2010 was 1/7 of the conventional oil. | Noted: Data checked = correct - it all depends on extraction time and definition: North Sea oil once was |
| 10522 | 7 | 25 | | | | Be consistent on ZJ or EJ as above. | Rejected - Table uses EJ for energy and GtC for carbon contents |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9469 | 7 | 25 | 1 | 25 | 5 | Unconventional natural gas such as shale gas has environmental and technical issues, and its development is not advanced in some areas.<br>As in page 24, it is described that production of Oil-shale is environmentally challenging, issues of unconventional gas also should be described.<br>In a commentary in the American Journal of Public Health, published in May 2011, Finkel and Law point out some isuues of shale gas development[1]. They note the following points ;a) toxic mud and fluid by-products from the drilling and fracking as well as spills of oil and gas wastes are not uncommon. Of the more than 8600 abandoned wells in Pennsylvania in 2009 alone, taxpayers paid to plug 259 because of leaking natural gas, oil, and acid mine drainage into the groundwater, surface water, and air, b) fracking has raised concerns regarding the way it may damage underground water supplies, c) soil contamination also has not been addressed fully, and d) little research has been done on the potential adverse health effects of fracking.<br>[1] M.L. Finkel and A. Law (2011) The Rush to Drill for Natural Gas:<br>A Public Health Cautionary Tale, American Journal of Public Health, Vol 101 No. 5<br>a)p. 784, column 3. b)p. 784, column 4. c)p. 784, column 4. d)p. 785, column 1. | Correct and not only for gas but all unconventional resources- but discussion here not possible due to space limitations |
| 3782 | 7 | 25 | 13 | 25 | 13 | Explain in more details what is the meaning of "diminishing energy ratios" in the context of this paragraph. | Rejected: This is a common term in the literature: It is the ratio of usable energy over total energy used for extraction - no |
| 16806 | 7 | 25 | 17 | | | Suggest replacing "a daunting outlook for climate stability" with "providing clear evidence that declining stocks of fossil fuels will not curtail emissions." | Taken into account- text revised. |
| 4079 | 7 | 25 | 19 | | | A line « Total » at the bottom of the table would be nice | Total exists in Table 7.2 |
| 11928 | 7 | 25 | 23 | | | It would be wise to mention that uranium and thorium have fissile components (isotopes). Otherwise it sounds like these are just substances. They give off energy from fission. | Rejected - space limitations |
| 16102 | 7 | 25 | 26 | 25 | 31 | The uranium resource described in this paragraph is clearly very dispersed. In p.26 lines 8 to 9, RE is dismissed on the same grounds. The chapter should be coherent between resources in this respect. | Rejected - text differentiates between conventional and unconventional resources - and defines a current min |
| 9240 | 7 | 25 | 34 | 25 | 34 | Please refer latest edition of the Red Book (2012) if possible. | Accepted - done |
| 10523 | 7 | 25 | 35 | 25 | 39 | Doesn't seem to match table 7.3 data. 3700EJ at < $260 /t leaves 3700 of total conventional resources - which is not "vast additional occurrences". Need to clarify. | Accepted & corrected |
| 11926 | 7 | 25 | 6 | | | This sentence, and in fact the entire paragraph, is a repeat of earlier | Accepted - text revised |
| 13483 | 7 | 25 | 1 | 25 | 5 | Text: "Unconventional natural gas reserves, i.e., coal bed methane (CBM), shale gas, deep formation and tight gas are now estimated to be larger than conventional reserves and resources combined. This does not include potential reserves from gas hydrates. In some parts of the world, unconventional gas already exceeds conventional supplies. In the Unites States unconventional gas now makes up about 60% of marketed production" I note there is no mention of the high-impact risks of exploiting coalbed methane - including underground fires and explosions. There is also no mention of the questions being put to shale gas producers regarding freshwater and aquifer extraction and the evidence surrounding groundwater poisoning. I would not say that gas hydrates are a "reserve" as there are few production models that are thought of as sustainable or economic. It is true that the United States relies increasingly on domestic unconventional gas production, but it would be useful to include a projection of the timescale over which this can remain true, owing to shale play/field depletion and the decline of more conventional gas fields. | Rejected: Point well taken but no action due to space limitations |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13473 | 7 | 25 | 14 | 25 | 18 | Text: "Since the industrial revolution, fossil fuel combustion released almost 400 Gt C into the atmosphere (Table 7.2). Fossil reserves alone contain two to four times that amount of carbon - a daunting outlook for climate stability." The reserves figures in Table 7.2 are to my mind rather suspect - particularly the one for coal reserves. I suspect that most of the unconventional oil and gas will remain unexploited owing to economic problems, and that, if the recoverable coal reserves are closer to 10 ZJ than 20 ZJ, the total hydrocarbons and coal that will get burned in the next 150 years is closer to the cumulative total of historical production so far - not twice or four times that amount. | Rejected - For coal and lower reserve limits this is correct but with oil and gas the lower range is twice historical emissions (900 vs. 400 Gt C) |
| 13484 | 7 | 25 | 14 | 25 | 18 | Text: "For climate change, it is the carbon endowment potentially available for combustion that matters. Table 7.2 also presents the world's fossil resource endowment in terms of its carbon content. Since the industrial revolution, fossil fuel combustion released almost 400 Gt C into the atmosphere (Table 7.2). Fossil reserves alone contain two to four times that amount of carbon - a daunting outlook for climate stability." As indicated in previous comments, I would contend that there is evidence that recoverable fossil fuel reserves going forward are comparable to historical production figures. The "safety limit" for global warming has been set at around 2 degrees C, and for that, only around 500 GtC (Allen et al. 2009) or 565 GtC (Carbon budget 886 GtC (2000-2049) ==> 565 GtC (2011-2049) Meinshausen et al. 2009 doi:10.1038/nature08017 Table 1) GtC more should be added in net emissions by 2050 - the "carbon budget" ("Warming caused by cumulative carbon emissions towards the trillionth tonne", Myles R. Allen, David J. Frame, Chris Huntingford, Chris D. Jones, Jason A. Lowe, Malte Meinshausen & Nicolai Meinshausen, Vol 458, 30 April 2009, doi:10.1038/nature08019, http://www.fraw.org.uk/files/climate/allen_2009.pdf, http://www.mathtube.org/sites/default/files/slides/PRIMA2009-Allen.pdf; "Greenhouse-gas emission targets for limiting global warming to 2 degrees C" by Malte Meinshausen, Nicolai Meinshausen, William Hare, Sarah C. B. Raper, Katja Frieler, Reto Knutti, Nature 458, 1158-1162, 30 April 2009, doi:10.1038/nature08017 http://www.nature.com/nature/journal/v458/n7242/full/nature08017.html, http://www.iac.ethz.ch/people/knuttir/papers/meinshausen09nat.pdf, http://www.pik-potsdam.de/~mmalte/pubs/Meinshausen_etal_2009_Nature/Meinshausen_etal_2009_GHGTargets2C_Nature.pdf; Allen, M. R., Frame, D. J., Huntingford, C., Jones, C. D., Lowe, J. A., Meinshausen, M. & Meinshausen, N. "Warming caused by cumulative carbon emissions towards the trillionth tonne". Nature, doi:10.1038/nature08019 (2009), http://www.nature.com/nature/journal/v458/n7242/full/nature08019.html, http://www.fraw.org.uk/files/climate/allen_2009.pdf). If economically recoverable fossil fuel resources prove to be comparable to this figure of a maximum "safe" carbon budget, then the 2 degree C carbon target may be possible. However, this level of emissions in such a short space of time would continue to threaten very dangerous climate change, with feedback warming, particularly as Arctic amplification is threatening massive gas release from tundra, permafrost and Arctic Ocean ("Estimating the near-surface permafrost-carbon feedback on global warming", T. Schneider von Deimling, M. Meinshausen, A. Levermann, V. Huber, K. Frieler, D. M. Lawrence, and V. Brovkin in Biogeosciences, 9, 649–665, 2012, www.biogeosciences.net/9/649/2012/ doi:10.5194/bg-9-649-2012, http://biogeosciences.net/9/649/2012/bg-9-649-2012.pdf) I would like to see some discussion of this possible outcome in the chapter - that recoverable fossil fuels are of the order of the 2 degree C carbon budget, but that global warming may still overshoot it owing to positive feedbacks. | Rejected. See previous comment (13473), not the section for a discussion on safety limits etc. |
| 9227 | 7 | 25 | | 27 | | To integrate both tables and to add the potential of RE the same as the Table presented in AR4 Chapter 4 Energy Supply Table 4.3.1. Whoever, if the suggestion is not acepted to add to table 7.2 the unconventional coal | Rejected - literature does not distinguish between conventional and unconventional coal really. Also coal |
| 4077 | 7 | 25 | 14 | 25 | 21 | The link between fossil fuels and climate is too short and should me more complete and more explicit | Rejected: this section is on resources. |

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| 4078 | 7 | 25 | 17 | 25 | 18 | Some more information would be useful in the text there. I would suggest to add something like : « In 2010, fossil fuel combustion released 9,1 GtC in the atmosphere, accounting for x % of global GHG emissions. This can be compared with the annual absorption capacity of the Earth of x GtC. Fossil reserves alone contain x times more carbon than can be released in the atmosphere in a 450 stabilization scenario. » | Rejected: space limitations do not allow the discussion suggested |
| 13197 | 7 | 25 | 22 | 26 | 26 | Not mentionig the possibilities open by the breeder reactors is misleading. This omission must be corrected. | Accepted- text revised. |
| 11927 | 7 | 25 | 23 | 25 | 23 | Misleading. Obviously not all concentrations are "minute". Say that some concentrations are 50x average or more. | Accepted - Done |
| 13485 | 7 | 25 | 26 | 25 | 29 | Text: "The theoretically available uranium in the Earth's crust has been estimated at 100 teratonnes (Tt) uranium of which 25 Tt occur within 1.6 km of the surface (Lewis, 1972). The amount of uranium dissolved in seawater is estimated at 4.5 Gt. Without substantial R&D efforts, these occurrences do not represent practically extractable uranium." This assessment of the practical recovery of uranium from dispersed resources - especially as regards seawater - is much more reasonable than the over-optimism of Professor David MacKay in his work "Sustainable Energy Without the Hot Air" (http://www.withouthotair.com/, http://www.inference.phy.cam.ac.uk/withouthotair/c24/page_162.shtml ) | Noted |
| 16105 | 7 | 26 | | | | This table is not sourced and is fairly contradictory with such sources as the CEA (Commissariat à l'Energie Atomique) of France, which suggests much smaller reserves of uranium and pleads for breeder reactors. | Rejected - Table source is NEA Red book. FBRs have been justified on the ground of U scarcity - a flawed argument |
| 16107 | 7 | 26 | | | | Most of the table 7.3 is speculative, because it rests either on the full closure of the uranium cycle, not even achieved in France, or on a thorium cycle, not even described yet. | Rejected: space limitations do not allow the discussion suggested |
| 16103 | 7 | 26 | 1 | 26 | 14 | These lines contradict somewhat the previous paragraph that tended to take seriously the marine resource of uranium. | Rejected - terrestrial Th has not been considered "seriously" at present - so |
| 3390 | 7 | 26 | 15 | 26 | 23 | I am not an expert on nuclear, but it seems that lithium-based nuclear power should not deserve such a long pargraph compared to the similar space given to more mature resources (lithium it´s not even mentioned in Table 7.3). Perhaps this is a sign of lack of expertise on nuclear in the author´s team? | Accepted - paragraph deleted. Information on Li too sketchy - hence not listed in Table 7.3 |
| 16106 | 7 | 26 | 15 | 26 | 23 | Fusion is not a serious option in the timeframe of mitigation. This paragraph should be skipped and replaced by a mention that fusion energy is not to be seriously available in the next century. The paragraph contradicts also the absence of fusion in the rest of the chapter. The only mention should be in the policy sections, because the very high spending on fusion research hampers other developments, be they in nuclear or in renewables. | Accepted - text deleted |
| 13292 | 7 | 26 | 15 | 26 | 23 | While lithium is a potential source of nuclear energy it is (at least for the forseeable future) also essential in the manufacture of batteries for electric vehicles. It is worth mentioning this competition, with estimates of the relative quantities of lithium required for each, given that EVs are a major option for decarbonisation of the transport sector | Rejected Comment correct - paragraph on Li deleted due to space limitations |
| 13293 | 7 | 26 | 15 | 26 | 23 | Much of the identified lithium resource - at least in Argentina, Bolivia and Chile - is in the form of pristine salt flats. There are signficant environmental implications of exploiting a large proportion of these reserves, which probably ought to be mentioned | Rejected: Comment correct - paragraph on Li deleted due to space limitations |
| 16807 | 7 | 26 | 15 | | 23 | Providing some context re how soon this tech will be available would be helpful -- it seems to me this is not a ready technology, even w/in a decade or more. | Rejected - discussion on fusion technology out of scope here (text |
| 2584 | 7 | 26 | 27 | 28 | 14 | The text underestimates the potential that could play renewable energy combined with energy efficiency in supply sustainable energy. If we take EU target by 2020: 20% energy efficiency and increasing renewables part to 20%, I, objectively that this will lead to less GHG emissions. Although, the fact that some countries would reduce the use of nuclear energy might not impact the current trends of GHG. Even in China, renewable energy are developing fast, and due to the technological progress, renewable energy will be soon the cost effective among energy sources. | Rejected - this section focuses only on technical potential; scenario literature and costs are addressed elsewhere in the chapter and AR5, so this comment is best addressed elsewhere |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3391 | 7 | 26 | 28 | 28 | 14 | Poor section with odd references to support simple ideas. Since there is an IPCC SR on RE it should be easy to rewrite, focusing on key messages from the SR. Avoid rethoric and unnecessary refernces (like in page 26 line 32 to page 27 page 8) or line 3 to line 11 in page 28 (that says the same that the last sentence) | Rejected - this section largely derives from some of the main themes in the SRREN, and many of the references are to the SRREN and its various chapters. The comment does not provide any |
| 18206 | 7 | 26 | 28 | | 35 | Comments: Hydraulic energy" is kinetic energy of water, flowing from a higher to a lower position, due to gravity. "Bio-Energy" is energy stored in biomass by photosynthesis, then extracted by different means. Comments: The RE potential is constantly available, provided you uses the means (economic, technological and other) adequate and sufficient to achieve its utilization. Knowledge and progressive practice with RE allows its deeper and better use. Comparing (with obvious restrictions) exploitable or Available potential of RE – REA (eg expressed in MM boe/yr) with proven reserves of fossil fuels, such amount (REA) will be available each year that passes, eg for 30 years (life average of a power plant). This explains the concept of available potential of RE, its magnitude and the difference with fossil energy reserves. | Rejected - We agree with the comment in many respects. However, hydro and bio energy rely on secondary forms of solar energy: we use the same definition of renewable energy as used in the special report, so we do not wish to deviate from that recent reference. We note in footnote 10 the need to extract RE at a rate that is lower than the rate of |
| 18207 | 7 | 26 | 28 | | 35 | Alternative paragraph:<br>7.4.3 Renewable energies (RE).<br>The sources of RE are thermal energy coming from the Sun, and it's interaction with the Earth's rotation, driving the air layers of the lower atmosphere, the water masses of the ocean, and the water circulation cycle in the atmosphere, allowing the use of solar, wind, ocean and hydraulic energy. Bio-energy is the use of energy stored in biomass by photosynthesis*. Geothermal energy is obtained from water and gases in reservoirs recharged with water from the surface, heated by the much higher temperature of magmatic rocks arising from deeper levels in the Earth's crust. In a realistic and practical sense, we can consider the available potential of RE, which depends not only on technologies or practices, but also on other critical and essential factors like social, economic and land use needs, possibilities and constraints, along with the technological level, because the available potential is the result of the interaction of all the above mentioned factors. Technical potential, as defined in Verbruggen et al. (2011) depends only on technologies and practices; nevertheless, the total global technical potential for RE as a whole is substantially higher than current global energy demands. Figure 7.9 summarizes the ranges of global technical potential for the different RE sources. A variety of practical, land use, environmental, and/or economic constraints are sometimes used in estimating the technical potential of RE. Definitions of technical potential therefore vary by study (e.g., Aviel Verbruggen et al., 2010), as do the data, assumptions, and methods used to estimate it (e.g., Angelis-Dimakis et al., 2011). Also important is the regional distribution of the technical potential. Though the regional distribution of each source varies (see, e.g., IPCC, 2011a), Fischedick et al. (2011) report that the technical potential of RE as a whole is at least 2.6 times as large as 2007 global primary energy demand in all regions of the world. | Rejected - we find the current text to be clear as stated, and very directly related to the text included in the SRREN |
| 10524 | 7 | 26 | 30 | | | Could add: …..bioenergy "and biofuels", …. | Rejected - as used in this chapter, and the SRREN, biofuels are a component of bioenergy. We do not think it is |
| 9990 | 7 | 26 | 30 | 26 | 31 | RE should be defined to include "aero thermal energy" that can be used with heat pump. RE is defined to include "aero thermal energy" based on the EU direction of "Promotion of the use of energy from renewable sources" and Japanese Law of "Sophistication of Energy Supply Structures". | Rejected - we need to stick with the SRREN for this purpose, to be consistent with previous IPCC reports, though we acknowledge that different definitions do exist. There is no single |
| 16108 | 7 | 26 | 32 | 27 | 13 | Estimates for RE technical potentials are clear, uncertainties are explicit and referenced. This is unlike the nuclear part, in particuler table 7.3 | Rejected: Table deleted - space limitations do not allow the discussion |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2828 | 7 | 26 | 32 | 27 | 34 | The discussion of renewable potential should be clearer about the fact that most of the studies examined do not consider economics – most of the quoted renewables potential is not directly comparable with the figures quoted for fossil fuel reserves and this should be noted. | Accepted - A number of the potential studies do in fact include actual or proxies for economic conditions when establishing resource potential, in part to distinguish between theoretical and technical potential. But these restrictions vary widely by study, as already noted in the text. As for fossil energy, the same levels of inconsistencies often exist, one reason that the distinction between resources and reserves is not always precise. We made one change to the text, and that is to note that the resource |
| 4809 | 7 | 26 | 32 | 26 | 35 | Remove the sentence on theoretical potential to reduce the size of the chapter | Accepted - removed |
| 4643 | 7 | 26 | 33 | 26 | 34 | “Because the theoretical potential does not take into account energy conversion losses or deployment barriers, the theoretical potential is of relatively little practical use”. This should not apply to biomass. | Taken into account - the discussion of theoretical potential has now been |
| 10525 | 7 | 26 | 33 | | | IPCC 2011b - the SPM - is a better rference here than just Chapter 1 of that SRREN report | Rejected - most of the details about theoretical potential for RE are included in Chapter 1 of the SRREN, so if a reader wants to understand that literature Ch. 1 is the place to go. The SPM certainly says what we have said here, but it is not the source of the actual information to defend the statement. Regardless, in the end, due to space |
| 16104 | 7 | 26 | 7 | 26 | 14 | Thorium is described without reference to any practical reactors being developed, there or elsewhere in the chapter. It is not helpful to list it as a resource (for what?) | Taken in to account: Text deleted due to space limitations |
| 4106 | 7 | 26 | 7 | 26 | 14 | Further detail by country should be given, to include research and investments in India, China, the USA, etc. as well as such data that do exist on the resource base - which is far larger than implied here. This sub-section seems to show a bias. | Rejected - space constraints do not allow to go into the details here. |
| 11851 | 7 | 26 | 7 | 27 | 14 | I think thorium (and perhaps lithium) should be introduced a bit better. Uranium is well-known as a source for nuclear power, but less so thorium and lithium. As a side note - this entire section (7.4) is written very nicely. Much easier to follow than preceding and following sections and concisely written! However much of what is covered seems common knowledge (i.e. reserves, reserves base, etc.), and not just here, but throughout the chapter it is hard to tell what the goal of the chapter is - to review all the background, or to point out new information (as compared to AR4 and preceding reports)...not all sections are equivalent in this respect | Agree with comment - but texts on Th and Li deleted due to space limitations |
| 6425 | 7 | 26 | 8 | 26 | 8 | "virtually every continent of the world…" there are only 7 continents, and this statement implies that the presence of thorium is quite extensive but its precision is vague. Can this be tightened? | Accepted - text deleted due to space limitations |
| 18204 | 7 | 26 | 9 | | 10 | Add to paragraph: (9) Reserves and resources of uranium are based on a once-through fuel cycle operation. Closed fuel cycles and breeding technology could would increase the uranium resource dimension 50–60 fold. But these “breeded” radioactive fuels represent a much greater contamination problem, in terms of use and storage. (10) In practice, RE sources are sometimes extracted at a rate that exceeds the natural rate of replenishment (e.g., traditional biomass, geothermal energy). Most, but not all, RE sources impose smaller GHG burdens than do fossil fuels. | Rejected: Comment correct - but space limitations prohibit this level of discussion. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18205 | 7 | 26 | 9 | | 10 | Alternative paragraph:(9) Reserves and resources of uranium are based on a once-through fuel cycle operation. Closed fuel cycles and breeding technology could increase the uranium resource dimension 50–60 fold. But these “breeded” radioactive fuels represent a much greater contamination problem, in terms of use and storage. (10) In practice, RE sources are sometimes extracted at a rate that exceeds the natural rate of replenishment (e.g., traditional biomass, geothermal energy). Most, but not all, RE sources impose smaller GHG burdens than do fossil fuels. | Accepted - text revised. |
| 6187 | 7 | 26 | | | | This section, and those that follow, have a number of places for potential cuts. Paragraphs spent on describing the availability of fringe nuclear fuels that exist mostly in labs could be shortened or cut entirely, as their contribution to the overall goals are miniscule. | Taken into account - text has been reduced considerably. |
| 9262 | 7 | 26 | | | | Under renewable energy you could comment on the ability to store it by using excess green energy to pump compressed air into subsurface reservoirs for use when the sun doesn't shine, wind stops, or there's peak demand etc. It's not common, but has been done for decades. Also comment on risk of deploying solar, wind and hydro during changing weather patterns due to climate change - requires forecasting to be correct. - maybe just refer reader on to 7.7.2? | Rejected - these issues are important, and are covered elsewhere in the chapter and need not be included here as well |
| 4107 | 7 | 26 | 27 | 28 | 14 | This whole section, though very important for the Assessment, is extraordinarily short and weak. The bland reference to the theoretical potential is far too generalised. There are severe limits on all forms of RE except CSP + UHVDC transmission taking a global perspective. At the regional level, taking into account latitudes and solar insolation, mean wind speeds, the presence or absence of large tidal ranges and wave movements as well as geothermal potential, need all to be taken into account. Belatedly, people are now awakening to bioenergy/biofuel constraints for many purposes and locations. There is reference to the technical potential for solar (p. 27, line 12) without differentiating between solar PV and CSP, and/or where solar PV systems can be optimally located and for what purposes. The brief reference to region potential (p. 27, lines 21-24) scarcely begin to face up to the challenges and differences. The bland statements on global and regional potentials (p. 27, lines 25-27) fail to address the challenges of low power densities, intermittency, etc. The reference on p. 28, lines 1-2, to wind energy potential and its treatment in the IPCC Special Report is jejune. The UK's offical planning guidance (PPS 22, Companion Guide, page 165) claims that wind energy developments in the UK typically achieve a load (or capacity) factor of 30% with a range of 20% to 50%. In fact data from the wind energy developers themselves for onshore developments in England over the past five years demonstrate that the average has been 22% (in 2010 down to 18.7%), and the range 4% to (in one case in the exceptionally windy year of 2008) 49%. Graham Sinden claimed back in 2007 that 35% would rapidly become typica. There is no evidence of that happening. The issue of intermittency is also very important, both from the point of view of the need for traditional source back-up, but also because hopes that - for example - if it is windy to the West or South of the UK this would back up for where there was a lack of wind for offshore facilities to the East or North. Research evidence shows (eg. Oswald et al) that if is calm in one nearby maritime area it is highly likely to be calm elsewhere offshore in that region. | Rejected - space constraints preclude a detailed discussion, but we provide links to the SRREN, which addresses issues of technical potential in more detail. This section also only addresses technical potential (not market/social/realistic potential, considering various constraints), while linking to other sections of the chapter that address scenarios/integration/ and the various constraints and opportunities for the use of RE. Those matters are best addressed in other sections of the chapter, not here. The same approach is used in discussing the potential for fossil and nuclear: we are not judging what is possible of likely in these sections, only how much resource there is. As such, this subsection's approach is consistent with those of others in 7.4. |
| 7731 | 7 | 27 | | | | Figure unclear. Suggest to improve resolution of it. | Accepted |
| 4434 | 7 | 27 | | 27 | | Figure should be re-drawn for clarity | Accepted |
| 10066 | 7 | 27 | | | | It should be made more clear that the RE potentials are annual potentials | Accepted |
| 4645 | 7 | 27 | | 27 | | The total primary energy consumption for 2009 is given as 492 EJ. The technical range for biomass is given as 50 EJ to 500 EJ. According to IEA, the biomass primary energy consumption for biomass is 10.2% of the total or 50 EJ. If wood consumption for non-energy uses is included, then this total is increased to about 72 EJ. Thus, the lower estimate of 50 EJ may have already been achieved. | Rejected - The IPCC report addresses this issue, and we do not have the space to reproduce the argument here. It is a good point, and for biomass, depends |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15944 | 7 | 27 | | 27 | | For wind energy potentials see the recently published - Nature Climate Change;<br>'Geophysical limits to global wind power'<br>Kate Marvel, Ben Kravitz & Ken Caldeira ; and PNAS 'Saturation wind power potential and its implications for wind energy'<br>Mark Z. Jacobsona,1 and Cristina L. Archerb,1<br>Nature Climate Change (2012) doi:10.1038/nclimate1683<br>Received 01 May 2012 Accepted 08 August 2012 Published online 09 September 2012 | Accepted - The figure is included in the SRREN, and is not planned for an update for the AR5. We have reviewed these citations for inclusion in the text, however, and have included one of the two. |
| 12157 | 7 | 27 | | 27 | | It's very important to improve the quality of the Figure 7.9, after all, it's difficult to understand well some information. | Accepted |
| 16809 | 7 | 27 | 1 | 28 | 14 | Just as in previous section's discussions of resource availability of fossil fuels, renewable energy sources have similar economic limits, i.e., some amounts are available at relatively low costs and some at a much higher cost. The supply curve slopes upward and to the right. Example: Some wind energy sites are ideal -- close to electric transmission and with good wind. As you move away from this optimal site, the costs increase (or productivity declines) -- the site may yet be fine, but it is not as good as the optimal. In a world with a carbon price, you would develop the optimal site first and may not develop the less optimal site until later when carbon price had increased. | Noted - this point is addressed later in the section, at least briefly |
| 9645 | 7 | 27 | 13 | | | Figure is blurry and difficult to read | Accepted |
| 12597 | 7 | 27 | 25 | | | It is interesting how the EU27 shows that financial wealth and renewable resource wealth (such as the UK) does not equate to high levels of renewables. To take the UK example further, looking at data from www.energy.eu, the UK is number 25 in the EU27 for renewable energy penetration, a surprisingly low position. | Noted - Does not appear that this comment suggests a textual change |
| 18208 | 7 | 27 | 25 | | 29 | Alternative paragraph:<br>As estimated by this literature, the global and regional technical potentials for RE as a whole are unlikely to limit deployment. Further, as with other energy sources, all else being equal, continued technological advancements can be expected to increase estimates of the technical potential for RE in the future, so as improvements in energy policy, planning and R&D&D, internalizing the environmental, land-use and social advantages of RE, reflected by its available potential, in the general frame of all the viable energy options, be it at sub-continental, national or regional level. | Rejected - Unnecessary detail for a section this is already at its page limit |
| 4644 | 7 | 27 | 9 | 27 | 10 | This statement points to the urgent need for reliable land use maps and inventories. This cannot be over-emphasized. | Noted - does not seem to suggest an actual textual change |
| 3394 | 7 | 28 | | 29 | | Simplify discussion around Figure 7.10. Well known ideas and I guess few changes respect to AR4. No need for so many new references unless they are supporting key numbers in Figure 7.10. Preferably, you should use references from major reports. | This section tries to address both new findings related to fugitive emissions of methane especially from natural gas systems, opportunities for reductions of these fugitive emissions from all fossil systems, and the existing fuel switching strategy. While fuel switching is discussed in AR4, the new findings listed here show that the issue is not quite as simple because gas fired power |
| 3272 | 7 | 28 | | 37 | | Section title of 7.5 is "Mitigation technology options, practices and behavioural aspects", but there is little description of behavioural aspects in this section. | Accepted - important behavioural aspects in the field of energy consumption are to be discussed in the demand chapters. In chapter 7 behavioural aspects are addressed in 7.6 (e.g., demand response) and 7.9 (risk |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10528 | 7 | 28 | 11 | | | … of the biomass resource (de Vries et al., 2007)." Delete "e.g" from in front of references. | Accepted |
| 12589 | 7 | 28 | 12 | | | One thing which also helps acceptance is joint ownership of the energy systems. If a system is owned by a community, they are much more supportive of it | Rejected. While the argument has merit, we do not have space to get into this |
| 12590 | 7 | 28 | 12 | | | There are issues with disinformation on renewable energy systems. Some of this is perpetuated by organizations which do appear from the outside to be fair, neutral sources. The Renewable Energy Foundation in the UK is a good example of this. | The comment seems to be misplaced. |
| 2971 | 7 | 28 | 15 | | | The “behavioral aspects” are missing in this section. | Rejected. This section addresses the emissions from the well/mine to electricity, heat, or refinery gate. Behavioural aspects may be important regarding the management of the chain |
| 5954 | 7 | 28 | 15 | | | Sections 7.5 andf 7.6 provide excellent summaries of current technology and infrastructure performances in relation to consideration of future mitigation. However, it would also be worthwhile to include a brief summary of advanced laboratory research developments, including use of nanotechnology, that have the potential to fundamentally restructure energy production and provision. | Rejected. First, we need to base the assessment on technologies that have been demonstrated in order not to mislead policy makers. The technologies must have been assessed in the peer-reviewed literature. Second, this would |
| 4814 | 7 | 28 | 15 | 28 | 15 | Include assessment of demand side management (smart grids/meters, energy efficiency measures, storage, etc) to the list of mitigation options | Rejected - though not from the perspective of resource potential, storage and DR issues are addressed in a later section. We have forwarded this |
| 3393 | 7 | 28 | 17 | 28 | 19 | Is this the place to remember that fossil fuels are a major cause of anthropogenic climate forcing…?. Delete full paragraph | The section also addressed the emissions from fossil fuel production, which were not covered anywhere else. This is now included in the discussion of |
| 10529 | 7 | 28 | 18 | | | Rest of chapter / report uses Gt, not Pg so suggest change to be consistent | Taken into account - comment is obsolete. Underlying text has been |
| 10526 | 7 | 28 | 2 | | | Why only wind chosen here? Suggest delete the wind reference and just leave Verbruggen et al, 2011 - and delete "generally". | Accepted |
| 9646 | 7 | 28 | 20 | 28 | 20 | add "oil and gas" before wells and pipelines or it sounds like it is coal wells and pipelines. | Accepted. Language changed. |
| 3784 | 7 | 28 | 20 | 28 | 20 | Check the figures in "(0.3 PgCO2, 1-28 PgCO2e CH4) | Taken into account - sourced checked. The numbers are correctly reproduced. Please note this paragraph has been |
| 3785 | 7 | 28 | 20 | 28 | 24 | Improve Figure 7.10 adding information on technologies required to reduce GHG emissions shown | Taken into account. Note that the original figure was not reproduced correctly in the FOD. CCS is included. Other emission reduction opportunities were not shown. They are potentially more difficult as many of the listed |
| 11929 | 7 | 28 | 21 | | | Label missing on abcissa in Figure 7.10. | Accepted. The figure was not correctly |
| 10530 | 7 | 28 | 22 | | | Not 7.2.3. Maybe quote Section 8.2 better | Accepted. |
| 17364 | 7 | 28 | 26 | | | can be reduced through… | Accepted. |
| 11930 | 7 | 28 | 27 | | | Define distinction between T and D. Which losses? T or D? | Rejected. This comment must be |
| 6696 | 7 | 28 | 29 | 28 | 37 | For sustainable development, we must consider energy security and economic influence. From this standpoint of view, not only replacing existing coal fired power plants by highly efficient natural gas power plants, but also replacing by more efficient coal plamts is needed. | Rejected. You are suggesting to introduce a longer discussion of alternatives which we do not have place |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11762 | 7 | 28 | 29 | 28 | 31 | Energy must be choosen taking into not only enviromnet but also economy and energy security. To avoid the misunderstanding, [prvided the economy and energy security is not taken into account] should be added after this sentence. Refer to No.4. | Reject. Energy security is addressed in 7.9.1, this section refers to climate mitigation. |
| 10067 | 7 | 28 | 29 | | 30 | It should be spelled out that the CO2 reductions here relates to the emissions during combustion only. | Reject. The review comment seems to be misplaced as specific emission |
| 10654 | 7 | 28 | 29 | 28 | 31 | Add a statement coal is preferred from the view point of energy security. | Reject. Energy security is addressed in 7.9.1, this section refers to climate |
| 9991 | 7 | 28 | 29 | 28 | 37 | This part should be revised to explain that it is important to use coal power efficiently from a viewpoint of energy security and economic efficiency. IGCC (Integrated Gasification Combined Cycle) technology is developing and has potential to reduce CO2 emission in the future, as described in (IEA, 2011, page7, 42 Fig14) and (Janos, 2009, page5 and 7-8, Figure1 and Table 1, 2).<br><br><Reference><br>[1] IEA (2011). Power Generation from Coal Ongoing Developments and Outlook, IEA Information Paper. Available at: http://www.iea.org/papers/2011/power_generation_from_coal.pdf<br>[2] Janos M Beer (2009). Higher Efficiency Power Generation Reduces Emissions, National Coal Council Issue Paper. Available at:<br>http://web.mit.edu/mitei/docs/reports/beer-emissions.pdf | Taken into account - this was evaluated in the figure 7.10. The missing labelling was corrected for the SOD. The cited literature was taken into account if appropriate. |
| 9368 | 7 | 28 | 29 | 28 | 31 | Coal fired power plant has potential to reduce CO2 emissions by improvig the efficiency of the plant.(IEA,2011).Thus it should include the view that effective utilization of coal fired power plant is needed for energy security. | Accepted - concerning domestic coal, this comment is addressed in section on energy security (7.9). |
| 13036 | 7 | 28 | 3 | 28 | 6 | This sentence appears to be a misleading restatement of data on technical potential for RE, and the source supplied does not sufficiently support the assertion of limited RE potential. | Accepted, in part - On a long term basis and under high carbon reduction targets, some technologies have limits on their contributions. We have clarified the statement to make it clear that we are talking about cases in which very deep carbon reductions are sought, and where individual technologies cannot meet huge proportions of total energy supply |
| 18052 | 7 | 28 | 31 | 28 | 31 | After "(NGCC) power plants" add" renewable energy technologies, efficiency". Without a reference to renewables is seems that the only mitigation options in the power sector is fuel switching from coal to gas and CHP, despit efficiency and renewables being the options with the highest carbon reduction potential in most areas of the world. | Rejected. This section addresses mitigation opportunities within the fossil fuel sector. The text is not formulated to suggest that fuel switching is the only |
| 10068 | 7 | 28 | 32 | | 34 | The methane issue should be more elaborted, with respect to the differen GWPs in different timeframes for the different GHGs .<br>See: The future of Natural Gas, E. Monitz et al, MIT (2011);<br>Shindell et al, Science 326, 716 (2009) | Taken into account - it has been noted that the 100 y GWP is used. It is an editorial decision of GWIII to utilize GWP100 throughout the report. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2829 | 7 | 28 | 34 | 28 | 37 | The discussion of LCA here is out of place and over-compressed and this sentence (and probably the whole paragraph) could be omitted – there is a better treatment in 7.8.1. In any event, the referencing at both points is odd. Singh et al 2011 is about CCS technologies so it is not clear why it is used as a reference for conventional generation – on which it takes its figures from the Ecoinvent database, which reflects historical European conditions. The discussion should point out that LCA figures are situation specific and depend on the underlying assumptions, so that quoting any single figure is misleading. In the comparison cited here, there is also an odd mixture of average and marginal data. While this is made clear in relation to the technology, it is not clarified in relation to the supply source. The natural gas-related emissions on which the comparison is based are based on the situation in Europe nearly a decade ago. For a new NGCC emissions would depend on the assumptions about the gas source – Russia? Qatar LNG? US shale gas LNG exports ? – all of which would give very different results, especially given the uncertainty about methane emissions in transmission from Russia, which alone could completely overturn the conclusion. | Accepted. We have updated the analysis using more recent emissions estimates for fugitive emissions from Burnham et al. The LCA appropriately combines different sources of emission. In this section, we systematically emphasise the importance of fugitive emissions during fuel production and emissions associated with gas transport, which may make fuel switching less attractive than when addressing only power plant emissions. We would appreciate references for emissions from |
| 11852 | 7 | 28 | 36 | 28 | 37 | Why is only one value and one data source reported for Coal vs NGCC (Singh et al 2011)? There are numerous LCA studies with varying estimates (e.g. - and this list is not exhaustive - Burnham, A., et al. Life-Cycle greenhouse gas emissions of shale gas, natural gas, coal, and petroleum. Environ. Sci. Technol. 2012, 46, 619-627; Argonne National Lab's GREET 2012 Model; Jaramillo et al. Comparative lifecycle air emissions of coal, domestic natural gas, LNG, and SNG for electricity generation. Environ. Sci. Technol. 2007, 41, 6290–6296; etc. ). | Taken into account. Please note that the findings from the paper by Jaramillo et al are cited. The Burnham paper was not available at the time of writing. The figure has been updated taking the fuel chain emissions from Burnham. |
| 17222 | 7 | 28 | 37 | | | The carbon intensities are not the default values recommende by IPCC and used by IEA. The CLAs are strongly requesed to check these numbers. | The numbers are sourced from the IPCC database following 2006 guidelines. Antracite: EF-ID 117627; natural gas: |
| 11853 | 7 | 28 | 37 | 28 | 38 | Why is the carbon content of anthracite coal listed? Anthracite is most typically used in metallurgical processes, not power generation. Anthracite has a high carbon content compared to, for example, bituminous or sub-bituminous coal (more typical for power generation). | Accepted. Has been replaced by sub-bituminous coal, which has a carbon content of 26.2 g/MJ compared to 26.8 |
| 6448 | 7 | 28 | 37 | 28 | 38 | Note that anthracite is not the major coal type used in electricity production; this sentence should include data for sub-bituminous coal which is much more widely used for electricity production | Accepted. Has been replaced , see response to comment 11853. |
| 5153 | 7 | 28 | 4 | 28 | 4 | how do this claim match the deployment predictions of ch 5 in the SRREN where Hydro may increase from 3000 to even 9000 TWh in 2050 - the sentence hints that there is not much hydro to develop | Accepted, in part - On a long term basis and under high carbon reduction targets, some technologies have limits on their contributions. We clarified the statement to make it clear that we are talking about cases in which very deep carbon reductions are sought, and where individual technologies cannot meet |
| 16036 | 7 | 28 | 41 | 28 | 42 | Further emissions ereductions maybe possible through CO2 Capture and storage and CO2 Capture and use for example through algae | Rejected. No reference provided to evaluate this option. |
| 5134 | 7 | 28 | 42 | | 45 | The sentence is not clear. What specific message the statement is trying to convey? | Accepted. Change to: "If gas is liquefied with a dirty power source and shipped over long distances, It should be noted that, depending on specific circumstance of fuel production, liquefaction and transport, the range of life-cycle GHG emissions of electricity |
| 10527 | 7 | 28 | 5 | | | Are solar and wind really "seemingly more-abundant"? Not shown by technical potential analysis of scenarios in Chapter 10 of SRREN. | Accepted - more abundant based on technical potential alone (not scenarios). |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4646 | 7 | 28 | 9 | 28 | 11 | “Competition for land --- may impact on aggregate technical potentials, as might concerns about the carbon footprint and the sustainability of the resource (e.g. biomass) ---“. This should not apply to woody biomass from existing sources as its NPP is far in excess of current demand. | Rejected - the word "may" provides the appropriate caveat here |
| 4779 | 7 | 28 | 3 | 28 | 6 | The sentence "may be limited by the available technical potential, e.g., hydropower, bioenergy, and ocean energy" is not correct. As stated in IPCC/SRREN report the untapped technical potential for those 3 technologies is still huge, refer to Figure 7.9 for instance. | Accepted, in part - On a long term basis and under high carbon reduction targets, some technologies have limits on their contributions. We have clarified the statement to make it clear that we are talking about cases in which very deep carbon reductions are sought, and where individual technologies cannot meet |
| 6188 | 7 | 28 | | | | This section is in general detailed, well-written, and comprehensible. However, it tends towards listing technologies and providing a brief explanation of them, which isn't quite effective in understanding how they compare to each other. Using tables or other figures as the primary means of displaying information could solve this problem, while potentially reducing the total page count. | There is a figure comparing different fossil fuel options. It is not clear whether the review comment suggests a figure for the entire section 7.5. Please note |
| 18508 | 7 | 28 | | | | An intro paragraph to this section explaining how the options presented in the different sub-sections fit together or complement one another would be useful. | Accepted - an intro paragraph to 7.5 has been introduced. |
| 18514 | 7 | 28 | | | | Each of the sub-sections (i.e. technology categories) has a different focus and structure, and in some cases topics stray to cover scenarios and risks. Some differentiation is of course necessary because of the fundamentally different nature of the technologies, but some similar structural elements would be useful. For example, an introductory paragraph summarizing the different options available in that category, a paragraph on changes since the AR4 (Section 7.5.4 does this in an exemplary way!), and a paragraph+ for each of the different options including where they've been deployed. | Accepted - issues of risk and scenarios have been removed as they are covered in other sections of the chapter. An introductory paragraph has been added. |
| 13486 | 7 | 28 | 40 | 28 | 41 | Text: "Emissions associated with NGCC are still too high to meet long-term stabilization targets." This is true if one considers all new Natural Gas combustion plant to be in permanently in operation. However, balancing variable Renewable Energy capacity with Natural Gas as backup will allow for gas power generation to idle. With the growth in different streams of Renewable Gas, net carbon emissions of gas generation should reduce significantly, even if carbon intensity is somewhat increased owing to variable energy values of the Renewable Gas sources. One important condition of new gas plant commissioning should be that the gas turbines are not only efficient, but flexible, or permit retrofit for more flexibility - to allow greater flexibility in the use of new resources of gas - namely Renewable Gas, which is likely to have variable energy density. | Taken into account - specified that this is the case only for use of NGCC for base load power. |
| 13487 | 7 | 28 | 41 | 28 | 42 | Text: "Further emissions reductions are possible through CO2 capture and storage" It seems to me to be wasteful to burn more gas in order to capture the carbon dioxide and pump it into permanent storage. The time taken to develop widescale carbon capture and storage capacity is going to take much longer than it would take to properly implement fugitive gas capture. (Example reports : "Leaking Profits, NRDC http://www.nrdc.org/energy/leaking-profits.asp; "Controlling fugitive methane emissions in the oil and gas sector", IIGCC, http://www.iigcc.org/__data/assets/pdf_file/0017/15371/Methane-emissions-Statement.pdf) | Rejected. We cannot base our report on the political statements of interest groups. |
| 14703 | 7 | 28 | | | | Assessment of GHG emission from unconventional gas is large depended on which GWP factor should be used. For examples, Howarth et al., 2011 is using much higher GWP (105 as 20 year and 33 as 100year from Shindell et al.2009) than IPCC 2007(72 as 100 year and 25 as 100year). Therefore the emission is evaluated very high. So the information which GWPs and time horizon are used should be shown in IPCC assessment report. | Accepted - see response to review comment 10068 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18509 | 7 | 28 | 16 | | | Section contains good information, but the structure is intermixed, making it difficult for the reader to pull clear messages. Having dedicated paragraphs on the three options introduced: 1) fuel switching; 2) ee; and 3) reducing fugitive emissions would be helpful. | Reject. Please note that fuel switching makes sense ONLY when fugitive emissions from natural gas chains are kept low and LNG plants use clean electricity and LNG ships are well designed and operated at the right |
| 15485 | 7 | 28 | 18 | 28 | 19 | Fossil fuel extraction, conversion and fuel switching – add in the brackets data for building and construction sector in the list as they represents around 40 % of the global GES | Rejected. The building and construction sector is addressed in Ch.9 |
| 4081 | 7 | 28 | 25 | 28 | 28 | Total climate forcing has to be reduced. It is not relevant to focus on climate forcing « per unit energy delivered ». I would suggest « Climate forcing from fossil fuels can be reduced through (1) containing the global energy demand (2) higher energy efficiency (3) switching to lower carbon-intensity fuels and (4) reducting fugitive emissions along the supply chain and black carbon emissions from combustion. » | Rejected. While this is absolutely true and the basis for WGIII, this section specifically focuses on reducing emissions in the fossil fuel/power/heat |
| 9228 | 7 | 28 | 28 | 28 | 28 | To add "(4) change or swuitching to economy structure more light" | Rejected. While this is relevant for mitigation overall, it does not fit into this section which deals with the fossil fuel |
| 11713 | 7 | 28 | 15 | 30 | 35 | High efficiency distribution generation, especially fuel cells (PEFC, SOFC) has been advanced and already commercialized. It might be effective not only reducing transmission loss but also changing the scale of combined heat and power (e.g. CHP in single home) and scale of energy system (e.g. smart grid). More discription on distribution generation is needed. | taken into account - fuel cells now are mentioned in the text. |
| 12326 | 7 | 28 | 15 | | | We recommend adding an introduction that describes the challenge - how much mitigation is needed in the 450 ppm scenarios, and the stabilization scenarios. The danger of "lock-in" should be commented on as this might be quite relevant in regions where the focus is on building a natural gas infrastructure without CCS. (Long term versus short term mitigation needs.) We also recommend moving (a shorter version of) section 7.8.1 to this sectrion 7.5 and moving chapter 7.8 (Costs and potential) immediately after chapter 7.6. | Taken into account - introduction has been added. |
| 12327 | 7 | 28 | 15 | | | Regarding the structure of 7.5: We recommend rearranging the order of the sub-sections to: 1. renewable energy, 2. fossil fuel extraction … 3. CCS 4. nuclear energy and 5. energy efficiency in transmission and distribution. Reasoning: this latter is relevant for all energy production, and will provide a better transition to Section 7.6. | A common order has been agreed for all the sections of this chapter. |
| 3395 | 7 | 29 | | 30 | | Focus on energy losses figures and avoid detailed technical details about trasnmission lines operating conditions, clearly out of scope in an IPCC AR report. | On reflection I don't accept this - the text was to be shortened and has been slightly, but note that examination of |
| 4435 | 7 | 29 | | 29 | | A y-axis with numbers is needed for this figure. | Taken into consideration. The figure has been revised (now figure 7.8) |
| 16110 | 7 | 29 | | | | No scales given. Even with the right scale, this figure is misleading, because the thermal plants will not usually be used as baseload, and their emissions will depend on the rest of the system. | Taken into consideration. The figure has been revised (now figure 7.8) |
| 14542 | 7 | 29 | | 29 | | Figure needs to be fixed | Taken into consideration. The figure has been revised (now figure 7.8) |
| 9591 | 7 | 29 | | | | Please, add name on each bar chart and calibrate unit. | Accepted. Figure has been corrected. |
| 4522 | 7 | 29 | | | | I do not understand this figure? Is there a label on the x-axis that is missing? | Accepted. Figure has been corrected. |
| 6230 | 7 | 29 | | | | no distinction between coal & gas | Accepted. Figure has been corrected. |
| 15945 | 7 | 29 | | 29 | | there is no identification of the X axis in this chart | Accepted. Figure has been corrected. |
| 10531 | 7 | 29 | | | | Explain the arrows with -19%, -16% -80% of what? Need x axis labels.Add data to y-axis. Explain probability bars. Delete "(BAT)" | Accepted. Figure has been corrected. |
| 10048 | 7 | 29 | | | | Legend unclear - different technologies should be included in the x-axis | Accepted. Figure has been corrected. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14702 | 7 | 29 | 12 | 29 | 13 | There are other analysis for life cycle GHG emission assessment for unconventional natural gas. Their analysis is summarized as follows;<br>1)Fugitive emission from shale gas well completion with hydraulic fracturing is much smaller than the emission from gas combustion at final demand. And the fuel combustion of natural gas is much smaller than that of coal. Therefore, the emission from shale gas is much smaller than coal by LCA. Reference cited; National Energy Technology Laboratory 2011(Life Cycle Greenhouse Gas Inventory of Natural Gas Extraction, Delivery and Electricity Production), Shell Global Solutions (U.K.), Shell Technology Centre Thornton 2011(Modeling the Relative GHG Emissions of Conventional and<br>Shale Gas Production).<br>2)Furthermore three is the report which points out that emission from shale gas is smaller than conventional natural gas because shale gas does not need liquid unloading. Reference cited; Argonne National Laboratory 2012 (Life-Cycle Greenhouse Gas Emissions of Shale Gas, Natural Gas, Coal, and Petroleum). | Taken into consideration. Note that there are competing views on this issue. See for example review comment 13488 and the references cited therein. We are surveying this emerging field and attempt to consider all findings and perspectives. |
| 5135 | 7 | 29 | 16 | | | Replace 'tar sands" with "oil sands" | Accepted. Replaced. |
| 9647 | 7 | 29 | 19 | | | No axis labels on the chart | Accepted. Figure has been corrected. |
| 9270 | 7 | 29 | 20 | | | Need to add actual units of measurement to Y axis (i.e. intervals of x kgCO2-e) | Taken into consideration. The figure has been revised (now figure 7.8) |
| 4082 | 7 | 29 | 20 | | | This figure lack of legend for histogram bars | Accepted. Figure has been corrected. |
| 15465 | 7 | 29 | 26 | 29 | 31 | We can add the fact that in the US, the combinsed transmission and distribution losses in the US are much higher at 14.9% in 2010. See reference: page 10 of http://www.americanprogress.org/wp-content/uploads/2012/08/0709_CleanEnergyWeb2.pdf or US EIA Annual Energy Review, 2012 | Rejected as the I don't believe that such focus on US data is appropriate, and actually the IEA give 6% losses fore the |
| 4810 | 7 | 29 | 26 | 29 | 27 | Add a line on the rationale for transmission losses being less than distribution losses. Does this apply to all countries? I would think that countries such as Brazil where most of the generation is located far from consumption would have more transmission losses compared to distribution, than countries where generation is close to consumption. Or is this losses by km instead of system losses? | Accepted. Text amended. |
| 10532 | 7 | 29 | 26 | | | Deelete "are known as transmission losses, they" and add "high-voltage" transmission system and "low-voltage" distribution system. Delete "(distribution losses)". | Accepted |
| 9648 | 7 | 29 | 28 | 29 | 31 | Seems outdated - is there more recent data? A comparison with non-OECD countries would be useful. | Accepted - text revised. |
| 10533 | 7 | 29 | 28 | | | Change "energy delivered" to "electricity delivered". But below is the 6.5% losses of electricity delivered or electricity generated? I suspect the former. Need to clarify in text | Accepted and dealt with |
| 16811 | 7 | 29 | 3 | | 6 | When discussing emissions from the energy use in fossil energy extraction, do we risk double counting emissions if we include these in emissions from fossil fuel use, as it typically done? | Taken into account. Please note that a consistent life-cycle methodology ensures that each emission is counted |
| 4436 | 7 | 29 | 30 | 29 | 31 | This transmission+distribution losses figure should be updated. | Accepted and dealt with as far as |
| 18510 | 7 | 29 | 30 | 29 | 31 | Is there not a more recent reference? At the time the AR5 is published, this reference will be more than 10 years old. | We are running with IEA 2003 until we have something better that is properly |
| 14543 | 7 | 29 | 6 | 29 | 6 | Consider adding " and ocean thermal energy conversion has significant potential for providing base load energy for small island state". Although small islands are minor emitters, they also need to take mitigation more serioosly, and be aware that RE such as OTEC can provide energy independence. | Taken into account. A box on developing countries and LDCs was included. |
| 16037 | 7 | 29 | 9 | 29 | 11 | to much sources | Rejected. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13488 | 7 | 29 | 12 | 29 | 13 | Text: "Fugitive emissions associated with unconventional gas production are controversially discussed (Howarth et al., 2011; Cathles et al., 2012)" Additional papers : "Methane Emissions from Natural Gas Systems", Robert Howarth, Drew Shindell, Renee Santoro, Anthony Ingraffea, Nathan Phillips, and Amy Townsend-Small, February 25, 2012, Background Paper Prepared for the National Climate Assessment, Reference number 2011-0003, http://www.eeb.cornell.edu/howarth/Howarth%20et%20al.%20--%20National%20Climate%20Assessment.pdf; Howarth et al. 2012, "Venting and leaking of methane from shale gas development: response to Cathles et al.", Climatic Change, DOI 10.1007/s10584-012-0401-0 http://www.eeb.cornell.edu/howarth/Howarthetal2012_Final.pdf | Taken into account. Please note that fugitive emissions of methane is an emerging issues also for coal. There is a lot of work that is coming out and we are keeping an eye on this. However, we are trying to get a balanced view and we see at this point no basis for endorsing one or the other of the competing views. |
| 13490 | 7 | 29 | 20 | 29 | 24 | This figure is missing the horizontal axis. | Accepted. Figure has been corrected. |
| 13489 | 7 | 29 | 40 | 29 | 42 | Text: "Emissions associated with NGCC are still too high to meet long-term stabilization targets. Further emissions reductions are possible through CO2 capture and storage (Section 7.5.3)" Carbon Capture and Storage is possible, but the question remains as to whether it is probable. Although on a very local level it is already being employed, it is difficult to imagine incentives for widescale use, considering its implications for added combustion of fuel, and the construction of a parallel infrastructure to gas grids. It is unlikely to happen in developing countries, who lack infrastructure-building capacity. Whilst it is true that Natural Gas Combined Cycle emissions are too high to meet long-term stabilisation targets, if they gradually become back up to renewable energies, such as widespread wind and solar power, and if gas supplies become decarbonised through increasing proportions of Renewable Gas (Renewable Hydrogen and Renewable Biomethane, principally), there is no reason to doubt that gas generation will continue to be useful and fall within any low carbon regime. | Rejected -- no scientific evidence / publications are provided to substantiate the reviewer's opinion. The reviewer is expressing their personal opinion. It is difficult to respond to a generic statement that "it is hard to believe" without some substance behind the comment or specifics about what should be changed in the text. |
| 15355 | 7 | 29 | 25 | | | This section could be strengthened through incorporating information on energy effiency in other areas for example demand sectors such as industry (boilers etc), buildings, transport, as the energy balance and other sections refer to significant consumption, low efficiencies as well as there being high potential for savings. | Rejected - such information is appropriate in this section. |
| 3451 | 7 | 29 | 26 | 29 | 31 | Are there any updated figures regarding T&D losses?. In the document the figure presented is for the year 2000 | Is IEA 2003 the latest published figure? I have added a ref to online IEA data for |
| 11931 | 7 | 29 | 27 | | | Energy intensive? | Unclear what is intended by this comment - the use of the term was fine |
| 6240 | 7 | 3 | 13 | | | ince prices determine demand, subsideis bias the price signal, IEA made some investitgation in international subsidies in their WEO, role of ubsidies in climate perspective should be mentionend in more depth. Especially subidies in developing countries | Taken into consideration - subsidies are mentioned in 7.12.3 |
| 6241 | 7 | 3 | 29 | | | topic of energy taxes is just mentioned but energy taxing might be looked with some higher depth since energy taxing might also help the meet climate purposes. | Rejected - space constraints do not allow to go into the details here. |
| 6239 | 7 | 3 | 3 | | | many mire reports than referenced have been produced on this topic | Rejected - comment seems to be misplaced. It is not clear what the |
| 12586 | 7 | 30 | | | | There is still much work to be carried out on CCS. Technically yes it is possible, but how commercially possible is it? | Noted. The text as currently written specifically addresses this point when it says "CCS is a technology suite that has the single purpose of capturing and storing CO2 and therefore is not deployed without either limits on |
| 4647 | 7 | 30 | | 30 | | CCS. See my notes above. | Comment unclear - as reviewer gave many comments at different places. |
| 4437 | 7 | 30 | 1 | 30 | 2 | Reference for the assertion of 25% losses from distribution transformers in Europe. | Only grey literature here but I have added a new ref (EU project report) |
| 17281 | 7 | 30 | 1 | | 2 | This statement requires a reference | Accepted and done |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15486 | 7 | 30 | 1 | 30 | 6 | Add data for developing countries (Africa Region based on studies on Grid integration) and, if possible, also for transition economies such as China in order to have comparable perspective | A figure for India was added, but to add more due to page constraints and limited value of the additional data is not |
| 4108 | 7 | 30 | 18 | 30 | 25 | There could usefully be a more detailed discussion here about work being done, and progress made, on UHVDC transmission, links to CSP and the Desertec concept, developments in California, and potntial to harness wind energy as well over large distances which might offset the criticism immediately above. | Rejected. Since the section is already too long and this is speculative, this was not added. |
| 18053 | 7 | 30 | 20 | 30 | 21 | "for very long lines" must be more specifically defined. App how many km? | Accepted and dealt with |
| 9470 | 7 | 30 | 23 | 30 | 25 | This part should be left in this report, as there is possibility that connecting renewable energy to utility grid increases transmission losses. | Accepted - no change required |
| 4438 | 7 | 30 | 23 | 30 | 25 | Define considerable distances. What losses are predicted for programmes, such as the IEA PV in the desert? There are discussions of a pan-Asian network and pan-Australian network. | Done |
| 16111 | 7 | 30 | 23 | 30 | 25 | This paragraphe is doubtful, because the losses will depend both on the local resouces such as PV, and the matching of this resource to the electricity usage in the area. Present developments are favourable with such local or even in-house production, the transmission being used in limited hours of the year (thus limiting losses). | Its not doubtful - its precise and logical |
| 11763 | 7 | 30 | 23 | 30 | 25 | This kind of concern should be recognized. | Accepted - no change required |
| 10655 | 7 | 30 | 23 | 30 | 25 | Good argument. | Accepted - no change required |
| 5155 | 7 | 30 | 23 | 30 | 23 | what os meant by "time varying renewable" ? Intermittent or variable ? | The term has been used as it is more precise than the two alternatives offered. |
| 9992 | 7 | 30 | 23 | 30 | 25 | This part should be kept in SOD because problems of RE are mentioned well and comprehensively. As described in FOD, Transmission losses caused by introducing huge amount of RE are considered to increase more than those of constituted only by large scale power plants system. This is because renewable power generators are located far from city areas. This information is described in (Quezada, 2006, page 533 and 537)<br><br><Reference><br>[1] V.H. Méndez Quezada, et al (2006). Assessment of Energy Distribution Losses for Increasing Penetration of Distributed Generation, IEEE TRANSACTIONS ON POWER SYSTEMS, VOL. 21, NO. 2, MAY 2006, | Accepted - no change required |
| 9369 | 7 | 30 | 23 | 30 | 25 | It raises an important fact. | Accepted - no change required |
| 16813 | 7 | 30 | 25 | | | Suggest adding this at end of line: ",which results in increasing relative cost for more remote resources." | Rejected. Not supported by the underlying technical literature. Furthermore, I don't understand what |
| 5136 | 7 | 30 | 26 | | 35 | As the losses due to transmission & distribution of electricity have been discussed in the section 7.5.2, this particular section dealing with fossil fuel ( oil & gas) transmission & distribution must discuss the associated energy loss and related energy efficiency issues. | Noted. The point the reviewer is making is not clear. |
| 9649 | 7 | 30 | 26 | 30 | 35 | this paragraph is out of place - doesn't fit with the rest of the section | I don't see a problem with the paragraph |
| 5154 | 7 | 30 | 3 | 30 | 6 | Sentence starting with "An increase--" - message could be made more easy to comprehend | Accepted and done |
| 2972 | 7 | 30 | 36 | | | A description of the infrastructure needs (pipelines) for CCS should be included. | Taken into account. This topic is |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18211 | 7 | 30 | 37 | | 44 | All of the components of integrated carbon dioxide capture and storage (CCS) systems exists and are in use today by the hydrocarbon exploration, production and transport; petrochemical refining; and power engineering sectors. A complete end-to-end CCS system would mitigate CO2 emissions by capturing CO2 from large (e.g., typically larger than 0.1 MtCO2/year) stationary point sources, compressing the captured CO2, transporting and injecting the compressed CO2 into a suitable deep (typically more than 800m below the surface) geologic structures, and then applying a suite of measurement, monitoring and verification technologies to ensure the safety, efficacy, and permanence of the captured CO2's isolation from the atmosphere (IPCC, 2005; HJ Herzog, 2011).Comment: As indicated in paragraph this technology is in the experimental stage. The text of this technology as a real and tangible to offer a product that does not exist from the establishment of a broad base theme. | Rejected. Not supported by a compelling body of scientific evidence/publications. The text as currently written in Chapter 7.5.5 is more accurate than this suggested revision. |
| 18212 | 7 | 30 | 37 | | 44 | Alternative paragraph:<br>All of the components of integrated carbon dioxide capture and storage (CCS) systems exists and are in use today by the hydrocarbon exploration, production and transport; petrochemical refining; and power engineering sectors. A complete end-to-end CCS system would mitigate CO2 emissions by capturing CO2 from large (e.g., typically larger than 0.1 MtCO2/year) stationary point sources, compressing the captured CO2, transporting and injecting the compressed CO2 into a suitable deep (typically more than 800m below the surface) geologic structures, and then applying a suite of measurement, monitoring and verification technologies to ensure the safety, efficacy, and permanence of the captured CO2's isolation from the atmosphere (IPCC, 2005; HJ Herzog, 2011). | Rejected. Not supported by a compelling body of scientific evidence/publications. The text as currently written in Chapter 7.5.5 is more accurate than this suggested revision. |
| 12626 | 7 | 30 | 39 | 30 | 39 | "would mitigate"  should be changed to present tense "mitigates" as it is happening today. | Editorial. That sentence was meant to define CCS. There was no greater point being articulated. The verb tense can be changed but I don't think this is necessary as the existing CCS projects are described in a subsequent paragraph |
| 12669 | 7 | 30 | 39 | 30 | 39 | "would mitigate"  should be changed to present tense "mitigates" as it is happening today. | Editorial. That sentence was meant to define CCS. There was no greater point being articulated. The verb tense can be changed but I don't think this is necessary as the existing CCS projects are described in a subsequent paragraph |
| 6426 | 7 | 30 | 40 | 30 | 43 | somewhere in here it should state the the CO2 is injected as a liquid or a supercritical fluid | Rejected (not supported by the broad body of peer reviewed literature). In the CCS technical literature and for most CCS applications one would use the term "super critical CO2." However, this section 7.5.5. needs to be written in a way that allows a broader and in particular non-CCS specialist reader to understand the text. The text currently reads "injecting the compressed CO2 into a suitable deep geologic formation." For CO2 storage into a deep unmiable |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10534 | 7 | 30 | | | | Missing something on super-conductors | Rejected outside the scope of this chapter not supported by peer reviewed research Super conductors are not a part of CCS systems. Perhaps this is a |
| 13491 | 7 | 30 | 1 | 30 | 2 | Text: "Approximately 25% of all losses in Europe are due to distribution transformers (and this will be similar in OECD countries) so use of improved transformer designs can make a significant impact." A programme of replacement of equipment in the electricity grids is a major undertaking, and cannot be expected without mandatory efficiency targets being set for utility companies. | Accepted - I have added a phrase. |
| 3452 | 7 | 30 | 1 | 30 | 22 | In Latinamerica there are countries with T&D losses greater than 30 or 40% (fro example: Domenican Republic). Some paragraph about this situation should be mentioned in the report, because this is one of the difficulties to implement GHG reductions through DSM programme | Rejected - as there is no clear pattern here - Chile even with its highly extensive transmission manages much |
| 3396 | 7 | 30 | | 32 | | There is an IPCC SR on CCS 2005 and additional input in a two page summary requires careful choice of new messages. As in previous sections, avoid mixing reference to individual authors to support well established ideas in the IPCC SR. For example, references in lines 9-13 of page 7 can be omitted. Lines 13-17 must be deleted as they refer to a single (out of many more) research lines with a high level of inmaturity and speculative character (chemical looping concepts for O2 and CO2 are regarded by most experts as priority R&D options for advnaced CO2 capture systems and have reached a relevant pilot scale-up, while ionic liquids have not yet passed the basic conceptual-laboratory scale-test, membranes are not even mentioned (and they should not)... ). Amuzing number of references to support simple ideas between lines 18-44 in page 31. If we got to this level of referencing detail in the rest of the Chapter we would escalete to hundreds of pages of references¡¡. Page 32 line 13 starts with a poor and obscure sentence: "...one of the most sophisitcated analyses done to date": is it good to be "sophisticated"?. The last paragraph of the section (page 32 line 15 to 28) is better discussed in section 7.12. | Accepted. The number of references in section 7.5.5 has been cut down. |
| 9650 | 7 | 30 | | | | No mention of biosequestration or mineral carbonation | Rejected. Beyond the scope of this chapter. Mineralization is discussed at length in the IPCC SR on CCS. This was a decision the CLA's made when the very first CCS section was written. The decision was to stick to core aspects of CCS and not try to provide a |
| 6436 | 7 | 30 | | | | Since AR4 the theoretical and practical aspects of CCS have been examined and the paucity of real-world data highlighted (Page et. al., 2009). It has been shown that most energy penalty values are the product of mathematical models and that limited energy penalty data from pilot-scale studies are higher than the modelled values. I suggest that the present status of energy penalty data on CCS applied to electricity generation is reviewed and reported in AR5. In addition the likelihood that CCS electricity plants will be used as baseload plants will limit the penetration of variable renewables (references given in the comments on the next section. Additonal reference on CCS: Page, S.C., Williamson, A.G. and Mason, I.G., 2009. Carbon capture and storage: Fundamental thermodynamics and current technology. Energy Policy 37 (9), 3314-3324. | Rejected. Outside the scope of this chapter given space constraints. I don't see any reason to add a citation to this paper by the commenter. This small section of Chapter 7 can not cover every possible point about CCS. And it is my judgment that this is not a particularly important point for the purposes of an |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2830 | 7 | 30 | 36 | 32 | 28 | This section seems out of touch and out of date. It talks about "dozens" of demonstrations worldwide without pointing to the recent cancellation of many of them. It would not be apparent to a reader of this section why a recent journal article was entitled "How a 'Low Carbon' innovation can fail – tales from a 'Lost Decade' for carbon capture, transport and sequestration" (Economics of Energy and Environmental Policy vol 1 issue 2). The authors may not agree with this assessment but they should recognise the challenges it describes. | Rejected-- not consistent with the underlying peer reviewed literature. As clearly stated in the paragraph in question, CCS will not deploy unless there is a significant climate policy in place. CCS has only one purpose to reduce CO2 emissions to the atmosphere. The lack of commercial CCS deployment is an issue caused by humanity's lack of progress in |
| 10959 | 7 | 30 | 36 | 32 | 28 | Confer: Torvanger, Grimstad, Lindeberg, Rive, Rypdal, Bieltvedt Skeie, Fuglestvedt, Tollefsen (2012), Quality of geological CO2 storage to avoid jeopardizing climate targets, Climatic Change, 114, 245-260. Confer also: Torvanger, Lund, Rive, Carbon capture and storage deployment rates: needs and feasibility, Mitigation and Adaptation Strategies for Global Change, DOI: http://dx.doi.org/10.1007/s11027-012-9357-7 | Noted. These two papers cover the same material that is discussed in other works already cited in Chapter 7.5.5. Given the limited amount of space available in Chapter 7.5.5 there isn't room to cite these papers as the points |
| 4214 | 7 | 30 | 36 | 32 | 28 | While CCS technologies are presented as being well established, the section does not address the substantial barriers to their timely and economical implementation. Standards and regulations must be developed, adopted and implemented with full participation and concurrence of all stakeholders, public and private. The needed national and international standards do not yet exist; their development, with strong public and private sector involvement, will require years of effort. This should be recognized in the report. Given the standards and regulations, individual projects still need to be approved by cognizant local, state and national regulators - a process that can take a decade unless the processes of the many regulators are coordinated and are supported by modern information technologies (Moving Forward: In-Depth Findings and Recommendations from the Consultative Council (2011), National Institute of Building Sciences, p11 (http://nibs.org/client/assets/files/nibs/2011_MovingForward.pdf)). | Taken into account. These points are addressed in Section 7. These points are made in the later sections of Chapter 7.9.2, 7.9.3., 7.9.4, 7.10. Many commenters seem to want one coherent discussion of CCS and nuclear power. The original submissions for both of these topics were more of an integrated assessment. But much of this text has been dispersed to different sections of the chapter. This leads reviewers to say that this point is missing. It is not missing. It is just not in the place where |
| 12328 | 7 | 30 | 36 | | | This section gives a better description of CCS than the description in Chapter 10. Please make sure the descriptions are more consistent between the two Chapters, and this section 7.5.3 should be the basis. | Noted. No action required for Chapter 7. |
| 17748 | 7 | 31 | 1 | | | replace "mind" by "mid" | Editorial. Text has been rewritten |
| 9266 | 7 | 31 | 1 | 31 | 1 | Start of second sentence does not make sense "As of Mind …" - perhaps it is meant to say "As of mid …" | Editorial. Typo has been corrected. |
| 8907 | 7 | 31 | 1 | | | Typo - "mind" should be "mid" | Editorial. Text has been rewritten |
| 13295 | 7 | 31 | 1 | 31 | 1 | The word 'mind' should presumably be 'mid' | Editorial. Typo has been corrected. |
| 4523 | 7 | 31 | 1 | 31 | 4 | The GCCSI reference give 8 large scale integrated projects in operation not 4. | Accepted. Text has been rewritten |
| 4811 | 7 | 31 | 1 | 31 | 1 | As of mid 2012, instead of mind 2012. | Editorial. Typo has been corrected. |
| 5156 | 7 | 31 | 1 | 31 | 1 | last sentence: --mind? | Editorial. Typo has been corrected. |
| 2784 | 7 | 31 | 1 | 31 | 5 | I think it is worth making the point that none of the four functioning CCS projects are in the power sector. Making CCS work in the power sector is still a major challenge. | Accepted. Text has been rewritten making this point obsolete. The text in Chapter 7 is clear that early CCS deployment will occur outside of the |
| 2273 | 7 | 31 | 13 | 31 | 17 | Given the breadth of potentially promising advanced capture technologies, the specific emphasis on amino acids and iocinic liquid based capture materials appears to be a bit arbitrary. | Accepted. Text has been rewritten making this point obsolete. |

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| 5733 | 7 | 31 | 13 | 31 | 17 | Currently, post-combustion capture from coal-fired power plants using solvent scrubbing must be technologically capable. However, NETL (Figueroa et al., 2008) and Davidson (2009) show the vision of innovative CO2 capture technologies from a perspective of time to commercialization and cost reduction benefit. Advanced technologies such as solid sorbents, membrane systems (Kai et al., 2008), ionic liquids, MOFs and enzymatic membranes, are expected to follow amine scrubbing systems.<br><br>J. D. Figueroa, T. Fout, S. Plasynski, H. McIlvried, R. D. Srivastava, “Advanced in CO2 capture technology – the U.S. Department of Energy’s Carbon Sequestration Program”, International Journal of Greenhouse Gas Control, 2(1), 9-20 (2008)<br><br>R. Davidson, “Post-combustion carbon capture – solid sorbents and membranes”, CCC/144, IEA Clean Coal Centre (2009)<br><br>T. Kai, T. Kouketsu, S. Duan, S. Kazama, K. Yamada, "Development of commercial-sized dendrimer composite membrane modules for CO2 removal from flue gas", Sep. Purif. Tech., 63 (2008) 524-530. | Accepted. Text has been rewritten making this point obsolete. |
| 8908 | 7 | 31 | 14 | | | The following statement "Wappel et al., (2010), and Vaidhyanathan (2010) are exploring advanced CO2 capture systems based upon novel approaches using amino acid and iocinc liquid-based capture materials which potentially represent the core of new CO2 capture systems that would require dramatically less energy (typically heat) to regenerate the capture solvent." is unnecessary and implies that ionic liquids and ammino-acid based CCS systems are significantly better than other advanced systems which are currently being researched (sorbent-enhanced shift, chemical looping, carbonate looping, ZECA, etc, etc). There are many others which should be mentioned if these two types of CCS are singled out for special treatment. There are also numerous issues with ionic liquids - high viscocity being probably the most challenging. The statement should be ommitted or simply left as "many advanced CCS technologies are being studied". Further details comparing the pros and cons of different advanced technologies are available in Mac Dowell, N., et al., An Overview of CO2 capture technologies. Energy and Environmental Science, 2010. 3 (11): p. 1645 - 1669. | Accepted / taken into account. The sections on CCS have been substantially rewritten to bring out the pros and the cons of the technology |
| 3001 | 7 | 31 | 14 | | | I could not understand the emphasis given to the research of Vaidhyanathan (2010) on iocinc liquid-based capture materials. The text states that this “potentially represents the core of new CO2 capture systems that would require dramatically less energy (typically heat) to regenerate the capture solvent.” Unfortunately, this is a very partial statement that, first, does not recognize the vast and diverse literature related to studies for reducing energy penalty; and, second, poses its expectation on a solely solution, which is very doubtful. I strong recommend to cite other studies that were published, showing that there is not yet a single and winner solution to reduce the energy penalty of post-combustion capture plants. Only to cite few examples, please see: Rochedo, P.R.R., Szklo, A.S., 2012. Work of Separation and Learning Curves for Carbon Capture based on Chemical Absorption. In: 7th Conference on Sustainable Development of Energy, Water and Environment Systems – SDEWES Conference, Ohrid-Macedônia. Raynal, L., Bouillon, P.A., Gomez, A., Broutin, P., From MEA to demixing solvents and future steps, a roadmap for lowering the cost of post-combustion carbon capture. Chem. Eng. J. Vol.171 No.3, pp 742-752, 2011. Zanganeh, K., Shafeen, A., 2007. A novel process integration, optimization and design approach for large-scale implementation of oxy-fired coal power plants with CO2 capture. International Journal Of Greenhouse Gas Control 1, 47–54. Rochelle, G., Chen, E., Freeman, S., et al, Aqueous piperazine as the new standard for CO2 capture technology.” Chem. Eng. J. Vol. 171 pp. 725-733, 2011. Svendsen, H. F., Hessen, E. T., Mejdell, T., Carbon dioxide capture by absorption, challenges and possibilities. Chem. Eng. J., Vol. 171, No. 3, pp 718-724, 2011. | Accepted. Text in section 7.5.5 has been substantially rewritten making this point obsolete. Hopefully the revised text is not nearly as narrowly focused as the FOD text on this point. |

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| 17365 | 7 | 31 | 15 | | | ionic liquid-based capture… | Accepted / taken into account. The sections on CCS have been substantially rewritten to bring out the pros and the |
| 4440 | 7 | 31 | 18 | 31 | 18 | Quantify the high capital costs, for example as a proportion of new powerplant capital expenditure or final cost of electricity. | Taken into Account. The text in 7.5.5 now clearly says "Estimates for CO2 capture costs are summarized in |
| 15481 | 7 | 31 | 18 | 31 | 20 | High capital costs as such do NOT drive CCS plants down the dispatch curve - you want to run a plant intensively if its variable costs are low, which is a different matter. The issue is more that you would only want to build something with high capital costs IF it had low variable costs and therefore could be run intensively. See eg Stoft, Power System economics, Wiley 2003, or Kirschen and Strbac, Fundamentals of Power System Economics, Wiley 2004, or Green, OXREP 2001 or 2005 or many other sources! | Accepted. New text is not in this section that hopefully clarifies this point. |
| 2831 | 7 | 31 | 18 | 31 | 20 | This sentence is odd given that, as the text recognises, there are no large scale commercial CCS power plants so it is not clear what it is supposed to be describing. In a future low carbon system dominated by renewables and nuclear, CCS plant might have to operate flexibly; the problem is how to construct the necessary incentives. Page 38 explains this better. | Rejected. No scientific evidence or peer reviewed publications offered in support of reviewer's comment. |
| 11855 | 7 | 31 | 18 | 31 | 23 | It is unclear what the term "single purpose" refers to here (and earlier). And why does CCS's 'single purpose' define its likely use only on baseload power systems? | Noted. The single purpose nature of CCS is an important issue as it |
| 6189 | 7 | 31 | 18 | 31 | 20 | "The high capital costs and single purpose use for CO2 capture equipment when mated to power plants drives these CCS-enabled power plants down the dispatch curve where they serve primarily to produce baseload power." This sentence seems flawed. The high capital costs may serve to discourage CCS-enabled plants from being built to serve new capacity, but once built those capital costs should not affect its merit order in dispatching. | Accepted. New text is not in this section that hopefully clarifies this point. |
| 11856 | 7 | 31 | 26 | | 27 | The following wording "are likely to arise in the aspects of the industrial sector that produce high purity 27 CO2 waste streams that are typically vented to the atmosphere" is confusing. What is meant by 'aspects' in this context? Also, is it possible to give a few examples of the industries that producee these high-purity CO2 waste streams? | Noted. The single purpose nature of CCS is an important issue as it contextualizes when and why CCS will be deployed. |
| 6697 | 7 | 31 | 28 | 31 | 33 | The cost of CCS project depends on conditions, for example its location, fuel used. Recent studies show that various problems with the large-scale realization of carbon CCS have been indicated; most important among them is its cost. "at about $100/tonCO2 the electricity sector is largely decarbonized with a significant fraction being from CCS deployment" isn't necessarily true.<br><br>See: Finkenrath, M. (2011) Cost and Performance of Carbon Dioxide Capture from Power Generation, International Energy Agency.<br>The same study was published as the following peer-reviewed article (but was only available for 24-hour access online): Finkenrath, M. (2012) Carbon Dioxide Capture from Power Generation – Status of Cost and Performance. Chem. Eng. Technol., 35: 482–488. | Rejected. Not supported by accessible peer reviewed literature. Since this is not accessible I don't see that it can or should be cited. Also it is not clear if the two reports being referenced here are reporting first of a kind costs or n-th of a kind costs. Suggest no changes to the text in Chapter 7 as currently written. This text has now been moved to section 7.11.3 |
| 9471 | 7 | 31 | 28 | 31 | 33 | As bioenergy is widely recognized as carbon-neutral, I wonder if installation of BECCS is examined in a factual manner. I also doubt that large-scale utilization of BECCS is well underway when the price is about $100/ton CO2.<br>If they are facts, status of examination of BECCS should be described more specifically. | Noted. I am not sure what the meaning of "facts" is here in the commenters note. The sentence that is being referenced is an accurate description of |
| 9263 | 7 | 31 | 28 | 31 | 28 | The figure of 100$/ton is old and depends on many factors. Figures around $60/t are now likely to be achieved with existing technology, though that's in optimal conditions. Maybe specify a range or state "up to $100/t"? Needs reviewing/update check. | Noted. Whether it is $60 or $100/tonCO2 doesn't really matter in terms of the point being made here which is that CCS sets a backstop price |

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| 2832 | 7 | 31 | 28 | 31 | 33 | This is another case where evidence from models should be qualified by reference to empirical evidence – see article referenced above. Even if models agree they do not necessarily provide much of a guide to the real world; it is symptomatic that a modelling result is described as an “important insight”. | Noted. No change required. |
| 16814 | 7 | 31 | 28 | | 33 | Suggest adding something to make clear the following: Economic modeling demonstrates the importance of CCS technology in terms of driving the costs of meeting stringent CO2 caps. If CCS is expensive, the CO2 price will be higher. If CCS is relatively inexpensive, the CO2 price will be lower. CCS, as a means to lower CO2 emissions, is much less costly than many other large scale mitigation options. | Noted. The text in question has now been moved to section 7.11.3 where it is presented in a broader context that hopefully brings forward the nuance the |
| 4812 | 7 | 31 | 28 | 31 | 28 | Add price to the line: at a PRICE of about $100/tonCO2 | Noted. |
| 9490 | 7 | 31 | 28 | | | Rewrite or delete reference to '$100/tCO2' in the context of CCS. This gives the wrong impression as CCS will in most cases be cheaper, and 70% cheaper than CO2 abatement without CCS (ref IEA Blue Map Scenario. | Reject. Not supported by the peer reviewed literature. I do not agree (to the extent I understand the review comment) and I do not believe this will improve the readability of the text. The |
| 9993 | 7 | 31 | 28 | 31 | 33 | This part should explain that there are many concerns about CCS. Even if carbon price maintain more than $100/tCO2, it is difficult to apply CCS in the real world because of technological, geographical, and public acceptance issues etc., as described in (Finkenrath, 2011, page39) and (Zobacka, 2012, Abstract). These literatures are listed in the No47 line of this table. | Taken into Account. The sections on CCS have been substantially rewritten to bring out the pros and the cons of the technology. NB. The discussion of CCS |
| 4441 | 7 | 31 | 30 | 31 | 33 | Net CO2 removal from the atmosphere when including land use changes and other externalities? | Noted. Yes, this is what the literature being summarized here is saying. |
| 16114 | 7 | 31 | 34 | 31 | 42 | The body of evidence does not go one way, as the message in this paragraph tends to say. What about earthquakes menacing the integrity of reservoirs? (e.g. Zoback M., Gorelick 2012 “Earthquake triggering and large-scale geologic storage of carbon dioxide” PNAS 109:5185–5189). This particular paper came after 2011, but so do several informations given in the same section (e.g. p.31 line 7, line 21, line 39...) | Taken into Account. The sections on CCS have been substantially rewritten to bring out the pros and the cons of the technology. NB. The discussion of CCS |
| 7732 | 7 | 31 | 39 | 31 | 42 | It is still premature to consider risk-reduction for CCS. | Rejected. Not supported by the peer reviewed literature. Furthermore, I don’t know what the basis is for saying it is premature to think about risk. It seems |
| 2274 | 7 | 31 | 42 | 31 | 42 | While a reference to a discussion of storage risks in chapter 7.9.3 is provided, they are nowhere mentioned in 7.9.3. | Taken into Account. The sections on CCS have been substantially rewritten. The risks of CCS and the means to mitigate them are now dealt with in |
| 16039 | 7 | 31 | 42 | | | In 7.9.3 is no discussion of storage riscs. | Accepted / taken into Account. The sections on CCS have been substantially rewritten. The risks of CCS and the means to mitigate them are now dealt |
| 16115 | 7 | 31 | 43 | 32 | 28 | The methodology for CCS is more balanced in its description of progress than previous paragraphs, but it does not describe the confidence level of the assessments quoted. This weakens the argument and looks like a plaidoyer in favour of CCS. In particular, the final sentence "the relative cost (...) could still be competitive with other large scale emissions mitigation measures" looks like a lobbying pamphlet and is ironic when no economic project has been started anywhere. | Rejected. No scientific evidence or peer reviewed publications offered in support of reviewer's comment. There is plenty of literature that comports with the idea of CCS being cost competitive with |

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| 2275 | 7 | 31 | 43 | 32 | 28 | These two sections on CO2 storage do seem to "downplay" a bit the existing differences in CO2 storage capacity evaluattion methodologies used across the world (some of which have quite significant differences in e.g. storage efficiency factor assessment or if the include open structures as well in their estimates) and the underlying uncertatinty of CO2 storage capacity estimates across most regions in the world (apart from a few highly developed countries), given the significant lack of site-specific geological data and injection experience for most regions. (see e.g. Lynton K Spencer, John Bradshaw, Barry E Bradshaw, Anna-Liisa Lahtinen, Alfredo Chirinos: Regional storage capacity estimates: Prospectivity not statistics Energy Procedia, Volume 4, 2011, Pages 4857-4864, or for a summary (in the grey literature) http://www.iea.org/media/workshops/2012/cert/Causebrook.pdf) | Rejected. Beyond the scope of Chapter 7. Yes there are differences in CO2 storage capacity methodologies. However, they are all based upon a fairly uniform set of bulk properties. Discussing these differences is too fine a level of detail for this Chapter. |
| 6427 | 7 | 31 | 46 | 31 | 46 | remove "just" | Editorial. Text has been rewritten |
| 16112 | 7 | 31 | 5 | 31 | 6 | The expression "critical advances" is clearly too optimistic when so much cost cutting is in order to match the present needs of carbon markets | Rejected -- not supported by the broad body of peer reviewed literature. A vast body of knowledge has been produced by these field experiments. There is no need to denigrate the importance of the |
| 5137 | 7 | 31 | 7 | | 8 | Considering the recent decision by the TransAlta ( a Canadian public electricity company) to withdraw from the heavily government subsidized CCS implementation in one of their coal-fired plants, there is some merit to add some discussion to the statement " CCS has not been applied to a large....". | Rejected. Not supported by peer reviewed literature. Not sure what the commenter wants to see done with the text. The cancelation of this particular project is yet more data to support the statement made at the start of this short CCS section that CCS is a single purpose climate mitigation technology |
| 4439 | 7 | 31 | 7 | 31 | 8 | A sentence could be inserted to describe the barriers to large-scale deployment of CCS solutions. This is relevant both as you have stated that each part of the CCS system exists already in practice and the potential that for CCS to mitigate global warming as discussed on p32, lines 13-28. | Taken into Account. These points are addressed in other parts of Chapter 7. These points are made in the later sections of Chapter 7.9.2, 7.9.3., 7.9.4, 7.10. There is material in Chapter 7 that |
| 10535 | 7 | 31 | 7 | 31 | 8 | How does a 2011 reference quite 2012 information? Also needs a comment on loss of power output due to power demand of CCS system. Also in section 7.5.3 needs a comment on legal liabilities and progress being made in that regard. | Accepted. Section 7.5.5 now explicitly discusses liability and what field research is telling us that informs |
| 3453 | 7 | 31 | 1 | 31 | 8 | Are there any cost to present regarding CCS? | Taken into Account. The text in 7.5.5 now clearly says "Estimates for CO2 capture costs are summarized in |
| 13492 | 7 | 31 | 28 | 31 | 29 | Text: "Integrated assessment models (see Chapter 6) tend to agree that at about $100/tonCO2 the electricity sector is largely decarbonized with a significant fraction being from CCS deployment" The problem with pricing carbon dioxide emissions is that, since the global economy is highly dependent on carbon dioxide emissions, a level of pricing at $100/tonCO2 would create significant risk of inflation, which would be followed by economic re-equilibriation, after which the carbon price would have no further impact. Plus, in a general atmosphere of volatility in energy prices, it is unlikely that a carbon emissions price of any amount would create enough of a signal to trigger decarbonisation - neither in energy efficiency, energy conservation, energy plant replacement, or in new energy sector investment. In fact, a strong carbon emissions price could deter energy users from investing in new energy resources, as they would be under financial duress from the carbon emissions pricing. There are too many forces and factors that would conspire to keep the price of carbon dioxide emissions "cost-efficient" and marginal, so it is hard to imagine a high price for carbon dioxide under any regime proposed to date. | Noted. The text as currently written accurately reflects the peer reviewed literature. It is clear that this reviewer does not agree with whether this is "likely" but that doesn't make what is written here wrong or doesn't require any changes. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10049 | 7 | 31 | 28 | 31 | 30 | Integrated assessment models do not reflect the technical possibility of large scale CCS and do not take into account the real costs of CCS equipment in the current development stage, nor the significant efficiency losses of power plants using CCS technology. It is important to note, that these intergrated simply assume that technology might work and that this technology might be available. In all energy modells, CCS grows on the expense of (lower cost) renewable energy. The current paragraph is misleading and must be significantly rewritten to reflect the assumptions used in those modells oin order to come to the quoted results. | Rejected. No scientific evidence or body of peer reviewed literature is offered in support of the comment. Chapter 6 deals with the capabilities and limits of integrated assessment models. There is no space to repeat that discussion in Chapter 7 and there certainly is no room to cover that same ground as it relates to one sentence about CCS deployment |
| 11932 | 7 | 32 | 1 | | | CO2 storage "potential" (or capacity)? | Note -- storage capacity is meant which becomes clear from the context and the beginning of the paragraph which |
| 15488 | 7 | 32 | 17 | 32 | 24 | Quote at least fossil energies subsidies schemes which are part of difficulties RES face to reflect the real price | Rejected - comment seems to be misplaced - please clarify to which part |
| 15489 | 7 | 32 | 17 | 32 | 24 | Introduce in a short sentence positive externalities and the concept of energy service | Rejected - comment seems to be misplaced - please clarify to which part |
| 9488 | 7 | 32 | 2 | | | reference to storage capacity in utsira fm - should refer to NPD(2012). Reference toSTRACHAN ET AL not relevant .- refer to http://www.npd.no/en/publications/reports/co2-storage-atlas-/ | Accepted. Reference changed. |
| 6698 | 7 | 32 | 26 | 32 | 28 | The cost of CCS depends on the distance from emission source to storage site, geological and geographical conditions. It should be noticed that the places where CCS plants can be economically installed are limited. Recent studies show that adding carbon capture and storage to a reference-case supercritical pulverized coal (PC) unit would raise the cost of electricity from 5.3¢/kWh to 8.8¢/kWh, and that the cost of CO2 avoided would be $49.7 per tonne. Thus CCS is not estimated to be cost competitive at this time.<br><br>See: Rubin, E.S., C. Chen & A.B. Rao (2007) Cost and performance of fossil fuel power plants with CO2 capture and storage. Energy Policy 35, 4444–4454. | Taken into account. These points are covered extensively in the Chapter. |
| 9994 | 7 | 32 | 26 | 32 | 28 | This part should explain that there are only limited places where CCS is economical. Cost for CCS is related to geological and geographical conditions of the site such as the distance between CO2 emission source and storage site, as described in (Finkenrath, 2011, page39). This literature is listed in the No47 line of this table. | Taken into account. These points are covered 7.8.2.1 |
| 18054 | 7 | 32 | 30 | 35 | 30 | It could be worth adding that this "small fraction" already covers 20% of the world's electricity needs. | Accepted - we have noted the contribution of RE to electricity to provide context also to the growth we |
| 4813 | 7 | 32 | 30 | 32 | 30 | Provide figures for potential RE and the fraction currently used, if available | Accepted - We have links to the earlier section where technical potentials are addressed. Due to space limitations we have not quantitatively compared the technical potential to actual use, but |
| 2585 | 7 | 32 | 43 | 33 | 2 | Hydropower: Technological progress increased the energy conversion to 90%; so nowadays, it is economically viable to install and exploit microhydropower. | Rejected - this improvement has not really been dramatic since the AR4, and here we are only providing a couple examples. We do not have space to |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10536 | 7 | 32 | 43 | 32 | 47 | Not clear why only these 3 examples are "notable". Could add geothermal (eg EGS or binary) and hydro (eg low head) to give better balance. | Accepted - we do not use the word "notable" alone, but instead make it clear that these are merely examples. We did not, however, add a lot of additional examples (other than CSP) as we are severely space constrained, and the examples could easily see no end. We have chosen a range of examples that, |
| 12599 | 7 | 32 | 44 | | | I think the major reason for the reduction in the price of PV has been the subsidization of Chinese PV factories by the Chinese government | Rejected - there is no peer reviewed literature that we are aware of, or even grey literature, that suggests this to be the case. The production cost of solar modules is now below $1/W, whereas modules sold for $4/W only 5 years ago. While there may well be some effect from subsidies from China, as suggested in the US trade case, that represents |
| 12598 | 7 | 32 | 46 | | | The reason we look to creating larger offshore wind turbines is that this means there is less infrastructure, as less turbines for the same energy output | Accepted - we have noted improvements in the cost structure of wind as a result, though we do not have |
| 18056 | 7 | 32 | 46 | 32 | 46 | write: "continued increase in the size, efficiency and therefore energy capture (...)" | Rejected - efficiency is not a well defined term in the wind industry, in our view. In fact, the trend towards larger rotors (with similar generator size) leads to greater energy capture, but efficiency is arguably reduced in that a smaller fraction of the available wind to the rotor |
| 18055 | 7 | 32 | 46 | 32 | 47 | Add: "increasing their yield and, thereby, economic viability." as the cost effect is made explicit for the other technologies in the paragraph - not for wind energy. | Accepted - we have noted the cost effect, though not in exactly the way |
| 12108 | 7 | 32 | 19 | 33 | 20 | In the discussion of technical potential for renewable energy - whilst it is important, as you have done, to be sober in this assessment, the fact that there is a large body of literature showing the technical potential for a transition to 80-100% renewable energy for electricity generation for many countries, now is surely important to note.....For an overview of this literature please see - Elliston B, Diesendorf M, MacGill I, 2012, 'Simulations of Scenarios with 100% Renewable Electricity in the Australian National Electricity Market'. Energy Policy 45:606-613. http://www.ies.unsw.edu.au/docs/diesendorf-simulations.pdf | Rejected - the issue is interesting but space constraints do not allow for an extended discussion. Please provide peer-reviewed literature to support your arguments. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12109 | 7 | 32 | 19 | 33 | 20 | In the discussion of the technical potential of renewable energy - there is no discussion of the fact that a significant barrier to achieving 80-100 percent is the myth that "renewable energy cannot provide baseload power." It is obvious that four types of renewable sources – hydro, biomass, hot rock geothermal and solar thermal - can provide baseload power. Graham Sinden at Oxford University has also found that wind, wave, solar and tidal power can also provide base load electricity when used in combination on a large scale separated by several hundred kilometres and subject to different wind, wave, solar or tidal regimes. The total output of such systems generally varies smoothly. Based on historical date, he found that it would be impossible for such an integrated system to be in a situation of no wind, waves, sun or tidal change at any site. He has also demonstated that most of the UK's electricity could be generated from renewable. [REF - ◦Sinden. G. (2006) Diversified renewable energy resources. Carbon Trust. http://www.eci.ox.ac.uk/people/sindengraham.php] Other research groups have come to similar conclusions for other countries. - Sigurd Weinreich's team at The Centre for European Economic Research, has developed a model that shows it is technologically and economically affordable for the EU to make a transition over the coming decades to meeting 100 percent of their electricity needs from renewable and distributed energy sources. [Weinreich, S. et al (1998) 'Long-Term Integration of Renewable Energy Sources into the European Energy System', Environmental and Resource Economics, LTIResearch Group, Physica Verlag, Heidelberg. Available at http://www.amazon.com/Long-Term-Integration-Renewable-Environmental-Economics/dp/3790811041. ]<br>- Further literature overviewed in Iliston B, Diesendorf M, MacGill I, 2012, 'Simulations of Scenarios with 100% Renewable Electricity in the Australian National Electricity Market'. Energy Policy 45:606-613. http://www.ies.unsw.edu.au/docs/diesendorf-simulations.pdf | Rejected - the myth might be part of the political debate. The AR5 is a scientific assessment report, which summarizes the peer-reviewed literature. It does not have the obligation to observe the political debate and to correct potential misunderstandings. A balanced discussion of the challenges associated with providing high shares of RE is given in chapter 7.4.2 and 7.6..1. |
| 12107 | 7 | 32 | 29 | 33 | 20 | Shouldn't co-generation and tri-generation - combined heat and power be mentioned either in the renewable energy section or at least somewhere else appropriate in this chapter? I could find no mention of co-generation or tri-generation in the "Energy Systems" chapter 7. | Accepted - it is mentioned in 7.5.1 already; comment best addressed to that section |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4109 | 7 | 32 | 29 | 34 | 14 | Section 7.4.3 was weak, but Section 7.5.4 Renewable Energy is even weaker. Issues such as power densities, real potential, and the plethora of exaggerated claims about performance to date and propsects are not dealt with. Is this all that can be said about CSP (page 33, line 10), or biofuels (page 34, lines 10-11) - already a disaster zone in the US transportation sector. Grand statements about the increased energy capture of wind turbines overlooks the patter of placing Vestas V90 machines where mean wind speeds are low, to increase energy capture and apparent capacity factor achievement while having too small a tubine etc to operate optimally in terms of total capex (the so-called Pickenham effect). Etc, etc. A complete rewrite is recommended. | Rejected - This section derives much of its material from the core material in the IPCC SRREN report, which we feel is appropriate. Technical potential is addressed in an earlier section. "Real" potential is not a well defined term, but is addressed to some degree in the scenarios section 7.11, which addresses deployment in various carbon mitigation scenarios. Economics is addressed in a later section of the chapter as well. These various issues were not intended to be covered in this specific subsection, and comments on those topics should therefore be directed to other sections by and large. We do not have the space to allow discussion of individual technologies in much depth. CSP, however, is addressed to some extent in the "infrastructure/integration" sections, as its primary advantage is that of thermal storage, issues addressed in the later section. Biofuels issues, including the many concerns, are similarly addressed elsewhere in the chapter, and in other chapters of AR5. The statement about increased energy capture of wind is technically accurate and, in our view |
| 11933 | 7 | 32 | 29 | | | Section could be reduced somewhat and simply refer to the recent IPCC report on RE, with one-line conclusions and references given here. | Noted -text reduced somewhat in places, but also augmented in others, with extensive referencing to the SRREN. |
| 10960 | 7 | 32 | 29 | 34 | 14 | Confer: Torvanger, Lund, Rive, Carbon capture and storage deployment rates: needs and feasibility, Mitigation and Adaptation Strategies for Global Change, DOI: http://dx.doi.org/10.1007/s11027-012-9357-7 | Taken into account. See comment above (4109) that suggested the inclusion of this paper in another part of |
| 15487 | 7 | 32 | 31 | 32 | 32 | Rewrite the sentence in brackets in a positive formulation “most, but not all, forms of RE supply have low life-cycle GHG emissions in comparison to fossil fuels » to avoid any misunderstand (even if the affirmation is true but comparing RE footprint in general as fossil fuels in general make no sense) | Rejected - We are not certain what the comment wants us to do with the sentence. Without further clarification on |
| 7124 | 7 | 32 | 34 | 34 | 13 | These paragraphs may deleted. The content in these paragraphs does not seem to focus on the section 7.5 title "Mitigation technology options, practices and behavioural aspects". However, some of the text could be moved to section 7.4.3 to serve as background material on Renewable Energy resources. | Rejected - the text here relates to conversion technologies, not resources. |
| 3260 | 7 | 32 | | 33 | | 1. This chapter needs more structure, by trying maybe a table or iconic figure that recapitulate all sources of energy described (nuclear, fossil, gas, hydrological, bioenergy, hydropower, windpower, solar energy, geothermal, etc) and map for each the acceptability and behaviroural implications.<br>2. Another suggestion on the change in the energy sector is the modification of land use for some of these sectors ( hydropower means big dams and a big change in water cycle, water flow, freshwater ecosystems, and other human impacts that can results in GHG emission). | Rejected - The acceptability issues are addressed elsewhere in the chapter, not in this subsection. Same is true on land use - those issues are addressed later in the chapter. Comment is really an overarching one that applies to the full |
| 13201 | 7 | 33 | 10 | 33 | 10 | The first time CSP is used, explicit the meaning Concentrated Solar Power | Accepted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12600 | 7 | 33 | 13 | | | Tidal devices have not really settled on one general commercial design, but they generally are horizontal axis turbines, for example Evopod, Open Hydro, Tidel and Marine Current Turbines. The only other main contender for this approach is the hydrofoil based devices such as Pulse Tidel. Wave is much more under development, generally devices are point absorbers, hydraulic or overtopping, | Accepted - we cannot provide these details, but we have added "certain types of tidal barrages" to make it clear that not all today devices are technically |
| 12601 | 7 | 33 | 14 | | | Typical three bladed horizontal axis turbine is mature, but there is still much work on a range of vertical axis turbines. Mostly these are for the urban environment where turbulant winds are supposed to, anecodtally, mean the vertical axis systems work better than horizontal. However, there is also the Aerogenerator X, a vertical offshore system hoped to scale up to 10MW – see http://www.windpower.ltd.uk/ | Accepted - we have added "traditional" to note that traditional land based technology is mature. We do not have the space to discuss more radical design |
| 18057 | 7 | 33 | 15 | 33 | 15 | Delete "relatively". | Accepted |
| 17367 | 7 | 33 | 15 | 33 | 16 | is increasing but is commercially mature… | Rejected - we believe that offshore wind is less technically and commercially mature. That said, the word commercial maturity is poorly defined. We eliminated it and instead noted that offshore wind is less technically mature |
| 18209 | 7 | 33 | 17 | | 24 | Delete: Because the cost of many RE technologies has historically been higher than market energy prices (e.g. Fischedick et al., 2011; Section 7.8), public R&D programs have been important and government policies have played a major role in defining the amount and location of RE deployment (Mitchell et al., 2011; IEA, 2011e; REN21, 2012). Additionally, because RE relies on natural energy flows, RE technologies must often be located at or near the energy resource, often collect energy from diffuse energy flows, and may produce energy output that is variable and—to some degree—unpredictable (IPCC, 2011b). The implications of these characteristics for infrastructure development and network integration are addressed in Section 7.6. Comments: Should be complemented by that R & D by the public sector institutions and associated patents most industrialized countries, could play an important role with respect to the effective transfer of technology to developing countries, it being understood that technology transfer is presumed easier when it comes to patents public sector private sector. | Rejected - We are not sure what is being requested, but we believe that the existing text is important to maintain. Issues of technology transfer are very important, but are not in the domain of this subsection - they are addressed elsewhere in the AR5 chapters. |
| 18210 | 7 | 33 | 17 | | 24 | Alternative paragraph:<br>Because the cost of many RE technologies has historically been higher than market energy prices (e.g. Fischedick et al., 2011; Section 7.8). Additionally, because RE relies on natural energy flows, RE technologies must often be located at or near the energy resource, often collect energy from diffuse energy flows, and may produce energy output that is variable and to some degree unpredictable (IPCC, 2011b). The implications of these characteristics for infrastructure development and network integration are addressed in Section 7.6. | Rejected - It seems that the commenter wishes to eliminate the text on the importance of R&D in driving costs lower, and the impact of policy in driving development. We think that these points are very important to maintain here to provide the proper context for why RE |
| 18213 | 7 | 33 | 17 | | 24 | Comment:<br>Variable retail prices can be used to make demand responsive to the availability of supply (Borenstein, 2005; Centolella, 2010). Comment: While this is true, people must be educated as to formally rational and efficient use of energy (UREE), in terms of development and sustainable consumption.<br>Alternative paragraph:<br>Variable retail prices can be used to make demand responsive to the availability of supply (Borenstein, 2005; Centolella, 2010). | Rejected - this comment is best addressed in the infrastructure/integration sections where these issues, including demand response, are addressed |
| 2587 | 7 | 33 | 17 | 33 | 24 | Bioenergy and hydropower can be stocked (thermal solar as well) and together with the integration of solar and wind energy, we can secure the supply. | Accepted - these issues are addressed in a later section of the chapter in more detail, but we made it more clear that the statements made here apply only to |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4649 | 7 | 33 | 17 | 33 | 17 | “Because the cost of many RE technologies has historically been higher than market energy prices ---“. This does not apply to existing biomass energy use including ethanol from sugar cane. Fuelwood and charcoal are very competitive with the fossil fuel alternatives. It is usually fossil fuels (and electricity) that are subsidized. | Accepted - this is why we use the term "many" but we have also added "not all". We have not added examples here, however, as that is better addressed in |
| 16041 | 7 | 33 | 17 | | | Because the investment costs of many … (because the operating costs of RE normaly much lower than from other energy systems due not need to by energy feedstock) | Rejected - the point here is simply that the total cost of many RE techs has been higher than market energy prices, |
| 12842 | 7 | 33 | 17 | 33 | 24 | Please include in the discussion whether or not taxes are included when comparing prices of RE and conventional energy. Comparison should be done on a equal base. | Rejected - this statement is based on the IPCC SRREN (and supported by section 7.8), and the reader is directed to that source document for the considerable documentation and caveats |
| 18059 | 7 | 33 | 22 | 33 | 23 | Delete "to some degree unpredictable". Wind is variable but highly predictable within the timeframes relevant for efficient system operation. It is unpredictable beyond 1-2 weeks which is irrelevant for systems operation and so are other technologies due to, e.g. unscheduled shut-downs | Rejected - we discuss wind forecasting in a later section of the report. However, we are not aware of peer reviewed literature that suggests that wind forecasting is, in broad terms, better than fossil plant output forecasts. In fact, the many integration studies that have been conducted demonstrate that the level of unpredictability, on a day ahead and hour ahead basis, and even after forecasting, does have implications for unit commitment and dispatch and reserves. These are details are better left for a later section. That said, we have made some small revisions to the text |
| 16116 | 7 | 33 | 23 | | | The word "unpredictable" should not be used here. In developed areas with experience with windpower, the production of energy is variable but known in advance with very hig levels of confidence (less than 10% deviation in 24 hours). This is better than many thermal plants. | Rejected - we discuss wind forecasting in a later section of the report. However, we are not aware of peer reviewed literature that suggests that wind forecasting is, in broad terms, better than fossil plant output forecasts. That said, we have made some small revisions to the text here to note the RE sources can be forecasted, so as not to |
| 11765 | 7 | 33 | 25 | 33 | 33 | In response to the result of No.50, these sentense should be amended appropriate. | Rejected - sorry, but we do not know what No 50 refers to here. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13296 | 7 | 33 | 25 | 33 | 33 | As per earlier comment - presumably RE was nearly half of new nameplate (i.e. peak) GW installed; however on average RE technologies will tend to operate at a much lower load factor (e.g. <20% for PV, around 30% for onshore wind) than fossil capacity operating at baseload, so TWh generation from RE installed in 2011 likely to be still consderably lower than that from new fossil plant - RE share might be 20-25%. Given that this is arguably a more accurate reflection of the share of new capacity, it would be worth adding this (probably in addition to the GW share, not instead) | Accepted - we cannot in fact show the incremental contribution to energy supply for the most recent year, as global energy supply statistics are always lagging by ~2 years. So the most recent-year statistics on energy supply contribution growth are not available on a global basis. We certainly agree that those statistics would be valuable (and more useful than capacity growth), however, so we now note the situation in a footnote so that the reader at least understands the limits to capacity |
| 18060 | 7 | 33 | 25 | 33 | 27 | If we insist referring to renewables as "relatively small", the bracket should say "(excluding traditional biomass and large hydro). The correct would be to write that - due to them comming into the market at a later stage, their share of total current energy supply is small, but their share of the market for new supply is significant globally and dominant regionally. | Accepted - we have presented data here so as not to only use words like "relatively small" that are hard to interpret. |
| 16816 | 7 | 33 | 25 | | 33 | Nameplace capacity of new plant is less meaningful than providing the amount of energy produced (GWhs) as percent of total -- it is important for people to see the progress is being made but that this is still at a relatively small scale. | Accepted - we cannot in fact show the incremental contribution to energy supply for the most recent year, as global energy supply statistics are always lagging by ~2 years. So the most recent-year statistics on energy supply contribution growth are not available on a global basis. We certainly agree that those statistics would be valuable (and more useful than capacity growth), however, so we now note the situation in a footnote so that the reader at least understands the limits to capacity |
| 10538 | 7 | 33 | 25 | 33 | 33 | This para better merged into section 7.2 | Taken into account - for the moment it will stay in this location, but it may be |
| 5927 | 7 | 33 | 25 | | 33 | Presenting only capacities gives a biased picture of the development: annual full-load hours of solar pv are often about 1000 h, wind 2000-2500 h, whereas fof conventional generation at about 5000-6000 h in baseload operation and up to 8000 h for nuclear. | Accepted - we cannot in fact show the incremental contribution to energy supply for the most recent year, as global energy supply statistics are always lagging by ~2 years. So the most recent-year statistics on energy supply contribution growth are not available on a global basis. We certainly agree that those statistics would be valuable (and more useful than capacity growth), however, so we now note the situation in a footnote so that the reader at least understands the limits to capacity |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9472 | 7 | 33 | 27 | 33 | 33 | It is written that “RE accounted for almost half of the 208 GW of new electricity generating capacity added globally in 2011”, but mentioning only generation capacity can lead to overevaluation of renewable energy, as many types of renewable energy have low generating efficiency. Taking into account the generating efficiency, electricity generated from renewable energy should be added. | Accepted - we cannot in fact show the incremental contribution to energy supply for the most recent year, as global energy supply statistics are always lagging by ~2 years. So the most recent-year statistics on energy supply contribution growth are not available on a global basis. We certainly agree that those statistics would be valuable (and more useful than capacity growth), however, so we now note the situation in a footnote so that the reader at least understands the limits to capacity |
| 4442 | 7 | 33 | 3 | 33 | 16 | How is maturity being defined in this paragraph? | Accepted - the definition is as noted already "level of technical and economic maturity to be deployed at significant scale". In other places we focus on technical maturity alone. While there is no single definition of maturity that is unambiguous, we have sought to be |
| 13212 | 7 | 33 | 3 | 33 | 4 | This sentence might be misunderstood : actually the solar cells improvements are not sufficient for puting PV at a "level of technical and economic maturity". I suggest deleting at least the first words "As a result of these and other advancements" | Accepted - excellent point |
| 10537 | 7 | 33 | 5 | | | IPCC 2011a better here than IPCC 2011 b | Accepted |
| 9651 | 7 | 33 | 6 | 33 | 9 | what about waste to energy? The relationship between bioenergy and food security needs to be mentioned somewhere. | Rejected - bioenergy encompasses waste to energy as per the IPCC SRREN. Food-bio links are addressed in chapter 11, and are not best addressed |
| 2586 | 7 | 33 | 6 | 33 | 8 | Bioenergy: R&D is proving the economic use of some drought resistant plant such as Jatropha for biofuel production. Since this specie can be grown in arid zone, it can be used as green barrier against desertification; a n impact of climate changes | Rejected - noted, but too much detail to be included here given severe space constraints |
| 17366 | 7 | 33 | 7 | | | biomass-fuelled power plants and… | Accepted |
| 4648 | 7 | 33 | 8 | 33 | 8 | See my comments above concerning lignocellulose-based transport fuel. | Noted |
| 15946 | 7 | 33 | 9 | 33 | 16 | solar pv is 'mature', and onshore wind is 'relatively mature'? Look at the numbers and the deployment and the LCOE. Wind is at least as 'mature' as pv. | Accepted |
| 16040 | 7 | 33 | 9 | | | (e.g. fuels, hydrogen or methan produced from … | Rejected - it seems to us that fuels is a sufficiently broad term to encompass the suggested additions, and we are under |
| 18058 | 7 | 33 | 17 | 33 | 24 | Delete the section. The first sentence about cost having historically been above market prices 1) holds for all technologies - not only RE and 2) confuses cost and prices. For over a decade, this has held true for all new technologies and still does, as most countries in the world are still operating with regulated prices for energy poverty reasons. The second sentence is dubious in stating that RE technologies must be located where the resource is (impliying far away from consumption), but failing to acknowledge that there are RE resources in some form in almost every location of the world. | Rejected - these points are quite directly made in the SRREN, and we believe they provide important links to other sections of the chapter in which related issues are addressed. While some wording changes have been made to this text based on this comment, and of course others as well, we believe the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3454 | 7 | 34 | | 34 | | Figures presented in the table are for developing countries, developed countries or world average? | Accepted - Table caption was revised to include the word "global" |
| 11764 | 7 | 34 | | | | Many RE are extremely low operating rate and uncontrolable so groth in RE Deployment in table 7.4 should be evaluated by not only GW but GWh. | Accepted - we cannot in fact show the incremental contribution to energy supply for the most recent year, as global energy supply statistics are always lagging by ~2 years. So the most recent-year statistics on energy supply contribution growth are not available on a global basis. We certainly agree that those statistics would be valuable (and more useful than capacity growth), however, so we now note the situation in a footnote so that the reader at least understands the limits to capacity |
| 10656 | 7 | 34 | | | | Also Provide GWh information because in case of renewable energy the capacity factor is very low. GWh is more important. | Accepted - we cannot in fact show the incremental contribution to energy supply for the most recent year, as global energy supply statistics are always lagging by ~2 years. So the most recent-year statistics on energy supply contribution growth are not available on a global basis. We certainly agree that those statistics would be valuable (and more useful than capacity growth), however, so we now note the situation in a footnote so that the reader at least understands the limits to capacity |
| 4650 | 7 | 34 | | 34 | | To put the RE growth in context, it would be good to include biomass heat energy which have an estimated 2% growth (P. 18, line 15). The respective numbers for 2009, 2010 and 2011, in million t of wood equivalent (energy value 18.7 GJ/t), are: 935; 954; 973. [50EJ, 51EJ, 52 EJ]. | Rejected - somewhat related data provided earlier, so there is no need to repeat them due to space constraints. |
| 7786 | 7 | 34 | | 34 | | Section 7.5.5 mainly explains risks and uncertainty about the use of nuclear power such as resource sustainability, disposal of high level waste while it touches upon little about the current role of nuclear power in relation to the mitigation. As this section 7.5 is about analyzing mitigation technology options, practices and behavioural aspects, author should also analyze the nuclear power as an existing example of low carbon power resource in commercial use whose share is 7.4% (IAEA,"Energy, Electricity and Nuclear Power Estimates for the Period up to 2050", p.17, 2011) of global power generation. | Taken into account - 7.11 addresses nuclear response to climate mitigation efforts. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5928 | 7 | 34 | | | | Presenting only capacities gives a biased picture of the development: annual full-load hours of solar pv are often about 1000 h, wind 2000-2500 h, whereas fof conventional generation at about 5000-6000 h in baseload operation and up to 8000 h for nuclear. | Accepted - we cannot in fact show the incremental contribution to energy supply for the most recent year, as global energy supply statistics are always lagging by ~2 years. So the most recent-year statistics on energy supply contribution growth are not available on a global basis. We certainly agree that those statistics would be valuable (and more useful than capacity growth), however, so we now note the situation in a footnote so that the reader at least understands the limits to capacity |
| 3787 | 7 | 34 | 13 | 34 | 16 | Improve Figure 7.11 layout | Comment does not refer to 7.5.5 |
| 18061 | 7 | 34 | 16 | 34 | 16 | Stating that nuclear contributes "significantly in "many" nations is an exageration. 31 of 204 countries (15%) in the world has nuclear energy. However, it is only in a handful of those 31 nations that it contributes "significantly", depending on how "significantly" is defined. | Accepted - "significantly" removed |
| 15490 | 7 | 34 | 16 | 34 | 16 | Delete “many” (with regards to the real number of countries and the total share expect for some countries like France) | Accepted - text revised, "many" removed |
| 10539 | 7 | 34 | 16 | 34 | 22 | Repetition from 7.2 - so also merge | Taken into account - Repetitive nuclear text in Section 7.2 removed |
| 17388 | 7 | 34 | 17 | 37 | 18 | From line 17~18, “…There are 433 commercial nuclear power reactors operating in 30 countries with a total installed capacity of 367 GWe as of October 2011 (IAEA, 2011)”. I strongly suggest that the statistical numbers should be updated to the end of year 2011, which could and should be available at this time of report editing, I think the current data were given earlier for this FOD version due to unavailability of year-end statistics. In addition, this part should better capture the latest state of nuclear developments in the world, particularly the post-Fukushima policy shifts in some major nuclear power countries. According to the news of “Japan unveils plan to phase out nuclear power” by the BBC on Sept 14, 2012 (http://www.bbc.co.uk/news/world-asia-19595773), the Japanese government plans to shut down the reactors completely by 2040 and seeks to shift to renewable options or fossil imports(gas, oil and even coal). Such new policy changes would cause a significant impact on future nuclear deployment. | Accepted - Data updated with IAEA 2012. Nuclear policy in Japan is uncertain. |
| 18062 | 7 | 34 | 18 | 34 | 18 | replace "14%" with "13%" (according to the table) | Accepted - replaced with IEA 2010 data. |
| 18063 | 7 | 34 | 21 | 34 | 21 | delete "more than half". It seems odd to write more than half when it is more than two thirds | Accepted - text revised |
| 17368 | 7 | 34 | 21 | | | two-thirds (68%)… | This applies to Section 7.5.5<br>Editorial - text revised |
| 16042 | 7 | 34 | 21 | 34 | 22 | they represent 68% of the current …. | Accepted - text revised |
| 12544 | 7 | 34 | 7 | | | “Other more revolutionary small modular reactors (SMR) with additional passive safety features are near commercial status” -- this is simply untrue, if “near” means deployable in less than a decade at an affordable cost. The NRC does not anticipate online operation of any SMR design types prior to 2022. U.S. Nuclear Regulatory Commission, 2012. Report to Congress: Advanced Reactor Licensing. http://pbadupws.nrc.gov/docs/ML1215/ML12153A014.pdf | This applies to Section 7.5.5. Taken into account - text revised |
| 3786 | 7 | 34 | 8 | 34 | 14 | What about sugar cane or sweet sorghum that produces simultaneously liquid fuel for transport and electricity for the grid? | Comment does not refer to 7.5.5 |
| 9229 | 7 | 34 | 14 | 34 | 15 | To Incorporate three rows: Fossil electric power capacity above RE electric power capacity; gasoline demand or production below the row "ethanol production" and Diesel below the row of biodiesel production, to compare the share and dinamic | Rejected - space constraints preclude us from expanding the table, and data availability may be an issue. The contribution of RE electricity in % terms |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4780 | 7 | 34 | 4 | 34 | 5 | It is important to note that storage hydropower and geothermal (as well as biomass under certain circumstances) are controllable renewable technologies that enhance the deployment of other variable renewables such as wind and solar. A sentence providing this information may be relevant. | Rejected - Good points, but addressed in the later section on infrastructure. |
| 18066 | 7 | 34 | | 37 | | In a report on the potential for climate mitigation, the timing of reductions should be addressed. This is perticular true for nuclear fission and fusion as well as CCS. Due to the long construction and planning times, these technologies are to a great extent long-term mitigation options that will not have significant impact on GHG reduction within the window in which AR5 says we need to reduce emissions. In fact, one must expect that the net carbon reductions from nuclear power will be negative as more plants are retired than new plants brought online, at least in the coming decade. | Rejected - not supported by current use of nuclear power nor historical deployment rates.<br>Disagree that nuclear fission is a long term option. They are operating today and contribute to emissions reduction, |
| 18511 | 7 | 34 | | | | Much of the text in this section covers risks associated with nuclear technologies. It is important that this is covered, but the reader would expect it in 7.9, where indeed much of the same discussion appears. To save space, shorten here to focus on the technology and merge the risks discussion with that in 7.9. | Rejected - 7.5.5 covers current nuclear status and plans, and the impact of current nuclear technologies on the fuel cycle. Nuclear fuel cycle and nuclear energy use are inherently tied. There is |
| 7125 | 7 | 34 | 23 | 37 | 2 | The content in these paragraphs does not seem to focus more o "Mitigation technology options, practices and behavioural aspects". These paragraphs could be trimmed or some of the material moved to section 7.4.2 to serve as background material for Resource and resource availability for nuclear | Rejected - All aspects of the nuclear fuel cycle is inherently tied to nuclear energy as a viable mitigation option. Some aspects of the fuel cycle must be discussed to provide context for nuclear |
| 16117 | 7 | 35 | 1 | 35 | 6 | Improved safety of EPR reactors is not proven because : none is operating and the record is nil; the size of the fuel charge is higher than any other civil reactor and thus inherently more problematic; safety is still depending on active measures and human responses. This paragraph should be more balanced. | Rejected - existing text uses the words "designs" and "features" and does not say that new LWRs are proven. |
| 15947 | 7 | 35 | 17 | 35 | 17 | the PBMR project in South Africa was abandoned years ago - and they were never 'developing' it. They were trying to get someone to pay for one. They had no takers. | Taken into account - text revised |
| 16817 | 7 | 35 | 20 | | | Suggest adding to end of paragraph: "the promise of "manufacturing" major components in this manner carries the possibility of beneficial learning curve impacts driving costs down significantly." | Taken into account - text revised |
| 9504 | 7 | 35 | 25 | 35 | 27 | Supply of uranium is enough for the future. So the text should be replaced like below. "the world has identified total resources of 5.4 million tons of uranium (available at a cost less than USD 130 per kgU), enough to last for 100 years at recent demand. Moreover, the IAEA notes that these figures include officially reported resources only, and that the potential is much higher as some countries do not report."<br>[1]IAEA (2010) “Red Book – Uranium: Resources, Production and Demand,” presentation at the RAF3007 Workshop on Uranium Data Collection & Reporting, July 2010(attached on email) | Taken into account - Resource issues addressed in 7.4.2. Text modified. |
| 11934 | 7 | 35 | 26 | | | "ore" grades | Editorial - corrected |
| 16119 | 7 | 35 | 30 | | | Use of the word "recycling" should not be used here to describe chemical reprocessing of nuclear waste. In France, the only country in the world to claim the whole cycle of reprocessing, actual use of waste materials amounts to only a few percentage points according to NGOs, and 12% according to the official Haut Comité à la Transparence et à l'Information sur la Sureté Nucléaire (http://hctsin.fr) in a 2010 report. It is a far cry from the 96% claimed by the French firm AREVA. | Rejected - Do not see a problem with the text as written. Text does not comment on the degree to which recycled materials are utilized. |
| 4110 | 7 | 35 | 45 | 35 | 45 | More on the thorium fuel cycle and its perceived advantages over uranium would be useful. | Rejected - Limited by page allocation constraints to discuss additional fuel |
| 17225 | 7 | 35 | 5 | | | Cummins etr al is not peer reviewed literature. | Rejected - referenced paper provides technical information on the safety features of AP1000 not available in peer |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17226 | 7 | 35 | 5 | | | Is Goldberg counted as peer reviewed literature? | Taken into account - referenced report provides useful comprehensive information on Gen II and III and small modular reactors that is not available in |
| 18064 | 7 | 35 | 5 | 35 | 5 | add "and higher costs" after "features" | Rejected - Costs are addressed in 7.8.2. |
| 16118 | 7 | 35 | 7 | 35 | 20 | Gas cooled reactors are not inherently safer or cheaper, nor in a good industrial trajectory this part is misleading and should be removed. See "Thomas S. 2011, the pebble bed reactor : an obituary" Energy Policy 39 (2011) 2431–2440) | Taken into account - text revised |
| 17227 | 7 | 35 | 8 | | | Kuznetsov is not peer reviewed literature. | Taken into account - replaced with IAEA |
| 13494 | 7 | 35 | 41 | 35 | 42 | Text : "Partial recycling of used fuels, such as the use of mixed oxide (MOX) fuels where U-235 in enriched uranium fuel is replaced with recycled or excess plutonium already contributes to improved uranium resource utilization and waste minimization efforts". MOX processing is not without its problems, and in some cases has been abandoned (for example, Sellafield in the UK). | Taken into account - text modified. That paragraph ends with reprocessing drawbacks of higher cost, associated complexities and proliferation concerns. |
| 13495 | 7 | 35 | 44 | 35 | 47 | Text : "Ultimately, full recycling options based on either uranium or thorium fuel cycles that are combined with advanced reactor designs where only fission fragments are relegated as waste can significantly extend nuclear resources and reduce high level wastes (GIF, 2002)." No option is without its waste disposal and security risks. The storage and treatment of "low level radioactive waste" is frequently omitted in assessing novel reactor designs. Plus the toxicity of some of the fission products of alternative reactor designs has its own unique risk profile. The "fallow" time needed for core development, before energy production can being, for some of the alternative fission reactor designs, will almost certainly make it harder to attract project financing than it currently is. | Taken into account - the following text "Higher economic costs and complexities of advanced fuel cycles and reactor technologies are current drawbacks. Potential access to fissile materials from widespread application reprocessing technologies further raises proliferation concerns. The advantages |
| 13493 | 7 | 35 | 7 | 35 | 20 | Text: "Other more revolutionary small modular reactors (SMR) with additional passive safety features are near commercial status (Kuznetsov, 2008; Rosner and Goldberg, 2011; World Nuclear Association, 2012b). The size of these reactors is typically less than 300 MWe and much smaller than the 1000 MWe size of current LWRs. Their lower power density, large heat capacity, and heat removal through natural means contribute to their improved safety. SMRs based on light-water designs rely on the substantial experience with current LWRs and utilize existing fuel cycle infrastructure. Light water SMRs from Russia, South Korea, and US are near commercial status. Gas-cooled SMRs, in addition to their passive safety features, have higher operating temperatures for increased electricity generation efficiencies relative to LWRs and potential industrial applications as a source of high temperature process heat (EPRI, 2003; Ming Zhang et al., 2009). Gas-cooled SMRs are under development in China, France, South Africa, and US. In general, smaller reactors that can be constructed in a factory setting with modular construction techniques and flexibility for incremental additions to total power capacity could shorten the duration of construction periods and improve the quality and economics of new nuclear plants (Rosner and Goldberg, 2011)." This paragraph reads like sales material, which does not convince me of the neutrality of the references cited. As a result I have doubts about the development of small modular reactors, and would be concerned about unmentioned aspects of their operation, including the disposal of waste and security from attack. | Taken into account - text revised and new references added. Added "the widespread applicability of SMRs remains yet to be determined." The text states that light-water SMRs utilize existing fuel cycle infrastructure, and does not comment on waste and security. |
| 4443 | 7 | 36 | 20 | 36 | 28 | The discussion on the Japan earthquake could be omitted as there have been discussions on nuclear safety on p34 and later on p36. | Rejected - this particular discussion of Japan nuclear accident is not redundant to other sections, and serves to provide |
| 4111 | 7 | 36 | 20 | 36 | 20 | It should be stressed that if the retaining wall had been built higher, or if the Fukushima plant had not been placed so close to a techtonic plate and the ocean, and if proper maintenance had been done by Tepco over the years there would have been no nuclear accident. In this sense it was not a failure of a nuclear system, but a wider systemic failure. | Taken into account - The text as written states that the "earthquake" and "tsunami" caused the accident. It does not state that there is a failure of nuclear |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15464 | 7 | 36 | 20 | 36 | 40 | It may be useful to mention somewhere in this section that in a dramatic shift away from policies that strongly suported the nuclear industry in Japan a "Cabinet panel on called for Japan to phase out nuclear power over the next three decades" http://www.washingtonpost.com/business/ap-interview-japan-nuke-probe-head-defends-report-that-didnt-blame-individuals-for-disaster/2012/09/13/c097b2f2-fe0c-11e1-98c6-ec0a0a93f8eb_story.html | Rejected - Nuclear policy in Japan is uncertain |
| 10541 | 7 | 36 | 20 | 36 | 28 | Also suggest to standardise the order of technologies discussed in each section to become the same for better readability e.g. coal/oil/gas/nuclear/RE/CCS | Accepted - sequence has been standardized: fuel shifting, RE, nuclear, |
| 11935 | 7 | 36 | 21 | | | should say "due to a loss of back-up power | Rejected - Unnecessary. |
| 9592 | 7 | 36 | 22 | 36 | 24 | Please, describe accurately the fact about Fukushima as two accidents differ in degree; France's national nuclear regulator IRSN published a comprehensive report in 2012 on the radioactive releases from the Fukushima accident. It found that the releases of radioactive iodine isotopes (of which iodine-131 is one of the most significant in terms of environmental and dosimetric impact) were on the order of a few hundred PBq, which is around ten times lower than the Chernobyl accident [1]. It also found that releases of cesium-137 (which will persist the longest in the environment with its half-life of 30.1 years), were estimated to be 21 PBq, accounting for around one-fourth of the cesium-137 released by the Chernobyl accident [2].<br>[1] IRSN (2012) "Fukushima, one year later: Initial analyses of the accident and its consequences," March 12, 2012<br>[2] IRSN (2012) "Fukushima, one year later: Initial analyses of the accident and its consequences," March 12, 2012<br>( http://www.irsn.fr/EN/publications/thematic/fukushima/Pages/overview.aspx | Taken into account - text revised. Reference to Chernobyl removed. |
| 11766 | 7 | 36 | 24 | 36 | 26 | As long as seeing next paragraph, nuclear deployment activities are still on-going around world. [some nations] is more appropriate. | Accepted - text revised |
| 9505 | 7 | 36 | 24 | 36 | 26 | Many countries are progressing the nuclear energy development, only Germany changed the policy. This text should be deleted. | Taken into account - text revised |
| 10657 | 7 | 36 | 24 | 36 | 26 | Disagree. There is more nations who promote nuclear energy than abandon it. | Taken into account - text revised. |
| 18065 | 7 | 36 | 26 | 36 | 26 | write "for many of the nations that utilise nuclear power" (it is in relatively few of the 204 nations in the world but in many of the 31 nations that have nuclear power). | Taken into account - text revised. |
| 16043 | 7 | 36 | 26 | | | Ad: Germany has decided to get out of the use of nuclear energy to the end of 2022 and Japon within the 2030th. | Rejected - Nuclear policy in Japan is uncertain. |
| 10043 | 7 | 36 | 26 | 36 | 28 | The list of countries who abanded nuclear programms is not complete. Countries like Belgium and Switzerland are currently discussing a nuclear phase | Rejected - Italy has no nuclear capacity. "Several nations" are used to include other countries. Nuclear capacity in Belgium and Switzerland are relatively |
| 7734 | 7 | 36 | 27 | 36 | 28 | The rsponse wasthat Japan has decided not to continue to pursue nuclear power as a source of enegy for the country. | Rejected - Japan nuclear policy is uncertain. |
| 7735 | 7 | 36 | 29 | 36 | 31 | For those nations, like Japan who has suffered immensely from the accident, populations have been strongly opposing to nuclear energy. This whole section could have been written in a way that convince people that nuclear energy is not to be used. However, it is not expected that scientific work takes this role. The current section is biased to show that nuclear problems have been or are about to be solved, which is not true. Please, access the risks of using this type of source of energy, which has been left out of the text, surprisingly. | Rejected - Risk of nuclear energy use covered in 7.9. |
| 16818 | 7 | 36 | 31 | | | Suggest adding after " … of power supplies." the following text: "Energy System modeling continues to show that nuclear technology provides one of the lower cost options for lowering CO2 emission from electricity generation." | Taken into account - Nuclear cost competiveness addressed in 7.8. Additional text added to recognize |
| 5157 | 7 | 36 | 39 | 36 | 39 | emerging nations ? Rephrase? | Taken into account - text revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17228 | 7 | 36 | 4 | | | The paragraph should discuss also the issue with a perspective to international policies. | Rejected - comment not clear. See 7.8 for nuclear cost, 7.9 for nuclear risk, and 7.12 for nuclear response to climate |
| 9473 | 7 | 36 | 41 | 36 | 44 | It should be described that nuclear power is one of the generation technologies that produces the least GHG emission in life cycle and have contributed to prevention of global warming. | Taken into account - text revised. Nuclear response to climate change |
| 11767 | 7 | 36 | 41 | 36 | 44 | Ameding to [Nuclear power has been around for five decades or more. Meanwhile it would be still cost effective compared with others(Tidball et al. 2010), unresloved issues remain for the .....] would be ballancing.<br>1.R. Tidball et al.:[Cost and Performance Assumptions for Modeling Electricity Generation Technologies], send attachment by another e-mail. | Taken into account - text revised. Cost discussion covered in 7.8. Nuclear response to climate change policy covered in 7.12. |
| 9593 | 7 | 36 | 41 | 36 | 44 | All forms of generation face unresorolved issues and nuclear is deployed in various reasons, including climate change mitigation. Please, rewite here by using following information; nuclear power is stemmed from the need to cost-effectively satisfy rapidly growing electricity demand in the emerging economies, as well as efforts to achieve energy and environmental policy objectives, including mitigating greenhouse-gas emissions and providing a secure, diversified and lowcost electricity supply. (WEO 2011, IEA) | Taken into account - text revised. Electricity demand and energy diversity referred to in earlier paragraph. Nuclear response to climate change policy covered in 7.12. |
| 10658 | 7 | 36 | 41 | 36 | 44 | Nucear economics have greatly improved. | Rejected - not supported by publically available cost data. See discussion on |
| 13198 | 7 | 36 | 41 | 36 | 43 | This statement is policy prescriptive and no justification is given for asserting that nuclear power is not presently a valid option for climate change mitigation. See a recent paper by R. Dautray, J. Friecdel and Y. Bréchet Nuclear energy in France today and tomorrow: IInd tio IVth generations, , C.R. Physique 13 (2012), 480-518, for a serious scientific analysis of this topic. | Taken into account - text revised for balance. Text does not say that nuclear is not a valid option. Nuclear response to climate change policy covered in 7.12. |
| 9995 | 7 | 36 | 41 | 36 | 44 | This part should be revised to explain that nuclear power has contributed largely to reduce CO2 emission in the world and has a merit to reduce CO2 emission more economically than renewable energy, as described in (Weisser, 2007, page1).<br><br><Reference><br>[1]Weisser, D. (2007). A guide to life-cycle greenhouse gas (GHG) emissions from electric supply technologies. Energy, Volume 32, Issue 9, Pages 1543-1559. | Taken into account - text revised to include nuclear contribution to emissions reduction. Nuclear cost competiveness addressed in 7.8. |
| 17750 | 7 | 36 | 42 | | | delete "CCS and" | Comment misplaced. Not in nuclear |
| 16819 | 7 | 36 | 43 | | | Re "resource sustainability" -- resources to build nuclear or any other technology is included in the economic calculations for the source. "Resource sustainability" is not well defined or understood. Does it take into account what we know from resource economics? | Taken into account - text revised |
| 5929 | 7 | 36 | 9 | | 10 | In Finland, the Posiva's final waste deposit Onkalo is under construction and progressing according to plans. | Taken into account - text revised. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13496 | 7 | 36 | 24 | 36 | 28 | Text : "The severity of the nuclear accident in Japan has brought about a reinvestigation of nuclear energy policy and deployment activities for many nations around the world, most notably in Japan and Germany. The response to the accident has been otherwise mixed and its full impact may not be realized for many years to come." The Fukushima Dai-ichi 3/11 ongoing accident was not an unique failure in nuclear power plant management. There have been regulatory problems regarding safety, modifications, repairs and servicing of nuclear power plants for some time, particularly in Japan, France and the US. There are regular unplanned outages reported in the press, and sometimes media coverage of administration problems. Two important examples of ongoing issues include the February 2011 reports of problems with control rods (Perry Nuclear Plant, GE Hitachi, Marathon control rods http://starbeacon.com/local/x789958596/Perry-Nuclear-Plant-monitoring-defective-control-rods ) and September 2011 potential problems identified for scram in a seismic event (20 - 30 US reactors, GE Hitachi, NRC http://www.nrc.gov/reading-rm/doc-collections/event-status/event/2011/20110928en.html ). Reports into the Fukushima Dai-ichi multiple reactor accident concluded that failures in human systems were to blame - a "man-made disaster ( http://icanps.go.jp/eng/final-report.html http://icanps.go.jp/eng/07VIfinal.pdf http://fukushima.ans.org/report/Fukushima_report.pdf ). Belgium is to consider the decommissioning of two reactors with extensive cracking : Tihange 2 and Doel 3, and this move may prompt similar consideration elsewhere, as case cracking is apparently prevalent with reactor age. There is an ongoing demand to improve venting in containment vessels in the USA (NRC, March 2012, order to all Mark I and Mark II reactors). The promotion of a nuclear power "renaissance" is losing its power to convince. | Rejected - The Nuclear Energy section does not mention nuclear power "renaissance" and comments on current activities. Historical capacity factors for nuclear plants have increased. No power plant is designed to last forever. All nuclear reactors have design lifetimes. |
| 10050 | 7 | 36 | 26 | 36 | 27 | add all countries who reacted with specific measure such as Italy (abonded nuclear plans), Belgium (stalled plans) etc, | Rejected - "nuclear energy policy and deployment activities for several nations" are used to include other countries. Italy has no nuclear capacity. Nuclear capacity in Belgium and Switzerland are |
| 3397 | 7 | 37 | | 37 | | Delete text. Empty of relevant content: From line 5-8 and from lines 32-43. | Taken into account - comment is obsolete as most of the text has been deleted due to space restrictions. The |
| 3398 | 7 | 37 | | 41 | | Remaining text (page 38 to 39) can be drastically reduced as it only introduces trivial and well known ideas and a large number of references. Factual figures and quantitative information should be preferred in IPCC reports: section 7.6.1 is very poor (it´s rethoric, and abuses of trivial messages and references (see for example page 40 lines 33 to 47, including a reference to claim for Sims et al (2007, 2011) the "discovery" that electricty has to be transported for considerable distances¡¡¡ )) . Section 7.6.2 is a perfect example of a high quality job..... EFFECTIVE CROSS-REVIEW BETWEEN LAs HAS TO BE ENCOURAGED IN THE SOD | Taken into account - comment is obsolete as most of the text has been deleted due to space restrictions. The entire section 7.6.1 has been rewritten und shortened considerably |
| 12592 | 7 | 37 | | | | Other issues with renewables in the grid will include: real power fluctuation, reactive power generation and absorption, voltage dips, and voltage harmonic distortions. Please see Chen, Z., Spooner, E., "Grid power quality with variable speed wind turbines", Energy Conversion, IEEE Transaction on, 2001, Vol 16, Issue 2, pages 148-154 | Rejected, - power quality has not been a major barrier in areas that have increased the supply of variable RE. |
| 12593 | 7 | 37 | | | | Some more detail on infrastructure would be good. For example, substation issues, of which one solution is fault current limiters. | Rejected, seems too detailed of a point for this broad discussion that other |
| 12595 | 7 | 37 | | | | Superconducting magnetic energy storage can also be used for grid quality issues | Rejected, minor point and might be |
| 12603 | 7 | 37 | | | | Peak energy demand is also effected by heat pumps on defrost cycles and electric cars in localised areas – this needs to be sorted | Taken into account - comment is obsolete as text has been deleted due to |
| 16820 | 7 | 37 | 17 | | 22 | Is this paragraph redundant with the previous paragraph? | Taken into account - comment is obsolete as most of the text has been deleted due to space restrictions. The |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2833 | 7 | 37 | 21 | 37 | 22 | In a liberalised market, the challenges are mainly to do with market and pricing structures, risk and reward, operating regimes etc. | Taken into account - comment is obsolete as most of the text has been deleted due to space restrictions. The |
| 16821 | 7 | 37 | 23 | | 31 | The claim that there are no technological limits to how much RE can integrated into energy system overlooks or does not sufficiently consider the growing cost impact on the rest of the energy delivery system as the share of RE grows. The change in the base load system need to maintain reliability adds to the total cost of each additional unit of RE. See: http://www.purdue.edu/discoverypark/energy/assets/pdfs/Wind_Impact_Report.pdf and http://economics.mit.edu/files/6317 and http://ei.haas.berkeley.edu/pdf/working_papers/WP221.pdf | Taken into account - comment is obsolete as most of the text has been deleted due to space restrictions. The entire section 7.6.1 has been rewritten und shortened considerably |
| 16044 | 7 | 37 | 25 | | | targets, and in some cases increased transmission infrastructure. (in the case of more decentralized energy production including local and regional energy autonomy is need less transmission infrastructure. | Taken into account - comment is obsolete as text has been deleted due to |
| 4444 | 7 | 37 | 29 | 37 | 31 | It may be worth emphasizing the institutional barriers at this point – many countries are interconnected and accommodate large flows of energy between them. | Taken into account - comment is obsolete as most of the text has been deleted due to space restrictions. The |
| 16045 | 7 | 37 | 29 | | | complexities and investment costs … | Taken into account - comment is obsolete as text has been deleted due to |
| 16046 | 7 | 37 | 30 | | | must adress existing institutional … | Taken into account - comment is obsolete as text has been deleted due to |
| 2834 | 7 | 37 | 35 | 37 | 38 | This section underplays the potential of the demand side in referring only to “any available flexibility” there. One of the main challenges is to encourage more demand-side flexibility, for which the potential is growing rapidly with advances in ICT, smart grids and so on. This whole area needs more detailed analysis. | Taken into account - comment is obsolete as most of the text has been deleted due to space restrictions. The |
| 18067 | 7 | 37 | 40 | 37 | 40 | Paragraph should be completed with:<br>However, increasing the size of a control zone or electricity market reduces the need for reserve capacity as balancing can be done over a larger area with an increased palette of assets. Increased flexibility, does not necessarily mean an increase in investments in reserve capacity. (or similar) | Taken into account - comment is obsolete as most of the text has been deleted due to space restrictions. The entire section 7.6.1 has been rewritten |
| 6789 | 7 | 37 | 3 | 43 | 19 | It may be helpful to shorten, move and merge contents under section 7.6 to section 7.5.2. This move may be helpful to reduce the number of pages and yet retain the flow. Section 7.5.2 may be further renamed to appropriately reflect the revised contents. | Taken into account - comment is obsolete. Text has been deleted due to space restrictions. |
| 9652 | 7 | 37 | | | | this sections is repetitive and can be shortened | Taken into account - comment is obsolete as text has been deleted due to |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6437 | 7 | 37 | | | | Since AR4 a number of authors have modelled 100% renewable electricity systems at half-hourly or hourly resolution, using historic data, and have demonstrated the technical feasibility of these systems. I recommend that these studies be included in the AR5 report. Denholm and Hand (2011) modelled hourly wind, PV (a mixture of fixed and 1-axis tracking) plus concentrating solar power electricity generation over the period 2005-2006. These authors demonstrated an inverse relationship between system flexibility and the curtailment of variable renewables. They showed that a poor observed correlation between wind availability and demand patterns could be improved by the addition of solar generation, with a resulting decrease in curtailment. Further reduction in curtailment by the addition of energy storage, and potentially demand response measures, was shown. Elliston et al. (2012) modelled a 100% renewable electricity generation system for Australia, at hourly resolution, for the year 2010. A generation mix comprising 27% (23.2 GW) wind, 17% (14.6 GW) PV, 18% (15.6 GW) CST with thermal storage, 6% (4.9 GW) hydro, 28% (24 GW) biomass and 2% (2.2 GW) pumped hydro energy storage (PHES) was found to be capable of supplying demand, consistent with existing standards. Mason et.al. (2010) demonstrated, at half-hourly resolution, how generation mixes comprising 53-61% hydro, 22-25% wind, 12-14% geothermal, 1% biomass and 0-12% additional peaking generation could provide a 100% renewable electricity system on an energy and power basis for New Zealand. Modelled systems were shown to provide security of supply, and to maintain net hydro storage, over a 3 year study period. In addition to these studies, several (apparently) non peer-reviewed but nonetheless robust studies (grey literature) demonstrated similar findings (Ackermann et al., 2009; Wright and Hearps, 2010; Troster et al., 2011; vandePutte and Short, 2011). | Rejected - space constraints do not allow to go into the details. |
| 6438 | 7 | 37 | | | | Additional peer-reviewed references for section 7.6.1: Denholm, P. and Hand, M., 2011. Grid flexibility and storage required to achieve very high penetration of variable renewable electricity. Energy Policy 39, 1817-1830; Mason, I.G., Page, S.C. and Williamson, A.G., 2010. A 100% renewable electricity generation system for New Zealand utilising hydro, wind, geothermal and biomass resources. Energy Policy 38 (8), 3973-3984; Elliston, B., Diesendorf, M. and MacGill, I., 2012. Simulation of scenarios with 100% renewable electricity in the Australian National Electricity Market. Energy Policy 45 (1), 606-613. (Apparently) non-peer-reviewed reports for section 7.6.1: Wright, M. and Hearps, P., 2010. Zero Carbon Australia Stationary Energy Plan. Melbourne Energy Institute, University of Melbourne, Victoria, Australia; vandePutte, J. and Short, R., 2011. Battle of the grids. Greenpeace International, Amsterdam, The Netherlands; Ackermann, T., Troster, E., Short, R. and Teske, S., 2009. Renewables 24/7: infrastructure needed to save the climate. Greenpeace International, Amsterdam, The Netherlands; Troster, E., Kuwahata, R. and Ackermann, T., 2011. European Grid Study 2030/2050. Energynautics GmbH, Langen, Germany | Rejected - space constraints do not allow to go into the details. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4355 | 7 | 37 | 3 | | | I think the section on electrical power system misses an important challenge to renewables: It's not only balancing, resource adequacy, and grids: Fluctuating renewables fundamentally alter the distribution of residual load: there will be more hours with low residual demand and fewer hours with high residual demand at high penetration rates of wind and solar power. Subsection 7.6.1.1 discusses mainly intertemporal flexibility (regulating power, ramps, balancing services) - but even if these issues would disappear, a wind/solar-intensive power system would be substantially different than a conventional one (less capital intensive / more peak load technologies). In other words, I suggest to split the section and discuss "contigency flexibility" (short-term responce, regulating power issues etc.) separately from "scheduled flexibility". While better forecasts of wind/solar power can decrease the need for balacing services, it is a fundamental property of these sources to be more available during some times than during others - and this fundamentally affects the requirements to the rest of the power system.<br>For references see<br>- Mills, Andrew & Ryan Wiser (2012): “Changes in the Economic Value of Variable Generation at High Penetration Levels: A Pilot case Study of California”, Lawrence Berkeley National Laboratory Paper LBNL-5445E<br>- Hirth, Lion (2012): “The Market Value of Variable Renewables”, USAEE Working Paper 2110237. | Taken into account - the point is accepted. New material has been added and there is more attention now to new loads and demand side management. |
| 11936 | 7 | 37 | 32 | | | This section should lead with a discussion of smart grids(many publications) and then get into integration of different types. Find it strange that smart grids are not mentioned until p.66. The discussion of RE is overly long and this section needs more balance | Rejected, smart grids were deliberately avoided as they mean different things to different people. There is a short note on |
| 10052 | 7 | 37 | 32 | 40 | 4 | This section requires more work: The system conflict between baseload generation and flexible generation should be explained in more detail - the grid is descripted as a barrier, but in fact it is the wy how the grid is used, not the grid itself. This should be made clearer in this section. The cable are the same in a flexible and in an inflexible grid - the grid management makes the main difference. | Taken into account - text has been rewritten considerably to clarify that point. |
| 10674 | 7 | 38 | 1 | 37 | 2 | Flexibility of CHP plants can also be improved through the addition of other heat sources such as network heat pumps see Kilmakommissionen. (2010). “Danish commission on climate change policy.” Kilmakommissionen. Copenhagen. Denmark. | Accepted - text added. |
| 9506 | 7 | 38 | 10 | 38 | 12 | "many country" is vague expression. At least there is no regulation about the restriction of flexible operation. This text should be deleted. | Accepted - text changed. |
| 16122 | 7 | 38 | 17 | | | In this line, it is not clear if CCS may become part of the solution to improve flexibility of the system. In fact, the research tries mainly to avoid that CCS hampers flexibility. This is not the same. The sentence could read "Characterizing CCS flexibility in order not to prevent evolutions to a more variable system.. is an area of active research". | Accepted - I've added a phrase to help clarify this but since I don't fully understand the comment, may have done the opposite. |
| 4817 | 7 | 38 | 19 | 38 | 27 | I'm not convinced by the low variable cost argument | Accepted - now re-phrased. |
| 13200 | 7 | 38 | 19 | 38 | 27 | The intermittence of wind energy may pose to the netrwirk satability serious problems which are not clearly presented by the present phrasing, e.g. How to cope with a wind speed zero over a large geographic region, under anticyclonic conditions which may prevail during several consecututive days, even if such an event does not occur every year ? Large investments in the network are necessary, for mainaining its stability, when the percentage of wind energy increases. Order of magnitudes shoul be provided, as far as popssible | Rejected - we address the low capacity credit of wind in the Resource Adequacy section |
| 5158 | 7 | 38 | 19 | 38 | 20 | hydropower is extremely more flexible than bio and geo and should not be directly compared here - it is a central property of storage hydro to be able to dispatch on very short notice - the phrasing: "to some extent" is not correct | Accepted - text re-written to ensure that high degree of flexibility of hydro is recognized |
| 18069 | 7 | 38 | 22 | 38 | 22 | Delete "highly". | Taken into account - comment is obsolete as text has been deleted due to |
| 18070 | 7 | 38 | 23 | 38 | 24 | Delete "because output cannot be perfectly forecast". No technology can be perfectly forcast and they do not need to be for efficient system operation. | Taken into account - comment is obsolete as text has been deleted due to |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12545 | 7 | 38 | 25 | | | Recent research indicates that geographically and type-diverse deployment of renewable resources will substantially decrease the need and cost of balancing reserves. Many other improvements can be made in grid operations to support more effective integration of renewable resources. GE Energy, 2010. Western Wind and Solar Integration Study. NREL/SR-550-47434. Lisa Schwartz, et al. 2012. Meeting Renewable Energy Targets in the West at Least Cost: The Integration Challenge. Report to the Western Governors' Association. http://www.westgov.org/index.php?option=com_joomdoc&task=doc_download&gid=1602 | Rejected - this issue is covered adequately in Sims et al 2011 and space it limited here. |
| 5138 | 7 | 38 | 27 | | | the reference "Sims" should be prperly cited. | Accepted - but most have been removed |
| 4818 | 7 | 38 | 27 | 38 | 27 | Thus increasing consumer bills which has an important social impact given the economic crisis | Rejected - not relevant here. |
| 2835 | 7 | 38 | 28 | 38 | 32 | Another, probably the, key strategy is improvements in market and pricing structures. | Taken into account - demand response |
| 18072 | 7 | 38 | 28 | 38 | 32 | Add changes in market operation and load control as strategies | Taken into account - demand response |
| 18071 | 7 | 38 | 29 | 38 | 29 | "access to flexible thermal plants" should be changed to "access to flexible thermal and / or renewable plants" | Taken into account - text revised. |
| 4445 | 7 | 38 | 3 | 38 | 18 | What is CCS flexibility? Under what scenarios would a CCS fitted to a conventional powerplant not be operated at full potential linked to plant throughput? | Rejected - references adequately describe conditions under which |
| 15478 | 7 | 38 | 3 | 38 | 18 | this discussion is clearer than that on p 31; Pouret, L., N. Buttery and W.J. Nuttall (2009) “Is nuclear power inflexible?” Nuclear Future, vol. 5 no. 6, pp. 333-340 suggest that existing designs of PWR can flex down to 60% of output | Accepted - we already cite this reference but not this statement so have added it. |
| 18068 | 7 | 38 | 3 | 38 | 18 | It seems very odd that the section puts so much enphasis on a power technology (CCS) that will not be deployed at any significaant scale - and thus will have little impact on system balancing - during the next decade, at least. | Rejected - we feel that it is better to include all of the options in the review, albeit briefly. |
| 6439 | 7 | 38 | 3 | 38 | 18 | Given the findings of the renewable electricity system modellers just mentioned, there is now good evidence that the inflexibility of nuclear and "fossil fuel with CCS" plants, will place significant limits the penetration of variable renewables and/or require their curtailment. | Taken into account - text revised. |
| 4815 | 7 | 38 | 3 | 38 | 4 | Relatively low variable costs: is this variable costs of operation or investment? | Accepted - text improved and clearer in |
| 4816 | 7 | 38 | 3 | 38 | 4 | Is there a technical constraint to build flexible nuclear plants? Because financially there is the incentive to operate them as hydro-storage plant which are able to capture high prices at peak time (on top of their base load profit) as they can ramp up quickly enough to enjoy these prices | Taken into account - comment is obsolete as text has been deleted due to space restrictions. |
| 13199 | 7 | 38 | 3 | 38 | 18 | While there is no doubt that nuclear power and CCS are capital-intensive, the related problems seem overemphasized ; while France produces 80% of its electricitythrough nuclear reactors, no difficulty has arisen. Moreover, why relating this problem to those two topics only, it's obviously the same for wind power : | Rejected - the comment is misleading but the issues are complex and would require much more text to deal properly with them. This section is now better |
| 9489 | 7 | 38 | 3 | 38 | 18 | Reference to CCS should be made more specific whether CCS is done on gasfired or coalfired. Gasfired with ccs require smaller investments than coalfired and will in the future have a larger role to balance variations in a net with large renewable power. future developement within gasfired with ccs will be towards more integrated solutions and also more compact with faster respons to variations in electric output . | Rejected - space constraints do not allow to go into every detail. |
| 5930 | 7 | 38 | 3 | | 41 | Nuclear and CCS are both capital-intensive low-GHG technologies, and they need to be operated in baseload mode to be economically meaningful, as the authors mention. I think one key point is missing in this text: large amounts of variable generation (wind & solar) in the electricity system make investments in nuclear or CCS economically impossible. With a large penetration of variable RE, we have solar pv with annual full load hours of about 1000 h and wind with full load hours of 2000-2500 h. If the rest has to be provided by fossil back-up generation, then the possible GHG emission reductions from the system remain very modest. | Rejected - but please note improved phrasing. |
| 6440 | 7 | 38 | 33 | 38 | | The previous modelling results confirm that penetration of variable renewables can be greater than 20% for for at least two quite different scenarios (Mason et.al., 2010; Ellistion et. al., 2011). This matter must be examined for each region or country and the emerging evidence is that provided storage is adequate, and that some small degree of energy spillage is accepted, varibale renewables can be accomodated high levels. Advances in power point tracking technology make this increasingly feasible. | Taken into account - text revised. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9594 | 7 | 38 | 34 | 38 | 36 | Please, describe here correctly as reference does not mention many regions, where balancing exceed 20% of total supply, but 7 regions, and not some regions, where balancing is above 40%, but two regions and one country. (IEA, 2011f) | Accepted - text changed. |
| 4819 | 7 | 38 | 38 | 38 | 38 | Note that new flexible generation will most probably be CCGTs in most countries which will increase GHG | Taken into account - comment is obsolete as text has been deleted due to |
| 2836 | 7 | 38 | 40 | | | The word “modestly” here is misleading. Presumably (though the text is unclear) this is a reference to cycling costs rather than total back up requirements (which can have a very significant impact on emissions in a wind-dominated system). Even in regard to cycling some studies show significant emissions and cost implications (eg Denny and O’Malley enpol.2008.10.050 http://dx.doi.org/10.1016/j.enpol.2008.10.050). | Rejected - Denny and O'Malley were included in review in Wiser et al 2011, the penalty remains less than 10% in these studies and below 5% in some of |
| 16822 | 7 | 38 | 7 | | 10 | Low variable cost almost by definition make a resource base load -- why would any system operate a low variable cost unit intermittently? | Taken into account - the text is now clearer so this misunderstanding is |
| 10687 | 7 | 38 | 28 | 38 | 32 | The importance of integrating information and communication technology (ICT) into power system management should be more explicitly stressed, since ICT is the key to realize secure communication, wide area monitering, and intelligent control and so on, which are essential to realize smart grids.<br>Load control (or demand response) is not only done to make demand follow the availability of supply in smart grids. Much study effort is being dedicated to better load control, by which the impact of variable renewable energy output can be mitigated without deteriorating the customer's comfort. | Accepted - demand response is clearly highlighted as an area of interest for providing flexibility. There is a short paragraph on smart grids at the end of section 7.6.1. |
| 9653 | 7 | 38 | 3 | 40 | | CCS does not really fit into this section - might be better to have it in the section on CCS or on its own | Rejected - this section is about electrical system issues as a whole, so it should |
| 4781 | 7 | 38 | 33 | 38 | 38 | Reference to IEA, 2011f is relevant. However it is important to mention that figures provided for Denmak (Fig 7.11) assume huge interconnections and back-up from neighbouring countries, in particular the flexibility provided by Norwegian hydropower. | Accepted - text changed. |
| 7736 | 7 | 39 | | | | Improve quality of image | Taken into account. Figure has been |
| 4446 | 7 | 39 | | 39 | | This figure could be re-drawn so the text is easer to read. | Taken into account. Figure has been |
| 12033 | 7 | 39 | | | | Not only the technical potential but also marginal costs should be discussed in this kind of comparison. For example, wind power can be much cheaper in areas with good wind conditions than those in poor conditions since the efficiency co-relate cubics of average wind velocity. | Rejected - the point about increasing marginal costs of wind sites is important, but not relevant to this section |
| 15948 | 7 | 39 | 10 | 39 | 13 | Better than curtailment, is using surplus wind to heat up the boilers in central and district heating systems, as is done now in Denmark. | Accepted text revised. |
| 15479 | 7 | 39 | 12 | 39 | 13 | in a number of EU countries, regulations strongly discourage system operators from constraining off wind power, and the support mechanisms used can force the system operator to pay the opportunity cost of subsidies foregone rather than the (near-zero) marginal cost of turning down the station | Rejected - although this is correct policy aspects and regulation issues are not discussed here due to space constraints. |
| 9654 | 7 | 39 | 13 | | | Figure is blurry and difficult to read | Taken into account. Figure has been |
| 16121 | 7 | 39 | 17 | 40 | 4 | Important paragraph that shows the system combinations are the key issue and not the choice of one source. | Noted. |
| 6450 | 7 | 39 | 17 | 40 | 4 | I strongly concur with the analysis and conclusions in this paragraph and suggest this represents important progress since AR4, which should be mentioned in the executive summary | Rejected - although it is correct, not every aspect can be included in the ES. |
| 2782 | 7 | 39 | 3 | 39 | 7 | Pumped hydro is not the only one. Also compressed air is used commercially e.g. in Germany. However, despite having both pumped hydro and compressed air storage in the power grid, the storage capacity in the German power grid is only 0.04 TWh. But storage capacity of the German gas grid is 217 TWh. Storage of wind power will begin in the German gas grid as wind methane in 2013. The same way also solar and wave power can be stored making very high share of intermittent power generation in power consumption possible. In addition, this technology makes it possible to use large amount of wind, solar and wave power in transport in methane vehicles (this is also Chapter 8 issue, see comment 38). | Taken into account - comment is obsolete as text has been deleted due to space restrictions |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13037 | 7 | 39 | 3 | 39 | 5 | While pumped storage is indeed a major contribution to energy storage at large scales, this assertion neglects the fact that conventional storage hydropower is also a storage technology. I.e., pumped storage is only needed when traditional storage reservoirs are not available. It is not reasonable to build pumped storage unless you have no option to build a storage hydropower facility. The statement could be improved by rephrasing as follows: "Outside of conventional storage hydropower, to date, pumped hydropower storage is the only power storage technology deployed at a large scale, with 300 plants amounting to 95 GW worldwide." | Accepted - text revised. |
| 16823 | 7 | 39 | 3 | | | suggest you add to end of sentence after Borentstein and Centolella references" "although the difference between the high price time of day vs. low price time of day price shrinks during periods when natural gas prices are very low. | Taken into account - comment is obsolete as text has been deleted due to space restrictions |
| 5159 | 7 | 39 | 3 | 39 | 5 | in regard to large scale: it could be mentioned that ordinary storage hydro has the ability to balance variable sources - ref Norwegian systems balancing Danish wind production; SRREN chapter 5.5.4 - "the only power storage technology--- " is misleading. The previous sentence talkes about energy storage. Storage hydro should be mentioned as an energy storage and an energy source, while pumped storage is only storage not a source. Propose to insert: To date, "storage- and " pumped hydropower storage is the only -----. the number of plants (300) will, however, need to be corrected if Storage HP is included - or a new sentence after scale; "Presently 300 pumped storage HP plants are applied worldwide." -- ? | Accepted, Revise to indicate that both hydropower storage and gas storage currently play a big role, but distinguish this from storage that relies on the grid for charging |
| 10542 | 7 | 39 | 3 | | | Add to end of storage sentence "but usually at a relatively high cost." Could reference Sims et al 2011 | Taken into account - text revised. |
| 10069 | 7 | 39 | 5 | | | In 2010 EPRI published a Report Electricity Energy Storage Technology Options (No 1020676) and gave an estimate of 127 GW; The IRENA Working paper Volume 1: Power Sector, Issue 3/5 cites the International Hydropower Association (IHA) (2011), IHA 2010 Activity Report, IHA, London with an estimate of 120 to 150GW. It would be good if a range could be given here as well. | Taken into account - comment is obsolete as text has been deleted due to space restrictions |
| 12594 | 7 | 39 | 6 | | | I think storage needs to be discussed more – include a mention of redox batteries, superconducting energy storage and flywheels. Happy to provide summaries if necessary. | Rejected - further detail regarding storage left to reference to Chapter 8 of |
| 6449 | 7 | 39 | 6 | 39 | 7 | Additional references for compressed air energy storage: Pickard, W.F., Hansing, N.J. and Shen, A.Q., 2009. Can large-scale advanced-adiabatic compressed air energy storage be justified economically in an age of sustainable energy? Journal of Renewable and Sustainable Energy 1 (3), 10 pp; Pickard, W.F., Shen, A.Q. and Hansing, N.J., 2009. Parking the power: Strategies and physical limitations for bulk energy storage in supply-demand matching on a grid whose input power is provided by intermittent sources. Renewable & Sustainable Energy Reviews 13 (8), 1934-1945. | Rejected - no space to add this level of detail. |
| 10051 | 7 | 39 | | | | Figure is misleading as it does not reflect the reason why technical capability is low: A large share of baseload power plants in the grid is a contrain for RE - not the grid itself. | Taken into account. Figure has been deleted. |
| 13497 | 7 | 39 | 10 | 39 | 13 | Text : "Finally, if surplus renewable supply exists despite the best efforts of system operators, renewable energy generation can be curtailed by switching off unwanted plant or through regulation of the power output. Indeed curtailment of wind power is common practice where and when transmission constraints prevent full utilization of available wind." There is scope for using unused wind and solar power for such things as the production of Renewable Hydrogen through electrolysis, and for heating banks of molten salts. These can be later employed as back up - such energy stores could be used to smooth and extend the output of a wind or solar farm for times when the wind is not blowing, over-blowing, or when solar generation is impossible - at night. | Accepted - text added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13498 | 7 | 39 | 19 | 39 | 21 | Text : "Base-load operation of CCS and nuclear plant, on the other hand, is of little concern from a system balancing perspective up to the point where the capacity of nuclear and CCS approaches the minimum net load of the system." Not included in this analysis is the problem of outages, both planned and unplanned. There will always be a need to have back up - even for generation considered as "baseload". Studies on the "supergrid" concept, and others, show that with a sufficiently geographically-widespread and integrated system of renewable electricity generation, balancing capacity and output is very achievable ("Saturation wind power potential and its implications for wind energy", by Mark Z. Jacobson and Cristina L. Archer, 2012, http://www.pnas.org/cgi/doi/10.1073/pnas.1208993109; Gregor Czisch, "Scenarios for a Future Electricity Supply: Cost-Optimised Variations on Supplying Europe and Its Neighbours with Electricity from Renewable Energies" http://www.theiet.org/resources/books/renewable/scenarios.cfm, http://www.iset.uni-kassel.de/abt/w3-w/projekte/LowCostEuropElSup_revised_for_AKE_2006.pdf ) | Taken into account - comment is obsolete as text has been deleted due to space restrictions |
| 13499 | 7 | 39 | 30 | 40 | 2 | Text : "Finally, if substantial GHG emissions reductions are required, some of the most cost effective current solutions for system balancing (e.g., relying upon flexible but GHG emitting fossil plant) may no longer be acceptable, requiring the application of currently more costly options." In developed countries with a gas grid, the backup, balancing electricity generation plant that currently burn gaseous fossil fuels could be converted to burn increasing levels of carbon neutral gas fuels - Renewable Gas - mixtures of gas feedstocks, and by-products from the reactions of different thermochemical, catalytic and electrochemical processing of biomass and Renewable Hydrogen - either fed into the gas grid or produced locally to a power plant. However, there would need to be explicit planning for such a fuel change - including making sure that all new gas plant is flexible to a range of fuels. | Rejected - space constraints do not allow to go into the details here. |
| 6242 | 7 | 4 | 5 | | | picture seems pretty much realistic with perspective on the energy demand in developing countries but does not argue on the challenges to provide energy with relativ low energy density in more industrializd countries. | Rejected - comment seems to be misplaced. It is not clear what the |
| 4447 | 7 | 40 | 1 | 40 | 4 | The reader may be reminded here that large-scale conventional powerplants have lifetimes on the order of 30-40 years which locks the system into a particular operation. | Taken into account - comment is obsolete as text has been deleted due to |
| 12548 | 7 | 40 | 10 | | | A recent useful paper on resource adequacy metrics is: John Fazio, 2011. A Probabilistic Method to Assess Power Supply Adequacy for the Pacific Northwest. Northwest Power and Conservation Council. http://www.nwcouncil.org/energy/resource/Adequacy%20Standard%20Background%20(2008-07a).pdf | Rejected - not a journal paper. |
| 2837 | 7 | 40 | 10 | 40 | 19 | It seems very odd to discuss theoretical constructs like capacity credits in terms of “value” and not economic incentives like capacity payments and obligations. | Rejected - specific payments and obligations are a regulatory/institutional layer on top of a physical/economic system. The current approach focuses |
| 18073 | 7 | 40 | 13 | 40 | 13 | replace "with" by "and". The distinction is important as a high fuel supply is not in itself an assurance of reliability. | Accepted - but a different phrasing adopted. |
| 6451 | 7 | 40 | 15 | 40 | 16 | This statement is also supported by modelling reported by Mason et. al. (2011) | Accepted - Mason ref added to Zotero |
| 9996 | 7 | 40 | 16 | 40 | 19 | This part should explain that the higher planning reserve margin will result in more costly structure as a whole power system. This is because it is necessary to install additional equipments for power grid stabilization if variable power sources such as wind power or photovoltaic were installed into power grid. This information is described in (DeCarolis, 2006, page 395 and 403).<br><br><Reference><br>[1] J.F. DeCarolis and D.W. Keith (2006). The economics of large-scale wind power in a carbon constrained world, Energy Policy 34 | Rejected - costs are addressed in 7.8.1. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16825 | 7 | 40 | 23 | | 26 | We may have a language issue -- a capacity credit of a coal plant would not be decreased per se, rather the nameplate capacity would decrease -- if the plant operated in a capacity market then yes its capacity credit would then decline. However, it is uncertain how much CCS will be used as coal retrofits vs. being designed as part of new plants. It is not broadly accepted as far as I know that the parasitic losses from CCS can be reduced during peak loads -- if this were so, why would not operators reduce these losses all the time? | Rejected - Since emissions go up during the time that parasitic losses are reduced, the plant operator would only want to reduce the parasitic losses during critical peak times if operating under a carbon constraint. So the plant would not operate with the reduced parasitic losses all of the time. This issue appears to primarily apply to |
| 4448 | 7 | 40 | 27 | 40 | 28 | Is line 27-28 a repetition of line 15-16? | Taken into account - comment is obsolete as text has been deleted due to |
| 4449 | 7 | 40 | 28 | 40 | 31 | These costs should be quantified. Specifically, how does the cost of energy storage compare with expanding generating capacity and associated fuel costs? | Rejected - costs are addressed in 7.8.1. |
| 17810 | 7 | 40 | 33 | | | After generation at the power station, electricity is transmitted via high-voltage power cables that are supported overhead, or laid underground, and these transmission lines run between substations. In this second stage, the major occupational hazards are electrical in nature, for example electrocutions. The third stage – distribution – connects the transmission system to the customer's equipment, and as in the second stage the main occupational hazards are again electrical (Fox 1998). Compared with the health impacts of the generation stage, there are few non-occupational exposures associated with the transmission and distribution stages of the supply chain. One area that has received particular focus over the past thirty years is the concern over exposure to electromagnetic fields (EMF). The World Health Organization's International EMF Project recently completed a thorough review of all health effects associated with exposure from the extremely low frequency electric and magnetic fields emitted from electric power lines (See: WHO, 2007 at http://www.who.int/peh-emf/publications/ELF%20EHC%20No238%20full.pdf). This chapter mainly provides a summary of the conclusions of this review. | Rejected - space constraints do not allow to go into the details here. |
| 16824 | 7 | 40 | 4 | | | Suggest adding sentence: Within this context, it is helpful to note that the most economically efficient determination of what resources to deploy and when is helped via a CO2 emissions price rather than via mandates to meet certain levels for favored technologies. | Rejected, Point is valid, but it seems to make sense in a policy section rather than this chapter |
| 6699 | 7 | 40 | 43 | 40 | 45 | It should be noticed that location of nuclear plant is determined by ground conditions and presence of coolant, rather than public health and acceptance. | Accepted - covered by change (see above comment) |
| 9474 | 7 | 40 | 43 | 40 | 45 | Although location requirements of a nuclear plant may differ according to countries and areas, it should be added that stable bedrock and a lot of cooling water are basic requirements. | Accepted, Change to indicate that cooling and site conditions are major |
| 11768 | 7 | 40 | 43 | 40 | 45 | Delete [health and safty]. They are too strange for reasons. | Accepted - the text has been changed to public perceptions of H&S |
| 9595 | 7 | 40 | 43 | 40 | 45 | Please, replace 'reasons of health, safety and public acceptability' with 'a result of site evaluation with regard to safety for the public in case of postulated accidents'. | Reject - see previous comment. |
| 10659 | 7 | 40 | 43 | 40 | 45 | Delete health and safety. Concern on health and safety are included in public acceptability. Nuclear plants are located at some disctance from the load centre mainly because it nees a lot of water for cooling and land cost is cheaper in Japan. | Accepted and re-phrased. |
| 9997 | 7 | 40 | 43 | 40 | 45 | This part should be deleted completely. In the survey described in (Jablon, 1991), it was reported that any general association was not detected between residence in a county with a nuclear facility and death attributable to leukemia or, in fact, any other form of cancer. In addition, wind turbines are also installed far from load centers too.<br><br><Reference><br>[1] Jablon, S., Z. Hrubec & J.D. Boice (1991). Cancer in Populations Living Near Nuclear Facilities. JAMA 265(11), pp. 1403-1408. Available at: http://jama.jamanetwork.com/article.aspx?articleid=385351 | Rejected but note that text has been revised to make it consistent with other comments. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18075 | 7 | 40 | 44 | 40 | 44 | add "access to water" after "health, safety" | Accepted - change made |
| 15491 | 7 | 40 | 5 | 40 | 31 | Resource adequacy - Quote and give figures on Geothermal energy for electricity production with a special attention to the Hot dry rock on-going projects with regards to the impressive potential for this technology to serve on a base load | Rejected - rearranged text and ref to SRREN obviates the need for this. |
| 11937 | 7 | 40 | 5 | | | This section can be incorporated with earlier discussions on resources. | Reject - resources have a different |
| 11938 | 7 | 40 | 32 | | | This section should be included in earlier T&D discussion, reducing length of document | Reject - these are two separate topics. |
| 18074 | 7 | 40 | 33 | 40 | 44 | There is an unfortunate and misleading bias in the paragraph. Attempting to address additional transmission needs for the different technologies seperately makes sense. The section states that renewables "will often" (line 37); CCS "may" (line 40); and nuclear "may" (line 43) require additinal transmission. This is not generally. Most wind energy has been connected to the existing infrastructure (in areas with high penetrations, new lines are needed). The same is true for PV and other RE technologies. Offshore RE technologies, obviously requires new infrastructiure, but the term "will often" is misleading. Especially so, when the term "may" is used to descibe transmission needs of nuclear (which most often needs new infrastructure due to the scale) and CCS (which would certainly need need least carbon transport infrastructure, as well as electricity in many cases. Gas also often requires additional gas and/or electricity infrastructure. Delete the paragraph and address it without forcing a distinction between (many different) renewables, Nuclear and CCS. | Taken into account - text revised to be more balanced. |
| 5139 | 7 | 40 | 45 | 41 | 11 | The section should perhaps also include other examples. Recently, a publication " Canada: winning as a sustainable energy superpower" published by the Canadian Academy of Engineering (CAE) Energy pathways Task forceISBN 978-0-9730830-9-5, 2012, www,acad-eng-gen.ca, identifies one of the few big national projects vison for a high voltage Pan-Canadian transmission and interconnection scenario for enabling low-GHG electricity while replacing high-GHG electricity generation in many parts of the country. | Taken into account - comment is obsolete as text has been deleted due to space restrictions |
| 18076 | 7 | 41 | 1 | 41 | 2 | I doubt this is generally true, especially given that many renewables can be applied decentraly. Maintaining this sentence would, at the very least, be substantiated with a credible reference. | Taken into account - a paragraph on distributed generation is added emphasizing that they may show lower demand for an extension of the grid, |
| 10543 | 7 | 41 | 1 | | | Add …"additional" transmission…. | Accepted - text revised. |
| 10545 | 7 | 41 | 13 | 41 | 20 | Move to 7.2 | Rejected. This is very small description of fuel balance for district heat. It often neglected in many global energy studies. So, many unfamiliar with this sector. |
| 10546 | 7 | 41 | 15 | | | …own use, "which is around XEJ, excluding traditional biomass. Could check these data with IEA Renewable Energy heating and Cooling 2008 report. Are discrepancies. | This is from IEA energy balance (see table 7.1. for details. |
| 11859 | 7 | 41 | 31 | 41 | 37 | This paragraph is quite confusing and doesn't really offer specific new concepts other than listing potential future technolgoies. Perhaps it could be shortened? | Accepted - content of the text has been improved. |
| 3788 | 7 | 41 | 32 | 41 | 32 | Check "cite". | Accepted text revised. |
| 9998 | 7 | 41 | 34 | 41 | 36 | The potential future technology development should include "heat pump technology" because heat pump is a representative of high efficient water heater. In addition, this part should refer to some examples that high efficient system of heat pump using river water is developed and used. | Agree. But there is relatively small room for this technology to work in district heating systems. |
| 10547 | 7 | 41 | 37 | | | needs a reference | Agreed. Provided. |
| 11860 | 7 | 41 | 39 | 42 | 4 | Gasoline pipelines and ethanol are not compatible, nor can biodiesel be transported in diesel pipelines if those pipelines carry jet fuel (as is typical in U.S.). In the U.S., ethanol is transported by rail and truck rather than pipeline due to ethanol's hydrophylic properties. This means that ethanol (and biodiesel in some cases) is transported much less efficiently than conventional fuels. | Accepted. Text has been added to limit supply of liquid fuels to the retail end of the distribution chain. |
| 10549 | 7 | 41 | 39 | 41 | 43 | Repetitive. Suggest delete | Rejected - necessary to provide some context for the following discussion. |
| 10544 | 7 | 41 | 8 | | | Add …"numerous" small……. | Rejected - numerous is not necessary |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18512 | 7 | 41 | | | | This section is focused strictly on ee improvements. Are there any challenges to fuel switching? E.g. incorporating more RE into district heating systems? Please incorporate mention of this aspect as well. | Taken into account in drafting the SOD. |
| 10548 | 7 | 41 | | | | Cooling networks not discussed - though is in title | Agreed. Text on cooling systems added. |
| 16123 | 7 | 41 | | | | The link of alternate gas injection, be it biogas, recombined methane, or hydrogen, is not done with the added flexibility of the links between regions and with storage, possibly an important feature in a 100% renewable system. Overall with section 7.6.3, it leaves the impression that only electrical links will bring flexibility to the power systems. | Accepted: Text has been added to indicate greater flexibility to RE sector via storage. |
| 11939 | 7 | 41 | 38 | | | Combine with 7.5.1 and shorten | Reject: The focus of the current section differs considerably from that of 7.5.1. |
| 7737 | 7 | 42 | 1 | 42 | 4 | What about GHG emissions reduction opportunities throughout fossil fuels production chains, such as in refineries, for instance? | Taken into account: Industrial processes are largely discussed in Chapter 10, although discussion on refineries is limited. Given the current focus of 7.6.3, the introductory text has ben altered to |
| 2785 | 7 | 42 | 14 | 42 | 22 | Personally I am very skeptical of biomethane replacing substantial quantities of natural gas. I think the anticipated scale of such substitution should be mentioned in the paragraph | Taken into account. Data from SRREN has been added. |
| 10550 | 7 | 42 | 16 | | | Could add more up to date SRREN ref from Ch 8 - Sims et al, 2011 | Taken into account: SREEN reference |
| 12602 | 7 | 42 | 17 | | | UK also injects biomethane into the grid - http://www.ngvaeurope.eu/uk-becomes-eighth-european-country-to-inject-biomethane-into-the-gas-grid | Taken into account: Text has been revised to be more general (page 42 line |
| 5140 | 7 | 42 | 23 | | 34 | It seems the entire paragraph is trying to discuss transport of hydrogen. The first sentence in the paragraph suggesting existing natural gas network could be used for hydrogen transport is questionable considering material hydrogen embrittlement issue. | Taken into account: Text has been revised to clarify limits (page 42 lines 17-20). |
| 3004 | 7 | 42 | 23 | | | I doubt that most of gas pipeline is able to transport H2, as written in the manuscript. This gives the reader a wrong idea. Please note that H2 embrittlement is a major corrosion issue. | Taken into account: Text has been revised to include comment on pipeline |
| 16827 | 7 | 42 | 24 | | 26 | The suggestion that it would be desirable to produce hydrogen from wind or solar seems speculative -- electrolysis of H2O to produce H2 involves efficiency losses, thus raising the cost of the energy (from an already relatively expensive electricity source). If there is "surplus" renewable energy then it is likely that it has already been deployed over the economically efficient level. The costs of this solution should be examined more closely relative to other alternatives. | Taken into account: Text has been revised to mention drawbacks. |
| 13297 | 7 | 42 | 30 | 42 | 33 | The Yang and Ogden work makes clear that the flow rate and the distance are important determinants not only of the delivery mode cost, but also of the consequent choice of delivery mode (as the flow rate and distance affect the costs of different delivery modes very differently) - it is worth making this clear, perhaps together with the implication that pipelines are favoured over shorter delivery distances and at high flow rates, while liquid hydrogen delivery is favoured by long delivery distances | Taken into account: Text has been revised to indicate differences due to distance. |
| 4450 | 7 | 42 | 33 | 42 | 34 | Specify that the 3000 km H2 pipelines is the global figure. | Editorial. Text has been revised (page 42 |
| 6431 | 7 | 42 | 36 | 42 | 36 | Does the distinction between CCS and CO2 storage need to be made? Can CCS suffice here? | Accepted: The beginning of this sentence can be shortened to "Options |
| 9507 | 7 | 42 | 39 | 43 | 2 | Evidences of these texts are not enough, one paper only, and contains too optimistic aspirations. Texts should be deleted. | Should be 7.6.4. Rejected - it is admissible to present the results even if this is only from one paper as long as others are not contradicting. Please |
| 6428 | 7 | 42 | 5 | 42 | 5 | remove "around the globe" and change to "Over 100 countries transport…" | Editorial: Text has been revised. |
| 17369 | 7 | 42 | 5 | 42 | 6 | In more than 100 countries… pipeline networks are estimated to have… | Editorial: Text has been revised. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13500 | 7 | 42 | 8 | 42 | 30 | Text : "...low pressure networks which distribute gas for power generation, industry and domestic use. Because of their ability to carry natural gas substitutes, these networks provide an opportunity to expand production of these gases. Low CO2 emitting natural gas substitutes can be produced from renewable sources such as biomass and waste...Provided the substitute natural gas meets the relevant gas quality standard (European Commission, 2001; IEA Bioenergy, 2006, 2009) there are no technical barriers to the injection of gas substitutes into the existing gas networks (European Commission, 2001). Substitutes are already being injected into natural gas networks. Examples of biomethane gas injection plants based on anaerobic production processes can be found in Canada, Finland, Norway, Sweden, and The Netherlands; Germany has over 50 operational plants injecting biomethane produced from animal waste and agricultural residues (IEA Bioenergy, 2011)...Although limited, the natural gas network also has the potential to transport and distribute hydrogen produced from biomass and fossil fuel sources, or produced to carry surplus energy generated from variable renewable sources such as wind or solar (IEA, 2006; Moriarty and Honnery, 2007; Honnery and Moriarty, 2009). Unless the amounts are small, combining hydrogen with natural gas is likely to mean gas quality standards will not be met (European Commission, 2004; Tabkhi et al., 2008). Large scale injection would require changes to gas appliances so remains a longer term option (Haeseldonckx and D'haeseleer, 2007). Additional factors limiting hydrogen injection relate to the integrity of steel pipelines and end user safety (European Commission 2004)..." Biomethane is also being injected in the UK ( IEA Task 37, "UK Experience with Gas Grid injection", John Baldwin, presentation http://www.iea-biogas.net/_download/publications/workshop/10/Experience_with.pdf 15th September 2011). For "transport and distribute hydrogen produced from biomass and fossil fuel sources, or produced to carry surplus energy generated from variable renewable sources", it should be made clear that the text means "carry surplus energy in the form of Renewable Hydrogen generated from variable renewable sources". Although there are limits on the amount of hydrogen that can be carried in the gas grids, owing to the permeability of metals to hydrogen gas, and the implications of changed Wobbe Index on end use appliances, the Dutch are actively supporting 5% hydrogen in Natural Gas - and are testing up to 20% (Kiwa Technology, http://www.kiwatechnology.com/uploadedFiles/Expert_Centre/Gas_Technology/Publications_and_Patents/Folder_AdvancedEnergySystems_A4_web.pdf, "PILOT PROJECTON HYDROGEN INJECTION IN NATURAL GAS ON ISLAND OF AMELAND IN THE NETHERLANDS", http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&ved=0CEQQFjAC&url=http%3A%2F%2Fwww.igu.org%2Figrc2011%2Figrc-2011-proceedings-and-presentations%2Fposter%2520paper-session%25201%2FP1-34_Mathijs%2520Kippers.pdf%2Fat_download%2Ffile&ei=DDxTUImWAaLB0gWZiYBQ&usg=AFQjCNF6n-NeZ8UN-OEnk7CFQYso-20c2w). In the UK, National Grid, Royal Dutch Shell, ITM Power and Kiwa are about to start testing hydrogen injection into the gas grid (http://www.itm-power.com/project/gridgas/). The upgrade of the low pressure gas grid in the UK - moving from old metal pipe to plastic pipe, is perhaps highly advantageous for the inclusion of hydrogen in the network. Even if the proportion of hydrogen in the gas grid cannot be higher than around 5%, Renewable Hydrogen would be a very valuable gas stream - it could be methanated with carbon rich flue gases from industrial furnaces, or even from power plants, to provide Renewable Methane for gas grid injection. This could even create carbon credits, if carbon dioxide is prevented from becoming emissions by being recycled into Renewable Gas. It might also be possible to use carbon dioxide to balance the burn profile of | Taken into account: Text has ben revised to give greater clarity (entire section). |
| 11940 | 7 | 42 | 35 | | | Discuss this in 7.5.5. It will make more sense to the reader | Noted. The CLAs made a decision to organize the chapter in this manner. The chapter discusses all relevant aspects of CCS (given space |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13501 | 7 | 42 | 36 | 42 | 38 | Text : "Options for CCS and CO2 storage are presented in 7.5.5, the focus here is the infrastructure required for CO2 transport. The recent CO2 transport literature addresses the scale of the required CO2 pipeline network and potential ways to optimize these (largely) yet-to-be-built pipeline networks." It may turn out to be unnecessary to construct CO2 transport pipeline infrastructure if carbon dioxide gas is no longer regarded as waste emissions that requires pumping (to the coast) and burying undersea/underground. The various Renewable Gas processes could recycle carbon dioxide. In fact, it may be more valuable to reuse carbon dioxide than permanently sequester it. The important thing is that initial carbon dioxide production is balanced so that net emissions (after all recycling and capture) to the atmosphere from the ground (fossil fuels) are minimised. | Reject: not supported by the broad body of peer reviewed literature. There is no robust literature that would say that "using" CO2 in this manner and on this scale would be feasible. |
| 3400 | 7 | 43 | 13 | | 19 | Excess of references for simple ideas. | Noted: No change to text needed. |
| 7738 | 7 | 43 | 13 | 43 | 16 | What about the dificulties in obtaining environmental licenses for projects like this in other parts of the globe and the difficulty in assuring the safety os storage? | Rejected. Not supported by the peer reviewed literature. There is no technical literature that can be drawn upon to substantiate a broad and sweeping point like this. At this point in time the comment from the reviewer is conjecture. There is no factual data set |
| 9508 | 7 | 43 | 13 | 43 | 18 | "lowest-cost transport option" is not clear the cost level, and cause the misunderstanding of easy installation. This text should be deleted. | Rejected. The text and the supporting references clearly make the required |
| 10551 | 7 | 43 | 13 | | | Change "storage" to CCS. Also needs a comment about energy inputs for CCS | Rejected. It is not clear what the commenter is referring to here and therefore there is no way to assess the |
| 7739 | 7 | 43 | 18 | 43 | 19 | It seems that the sentence is incomplete when it says that "International institutions and would..." | Accepted - text revised. |
| 16828 | 7 | 43 | 2 | | | Suggest addition of following after "evolve." "Analysis suggest the additional CO2 price required to incentivize the construction of an extensive pipeline system could range from $10 to $15/ton CO2." See: http://www.pnl.gov/main/publications/external/technical_reports/PNNL-17389.pdf | Noted. The CLAs made a decision to organize the chapter in this manner. The chapter discusses all relevant aspects of CCS (given space |
| 13298 | 7 | 43 | 22 | 43 | 29 | This paragraph emphasises the impacts of climate change in terms of raising electricity demand for cooling, but fails to mention that it could reduce energy demand for heating in many countries - it could do with more balance | Accepted. Increase of cooling demand and decrease of heating demand are mentioned with more balance. |
| 16829 | 7 | 43 | 25 | | 33 | I find these sentences unclear -- what are you trying to say? | Accepted. Rephrased. |
| 14545 | 7 | 43 | 34 | 43 | 34 | change 'whether' to 'weather'. Sentence could be reworded | Editorial. changed |
| 11861 | 7 | 43 | 36 | 43 | 39 | Suggest deleting this paragraph. This repeats earlier assertions. | Accepted. Deleted. |
| 18077 | 7 | 43 | 36 | 43 | 36 | "grid" instead of "grip" | Editorial. The sentence is deleted. |
| 6190 | 7 | 43 | 36 | 43 | 36 | "grip" should be "grid" | Editorial. The sentence is deleted. |
| 6441 | 7 | 43 | 36 | 43 | 36 | Spelling error: grid (not 'grip') | Editorial. The sentence is deleted. |
| 16830 | 7 | 43 | 38 | | | Suggest you insert after "inflexible" the following: "i.e., peaks will become larger relative to normal demand levels." | Rejected - sentence altered such that unclear text has now been eliminated. |
| 13299 | 7 | 43 | 40 | 43 | 42 | It may be worth adding water desalination as a further example of increased energy demand as a response to climate change | Accepted. Sentence on water desalination is added. |
| 9230 | 7 | 43 | 18 | 43 | 18 | the world "missing": insernational institution and_WHAT?__would be needed---- | Accepted - text revised. |
| 3158 | 7 | 43 | 1 | | | Section 7.7 doesn't say much. I suggest delete and ask the adaptation people (WG2? or perhaps other chapters in WG3, such as chapter 15) to address. | Rejected. It is important to focus on the key climate change impacts on energy demand, as a lead-in to the next bit of text on supply side impacts. Moreover, the IPCC agreed to include this overall |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 6921 | 7 | 43 | 29 | 43 | 33 | Please provide a more specific reference to WGII AR5. | Accepted. Specified: AR5 WGII 8.3.3 |
| 12605 | 7 | 44 | | | | I will send through a short document I wrote on biofuels and how they are effected by climate change, and the same for hydro. It might be useful. | Rejected - documents not received by authors, and not appropriate to include additional citations within the current IPCC quotation that is the primary way |
| 14544 | 7 | 44 | 14 | 44 | 14 | Add 'Angeles et al., 2010' to the references: Moises Angeles, J. E. Gonzalez, D. J. Erickson, III, and J. Hernandez-Figueroa, The impacts of climate changes in the renewable energy resources in the Caribbean region. ASME J. of Solar Energy Engineering, August 2010, 132, 031009 (13 pages), doi:10.1115/1.4001475 | Rejected - this is a very short section and we simply do not have the space to add many more references. We have largely tried to cite meta-studies that |
| 6191 | 7 | 44 | 16 | 44 | 29 | There's no need for such a long self quote; summarize the important conclusions and move on. | Rejected - this self-quote is in fact about the shortest text that one can write to summarize the conclusions of the |
| 12546 | 7 | 44 | 26 | | | After “countries,” add – “At regional scales, climate change will shift hydrographs and potentially decrease total annual output.” Il-Won Jung, Heejun Chang, 2011. Assessment of future runoff trends under multiple climate change scenarios in the Willamette River Basin, Oregon, USA. Hydrological Processes, Volume 25, Issue 2, pp. 258-277, DOI: 10.1002/hyp.7842 | Rejected - Cannot easily insert text within a quotation, and space constraints for this section are severe. Already noted that country and regional impacts are different than global. Don't want to get |
| 5141 | 7 | 44 | 30 | | 33 | If we are thinking about a time scale of more than 25 years for climate change impact on the local wind and solar resources, then the statement "reusing wind turbines, solar panel, etc. at different project sites" is questionable considering typical design life of these components are less than 25 years! | Accepted - There is no reference to reusing specific wind turbines at different sites. Here is the text: "The limited lifetime and portability of some RE technologies, such as wind turbines, solar panels, or bioenergy facilities, may mean that these technologies are more adaptable to such changes; a decline in resource potential in one area could lead to a shifting in the location of projects |
| 12591 | 7 | 44 | 30 | | | I think this statement is an oversimplification which ignores the infrastructural issues. For example, a wind farm will require the transmission and distribution grid to be extended, and improved. Additionally, local substations may be improved, or new ones built. New systems will, ultimately replace old systems as they become obsolete | Accepted - some additional text added |
| 18078 | 7 | 44 | 37 | 44 | 38 | EWEA has researched this (without having peer reviewed literature on the matter): offshore wind turbine standards and design criteria are already taking into account some CC related extreme conditions, such as rising water levels, gusts of wind, etc... | Rejected - noted, but without a peer reviewed citation we will not incorporate; moreover, we would need to dig up |
| 17370 | 7 | 44 | 39 | | | (D Arent and Tol, Forthcoming; Karl et al., 2009; S.C. Pryor and Barthelmie, 2010; R. Vautard et al., 2010; Wiser et al., 2011; World Bank, 2011) (S.C. Pryor and R.J. Barthelmie (2010): Climate change impacts on wind energy: A review. Renewable and Sustainable Energy Reviews 14 (2010), pp 430-437.) (R. Vautard et al. (2010): Northern hemisphere stilling partly attributed to an increase in surface roughness. Nature Geoscience Letters, 17 October 2010). | Rejected - The Prior study is included by reference in the Wiser et al meta-study. There are numerous potential studies that could be added, but we need to focus primarily on meta-assessments of the literature |
| 12547 | 7 | 44 | 40 | | | A useful recent reference: S. Rose, P. Jaramillo, M.J. Small, I. Grossmann, J. Apt, 2012. Quantifying the hurricane risk to offshore wind turbines. Proc Natl Acad Sci U S A. 109(9):3247-52. | Accepted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15466 | 7 | 44 | 42 | 44 | 45 | Although the issue of cable sag in the transmission lines is discussed in section 7.5.2, there is no mention direct mention of how climate change will affect its performance. Specifically, "At the transmission level, thermal expansion of transmission and distribution power lines causes line sag, decreasing the amount of power that can be securely transported through lines." http://www.dis.anl.gov/news/WECC_ClimateChange.html | Accepted - have addressed this peripherally. We may not be very specific, however, given space constraints |
| 12604 | 7 | 44 | 44 | | | Worth giving the example of how the drought in Australia has caused issues with a lack of cooling water for coal fired power plants | Rejected - We already noted that power generation facilities may experience performance problems from lack of |
| 5952 | 7 | 44 | 46 | 47 | | Objectivity: Nuclear facilities are designed to accommodate extreme weather events. Their resilience is being enhanced following safety reviews triggered by the Fukushima (geological) incident. | Noted - text eliminated |
| 17371 | 7 | 44 | 46 | 45 | 3 | In countries like France, measures have been taken to protect the nuclear facilities against high ambient temperatures during heat waves. It is expected, that there will be no need for further modifications due to the large margins that have been accounted for in the design changes. No special measures have been taken in France to protect the nuclear power plants against higher wind speeds and more frequent and more powerful lightnings. Only measures to protect the grids against higher wind speeds (storms) are needed. Also, higher ambient temperatures related to extreme weather do not pose a risk for nuclear power plants at river sites in France. Proactive water resource management is mandatory in the EU. An adaptation program is ongoing to preserve river sites in France during the lifetime of the nuclear power plants.<br>For other world regions, adaptation strategies to extreme weather events may be necessary, including, but not limited to, infrastructure relocation and reinforcement, cooling facility retrofit, and proactive water resource management (D Arent and Tol, Forthcoming; Rademaekers et al., 2011; Rübbelke and Vögele, 2011).<br>(K. Rademaekers et al. (2011): Investment needs for future adaptation measures for EU nuclear power plants and other energy generation technologies due to effects of climate change - Final report. ECORYS Nederland BV, Nuclear Research & consultancy Group (NRG), Energy research Centre of the Netherlands (ECN), 2011. | Rejected - all very good points, but section is severely space limited, and this additional detail simply cannot be added (if this detail were added, a lot more detail would also be needed). It is more appropriate for the WG2 report to go into this level of detail. Also need to focus on peer reviewed literature |
| 17372 | 7 | 44 | 46 | 45 | 3 | http://ec.europa.eu/energy/nuclear/studies/doc/2011_03_eur24769-en.pdf | Rejected - all very good point, but section is severely space limited, and this additional detail simply cannot be added (if this detail were added, a lot more detail would also be needed). It is more appropriate for the WG2 report to |
| 10552 | 7 | 44 | 7 | | | Change to ….impact of climate change on transport, including shipping and aviation, while…. | Accepted |
| 18513 | 7 | 44 | | | | Please also make use of the discussions in the IPCC SRREN on cc impacts on RE supply. This is covered in a dedicated section of each of the technology chapters. | Rejected - we already cite the summary for policymakers. Knowledgeable readers will discern that the source for the SPM are the underlying chapters of |
| 11941 | 7 | 44 | 1 | | | Everything in here should be put into the scetions where the particular technology os discussed in 7.5. | Rejected - basic structure of chapter determined by IPCC management, but |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4782 | 7 | 44 | 30 | 44 | 35 | I don't agree with this statement: "The non portability and longer lifetimes of dams used for hydropower may mean that these facilities are less adaptable to such changes.". It is true that hydropower has a long lifetime, but it's the first time I heard such a statement that long lifetime is a bad point ... the world need long term vision for curbing climate change, and a 15 year technology is maybe not enough ... ! It is a real adavantage to have those assets, as they could provide storage facility (both electricity and water), and regarding the water-energy (-and food) nexus, hydropower will thus play a key role for both mitigation and adaptation to climate change. Could the paper refered as (Roberto Schaeffer et al., 2012) be circulated in order to understand this statement? otherwise please remove the sentence. Furthermore the impact on climate change on hydropower is expected to be globally positive (but with differences from regions). | Accepted -Certainly the longer lifetime of hydropower is a positive in many respects, but with respect to the impacts of climate change / changes in precipitation patterns, the long lifetime is a downside in terms of the adaptability of the facilities themselves. We have, however, made changes to the text noting the possible climate adaptation benefits of long-lived dams from the |
| 4820 | 7 | 45 | 11 | 47 | 14 | Most of the text in this section could be summarised in a table | Accepted. A diagram has been |
| 18214 | 7 | 45 | 12 | | 16 | Delete: Significant opportunities exist to mitigate greenhouse gas emissions and other climate forcing within the energy sector. These opportunities include efficiency gains in the entire supply chain, reduction of methane and black carbon emissions, and albedo and soil carbon management; the most significant opportunity, however, is a shift in energy supply away from high-carbon energy sources, particularly coal. Comment: It certainly is a great opportunity, however, another great opportunity seen in formal education of the world population for sustainable development and rational consumption, which would impact on the reduction of energy demand and thus the decrease in supply this.<br>Alternative paragraph:<br>Significant opportunities exist to mitigate greenhouse gas emissions and other climate forcing within the energy sector. These opportunities include efficiency gains in the entire supply chain, reduction of methane and black carbon emissions, and albedo and soil carbon management; | Rejected. We prefer to remain specific as the current text is. The suggested text does not really say much. |
| 11769 | 7 | 45 | 14 | 45 | 16 | Energy must be chosen taking into  not only enviromnet but also economy and energy security. To avoid the misunderstanding, [prvided the economy and energy security is not taken into account] should be added after this sentence. Refer to No.4. | Rejected. Please note that economic and energy security aspects are taken up in other sections of the chapter (e.g. |
| 6460 | 7 | 45 | 14 | 45 | 16 | A shift in energy supply may include high-efficient usage of coal with CCS. So, the sentence should be changed to, for example;<br>“the most significant opportunity, however, is a shift in energy supply towards low-carbon, such as renewables, fossil fueled power generation with CCS, and nuclear”. | Accepted. "Capture and storage of CO2" was added to the list of important opportunities. |
| 9596 | 7 | 45 | 14 | 45 | 16 | Please, replace high-carbon energy sources with fossil fuel energy sources, and delete particulary coal. | Rejected. Note that coal is a lot more polluting than natural gas, as apparent |
| 10660 | 7 | 45 | 14 | 45 | 16 | Add a statement coal can be chosen from the view point of energy security. | Rejected. This section investigates options available for climate mitigation, |
| 10554 | 7 | 45 | 14 | | | Delete " and albedo and soil carbon management" which are not energy supply examples. | Rejected - both bioenergy, solar and hydropower systems can affect these |
| 9370 | 7 | 45 | 14 | 45 | 16 | It is more realistic and more productive to consider how to improve the efficiency of coal fired power plant than to simply encourage a shift in fuels. Therefore, the sentence should be rewritten or deleted. | Highly efficient coal fired power plants still have too high emissions to be a meaningful contribution to a stringent |
| 16831 | 7 | 45 | 15 | | | Suggest you replace "carbon energy sources, particularly coal" with "emitting fossil fuel technologies to low emitting technologies." | Taken into account. Please note that I have replaced "high carbon" with |
| 5933 | 7 | 45 | 16 | | | Life-cycle assessments of emissions from generation technologies do not significantly alter the assessment | Life cycle aspects are of crucial importance when going to very low emissions, evaluating bioenergy or |
| 16832 | 7 | 45 | 18 | | | Suggest adding after "… energy conversion technology." the following:  "In systems which rely on carbon prices to incentivize mitigation, it may be necessary to account for or include life cycle emissions as part of the price regime." | Rejected. Thanks for the suggestion, but questions of policy are not addressed in this section and there is no room for this |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 10555 | 7 | 45 | 18 | | | Avoid personal pronouns | Accepted. language has been adjusted. I do not in general agree with avoiding |
| 10070 | 7 | 45 | 21 | | 34 | The methane issue should be more elaborted, with respect to the differen GWPs in different timeframes for the different GHGs .<br>See: The future of Natural Gas, E. Monitz et al, MIT (2011);<br>Shindell et al, Science 326, 716 (2009) | Taken into account. The forcing of CH4 is an important issue and we are aware of the references suggested. However, the issue of metrics is one of overall importance for this report and it should be treated consistently throughout; |
| 5953 | 7 | 45 | 21 | 30 | | Clarity: A life cycle approach is appliewd to gas generation whereas coal is treated at point of use only e.g. coal bed methane emissions are not considered in the comparison made. | Rejected. No, all data refers to life-cycle emissions. |
| 10556 | 7 | 45 | 21 | 46 | 48 | Could be better presented as a table. | Accepted. A figure has been inserted. |
| 9909 | 7 | 45 | 22 | | | "and further review papers have been published since." Please cite them. Examples for systematic reviews are:<br>Burkhardt, J.J., Heath, G. and Cohen, E., 2012. Life Cycle Greenhouse Gas Emissions of Trough and Tower Concentrating Solar Power Electricity Generation. Journal of Industrial Ecology, 16, pp.S93–S109.<br>Dolan, S.L. and Heath, G.A., 2012. Life Cycle Greenhouse Gas Emissions of Utility-Scale Wind Power. Journal of Industrial Ecology, 16, pp.S136–S154.<br>Hsu, D.D. et al., 2012. Life Cycle Greenhouse Gas Emissions of Crystalline Silicon Photovoltaic Electricity Generation. Journal of Industrial Ecology, 16, pp.S122–S135.<br>Kim, H.C., Fthenakis, V., Choi, J.-K. and Turney, D.E., 2012. Life Cycle Greenhouse Gas Emissions of Thin-film Photovoltaic Electricity Generation. Journal of Industrial Ecology, 16, pp.S110–S121.<br>Potsdam-Institut für Klimafolgenforschung, 2012. Renewable energy sources and climate change mitigation : special report of the Intergovernmental Panel on Climate Change. New york: Cambridge university press.<br>Warner, E.S. and Heath, G.A., 2012. Life Cycle Greenhouse Gas Emissions of Nuclear Electricity Generation. Journal of Industrial Ecology, 16, pp.S73–S92.<br>Whitaker, M., Heath, G.A., O'Donoughue, P. and Vorum, M., 2012. Life Cycle Greenhouse Gas Emissions of Coal-Fired Electricity Generation. Journal of Industrial Ecology, 16, pp.S53–S72. | Taken into account. Please note that none of the cited articles addresses all the technologies. Rather, they are technology specific. New data including some of these references are cited as appropriate in the discussion of each individual technology further down. I have reviewed all of the cited papers, but prefer to cite original work over review articles when review articles add little to the original work. |
| 18079 | 7 | 45 | 25 | 45 | 26 | It would be helpful to have the average CO2 emissions for both oil and gas in co2/kWh here. It says that a combined cycle gas is 60% lower than coal. What is relevant is the average of all gas power plants. Provide the figures. The average carbon emissions for the fossil fuel technologies (oil, gas and coal) should be included, to give the reader a feeling of the challenge of reducing the power sector to below 100 gCO2e / kWh by 2050 and eventually zero (line 34) | Taken into account This issue is covered by a figure. |
| 9475 | 7 | 45 | 32 | 45 | 34 | Suitable sites for renewable energy or CCS are eccentrically-located and installation of them requires great cost. It should be added that there are difficulties to make world's average emission factor of electricity to zero. | Agree that aspects of grid integration need to be better addressed. Little research available and little space. |
| 9999 | 7 | 45 | 32 | 45 | 34 | If "eventually need to go to zero" means 0℃ target, this part should be deleted completely. There is not such an international agreement to have 0℃ target. In addition, 1.5 ℃ target is not realistic and even 2℃ target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract). These literatures are listed in the No10 line of this table. | Ch. 6 shows that emissions need to go to zero also for a 2 deg. Target. Reference to Ch.6 is now added. |
| 16833 | 7 | 45 | 33 | | 34 | Suggest replace "eventually need to go to zero" with "in the longer term may need to incorporate a large share of "negative emissions" (biomass with CCS)" then replace "even lower" with "negative" later in the sentence. Chapter 6 makes case that if some targets are to be achieved it may be necessary to do a large amount of negative emissions via biomass/CCS as part of an overshoot strategy. | Rejected. Too long and complicated sentence. The feasibility of negative emissions is really questionable from a life-cycle perspective and not |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 10072 | 7 | 45 | 35 | | 44 | The assumptions on additional primary energy demand for CCS should be listed.<br>According to Singh et al. coal (supercritical BAT and IGCC with 43% and 44% net efficiency compared to 35% world average) has a 74 to 78% reduction and Natural gas (NGCC and partial oxidation have 58% and 56% net efficiency compared to 42% world average) 64 to 73%. This should be made clear in the text. | Accepted. Text revised. |
| 6799 | 7 | 45 | 35 | 45 | 35 | There is much discussion about carbon capture and storage in this chapter. It's very important to indicate that harnessing this approach, if it serves practical will likely take decades. A special issue of Science a few years ago talked about large scale use in the mid 2030s. But nuclear and renewable technologies are available today. This time frame issue needs to be discussed. CCS is not a near-term solution, and it is critical that we address carbon emissions immediately. | Taken into account These are issues that should be considered by the scenario analysis. It does not take longer to build a large-scale CCS facility than a nuclear facility - or to implement large |
| 6192 | 7 | 45 | 35 | 46 | 13 | Long prose summaries of numerical data are rarely more effective than a chart. Charts allow for rapid comparisons and easier lookup. Suggest cutting down on these few paragraphs. | Accepted. A diagram has been introduced. |
| 5161 | 7 | 45 | 35 | 45 | 35 | is this referring to CCS? clearifications needed - "capture plants" are used several places | Taken into account. It says CO2 capture and that sentence is correct. There is a potential to misunderstand the follow on sentence, which has been changed to "When considering emissions of non-CO2 greenhouse gases and those connected to fuel production, capture plant and CO2 transport and storage, |
| 9655 | 7 | 45 | 38 | | 44 | When referring to emissions of 180-200 gCO2e/Kwh - it is not clear what this is referring to. Is this additional emissions associated with CCS on a coal plant? If so, please elaborate. The next sentence is also confusing - is this the fuel prodcution chain in Capture plants? CCS is portrayed as being negative - even though it still has a net positive impact in overall emissions from business as usual. | Taken into account - a figure has been introduced to clarify this issue. |
| 10071 | 7 | 45 | 39 | | | 1% leakage: is this the leakage rate for the transport of CO2? What is the annual leakage of the storage? | Accepted. The leakage refers to natural gas, and the language has been |
| 15444 | 7 | 45 | 4 | 45 | 9 | It may be worth noting that the interdependices between the energy sector and other sectors can potentially result in adverse sustainability outcomes. For instance, a climate change driven increase in energy costs may favour irrigation techniques that are less energy intensive but are also less efficent in terms of water use, such as flood irrigation. This would be tend to counteract recent trends in irrigation practices in many countries (such as Australia) where water use efficiency is being pursued as a climate change adaptation mechanism, noting that any change in irrigator behaviour would be subject to their individual sensitivity to energy costs relative to water scarcity. | Rejected - a good comment, but outside scope of this subsection, in which we focus on the physical impacts of climate change (not financial). Financial impacts and related sustainability issues are better addressed in Section 7.9 |
| 3402 | 7 | 45 | 44 | | | It should be obvious that co-processing of a small fraction of sustainable biomass with coal can bring the specific emmissions of CCS systems to zero or even negative values (IPCC SR CCS, 2005). | Rejected. We would need a peer-reviewed life-cycle study that demonstrates this. As this depends mostly on the emissions connected with biomass combustion, it is not mentioned |
| 5142 | 7 | 45 | 7 | | 8 | The water and energy conflicts could also impact bioenergy! Perhaps it should be mentioned. | Accepted - water/energy conflicts impact many energy supply sources. Rather than listing all of them, we instead alter the text to allow for other non-hydro impacts. Bioenergy related impacts from climate change, including from water, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13038 | 7 | 45 | 7 | 45 | 9 | Suggest adding the word "potentially" before the words "impacting hydropower". Regional conflicts exist currently and can be managed to allow for hydropower negotiation. Increased water conflict across borders may indeed occur due to climate change, but asserting that this will impact on hydropower is not a given. | Accepted - text amended accordingly |
| 5160 | 7 | 45 | 7 | 45 | 9 | (Sentence starting with "Climate change---") - On the other hand - since hydropower is in the nexus of water and energy it may be seen as a mechanism to solve conflicts by providing available water - the statement here seems too one-sided negative. ref SRREN ch 5.10 | Accepted - we also note the adaptation benefits of storage hydropower, though not in exactly the way suggested by the |
| 10553 | 7 | 45 | 7 | | | Could add after "Chapter 11)." Conversely, energy-smart food can closely link agricultural production and processing with sustainable energy systems (FAO, 2011).<br>Ref is: FAO, 2011. Energy-smart food for people and climate, UN Food and Agricultural Organisation, Rome. 65 pp. http://www.fao.org/docrep/014/i2454e/i2454e00.pdf | Rejected - Due to severe space constraints, we cannot add more text to this section unless absolutely essential. The food-bioenergy linkages are |
| 13502 | 7 | 45 | 7 | 45 | 9 | Text : "Climate change may also exacerbate water and energy conflicts across sectors and regions, impacting hydropower development (Cisneros and Oki, Forthcoming; D Arent and Tol, Forthcoming; Kumar et al., 2011)." The exploitation of unconventional fossil fuels is also at risk from climate change-stressed water supplies. The production of shale gas and oil from sands are particularly dependent on water. Water and energy conflicts are likely to become more widespread for most thermal (combustion) electricity generation, particularly higher incidence of drought. | Accepted - slight revisions made to reflect this potential impact, though we do not mention the impact specifically as it is better addressed in the WGII report, where space constraints are of less concern. |
| 4783 | 7 | 45 | 7 | 45 | 9 | The sentence "Climate change may also exacerbate water and energy conflicts across sectors and regions, impacting hydropower development" should be rephrased on a more positive way. Indeed the IPCC/SRREN stated that, as hydropower is at the cross-roads of 2 pilars for the development of a country (energy & water). It is important to note that climate change will have a global positive impact on hydropower (IPCC/SRREN). Furthermore thanks to the storage provided by reservoir hydropower plants, the development of hydropower regarding multi-purpose users (and under a sustainable way) should be part of the solution for both climate change mitigation and adaptation (control extreme events such as flood or drought seasons). | Accepted - we note the adaptation benefits of storage hydropower, though not in exactly the way suggested by the comment |
| 13059 | 7 | 45 | 10 | 55 | 1 | On the Costs & Potentials issues it is difficult for the reader to access the bigger picture of the cost & potential information. Each sector has its own approach to costs and potentials, which is appropriate as each sector has its own unique qualities and considerations. Nonetheless, the information that will be most relevant to take-away for policy-makers is overarching cost information that brings these different pieces together. To help policy-makers access this information, it should be important to highlighting market realization, but also the policy aspects of cost (by policy it is meant institutional frameworks and/or market frameworks and/or capacity building arrangements, etc...). In both developing and developed countries policy can have a strong impact on cost. Simply looking across the costs & potentials sections of the sector chapters, the reader could miss this message, although the information on policies and measures is there in the chapter. Therefore it could be important to make sure that these informations are put in perspective appropriately. | Taken into account - during the Vigo lead author meeting a process was initiated that improves the intercomparability between different sector chapters. Although this is still an on going process that will be finalized for the final draft, the current text has been partially improved. Aspects of capacity building are discussed in the policy section (now chapter 7.12). |
| 18542 | 7 | 45 | | | | There is a lot of good information in this section, but a lot of it repeats and expands on what appears in 7.5. Why not break it into relevant pieces and present this information there? This would help the reader by keeping the discussion of all emission reduction measures in one place. | Rejected - 7.8.1 serves as a summary section on these issues. |
| 6548 | 7 | 45 | 16 | | | Replace "high-carbon energy sources, particularly coal" with e.g. "high-carbon emitting sources, particularly low efficient coal burning technologies without CCS", as what matters is emissions, and the latest high efficient coal burning technology with/without CCS can be an effective option to mitigate CO2 emissions, especially in developing countries. | Taken into account. The text has been changed to "unmitigated fossil fuel based technologies, particularly coal." to indicated the relevance of CCS. CCS |
| 6549 | 7 | 45 | 32 | | 33 | Replace "need to be reduced [...] to meet the 2 degrees C mitigation goal" with e.g. "need to be reduced [...] if the 2 degrees C mitigation goal is to be met", as this goal has not been agreed on globally. | Taken into account. Good point. However, the suggested language change does not really have the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6550 | 7 | 45 | 33 | | 34 | Replace "need to go to zero" with e.g. "need to be reduced significantly" in accordance with AR4 WG1 Report Figure 10.21, or give a reference paper. | Taken into account. Reference to Ch.6 was added. |
| 6551 | 7 | 45 | 35 | | 39 | Add description for biomass/biogas co-firing, which has potential to reduce effective net life-cycle emissions from thermal power plants even to zero or below zero if adopted in addition to CCS. | Rejected - space constraints do not allow to go into all details here. |
| 13503 | 7 | 45 | 41 | 45 | 44 | Text : "Measures to increase energy efficiency and reduce fugitive emissions in fuel production and distribution can give further emission reductions, but these gains may be offset by the need to tap lower-quality resources which result in higher fuel-chain emissions (Section 7.5.1)." Arguably, the world is already using lower-quality fossil fuel resources, although they are still mostly classed as "conventional". Even if the fossil fuels are of a reasonable quantity, their increasing inaccessibility and the distribution effort required are reducing the overall energy rate of return, the Energy Returned on (Energy) Invested (EROI/EROEI). | Taken into account. Yes, and this is mentioned in 7.5.1. We found no published studies that provide firm evidence for increasing emissions, but follow the reasoning. |
| 2973 | 7 | 46 | 1 | | | Here and in the text the importance of the subsidies on fossil fuels should be described, emphasizing that in many developing countries renewable power production would be considerably closer to competitivity if subsidies on fossil fuels would be removed. See: Tobias S. Schmidt, Robin Born and Malte Schneider, 'Assessing the Costs of Photovoltaic and Wind Power in Six Developing Countries', Nature Climate Change, 2 (2012), 548–553 <http://dx.doi.org/10.1038/nclimate1490> [accessed 13 August 2012].. | Rejected - the section is about technical aspects. Subsidies are discussed in 7.12. |
| 16834 | 7 | 46 | 1 | | 30 | This section has problems -- begin by talking about the high life cycle emissions associated with particular energy sources, primarily from the manufacture of components to deploy these technologies. It then goes on to note however that as the system emits less and less these estimates will not hold -- this would say to me these estimates are extremely flawed. Perhas better to say something along lines that in mitigation scenarios, where increasing amounts of low emitting technologies are deployed, that the associated life cycle emissions in the manufacture of these technologies continue to decline. In systems which employ a CO2 price, the cost of the technologies will reflect the associated carbon emissions -- these costs will decline then as the overall system is increasingly low emitting. | Taken into account. Text replaced by figure as per earlier comments. |
| 3789 | 7 | 46 | 1 | 46 | 13 | Extend discussion to include biomass based electricity generation and, eventually, cogeneration | Rejected. Please note that bioenergy is covered in an annex to chapter 11 and there is not sufficient space to take this |
| 2838 | 7 | 46 | 20 | | | Another reference to what scenarios "will" produce without any corrective to note that this outcome is at present unlikely and would require big changes. For the reasons given on p 24-5 and 29 and section 7.10.5, emissions from marginal production of fossil fuels are likely to increase, not decrease, as unconventional sources take an increasing share and we remain locked in to fossil capacity. | This section has changed due to a figure to be added, and the meaning was clarified. I agree that will should be replaced by would |
| 4451 | 7 | 46 | 23 | 46 | 26 | Studies exist which show how that PV modules perform at better than 90% name plate capacity after 30 years in the field [Dunlop & Halton (2006). The performance of crystalline silicon photovoltaic solar modules after 22 years of continuous outdoor exposure. Progress in Photovoltaics: Research and Applications, 14, 53 – 64.]. This has implications for the current economic lifetime assumption of 20-25 years for PV devices. Moreover, recovering the material from end-of-life PV modules avoids the need to use virgin resources and associated the associated manufacturing energy penalty. PV modules from recycled materials have up to 60% less embodied energy [ (Bombach et al (2005). Recycling of solar cells and modules - recent improvements. Published at the 20th European Photovoltaic Solar Energy Conference and Exhibition.] | This comment may suggest that not all potential improvements in PV technology are adequately considered in LCA studies, or that the performance is misrepresented. We try to cite good studied, but potential issues with the literature that we cite must be addressed through the open scientific process. |
| 3790 | 7 | 46 | 23 | 46 | 30 | When discussing the impact of manufacturing processes or as process emission it should be wise to look the impact due the transportation sector with the introduction of electric or hybrid plug-in vehicles. | Rejected. This issue is not part of the scope of Ch.7. |
| 13040 | 7 | 46 | 31 | 46 | 31 | The phrase "complex issue" needs to be qualified, especially since the values given are in line with the values for solar and nuclear earlier in the same page (lines 3-5) | Noted. The term "complex issue" does not appear in the document. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13041 | 7 | 46 | 31 | 46 | 31 | The word 'emissions' needs to be changed to 'flux' because water bodies can absorb and degrade carbon as well. | Rejected. "Emissions" is used in the SRREN and kept here for consistency. The literature shows clearly that freshwater bodies are net emitters greenhouse gases (Bastviken et al. 2011, Science 331(6013):50), and this |
| 13039 | 7 | 46 | 31 | 46 | 48 | This topic is a complex subject to summarize but this paragraph fails to do this accurately and scientifically. | The summary has been changed after a careful reading of the more complete |
| 5162 | 7 | 46 | 31 | 46 | 48 | this paragraph should be checked against the contents of the SRREN ch 5.6.3 - many of the statements are to categorical and lacks references. | Taken into account. SRREN has been revisited, in addition to many publications on this issue. Text revised |
| 5935 | 7 | 46 | 31 | | | The discussion of emissions from hydropower facilities should reference the work done by IHA/UNESCO http://www.hydropower.org/iha/development/ghg/index.html | Rejected. This is a reference to a general website with content that shifts |
| 13042 | 7 | 46 | 32 | 46 | 32 | CO2 is not an issue with regard to hydropower. The UNESCO/IHA GHG Project has identified that CO2 is already likely to be emitted by the water body irrespective of the existence of a reservoir. The 'issue' is the conversion of CO2 to CH4. | Noted. About 0.9 PgC are transported by the rivers to the oceans. An estimated one half to two thirds of this carbon is in the form of organic carbon. In the ocean, organic carbon either is transported to the deep ocean (akin to the biological pump) or oxidized and dissolved. If dams lead to a reduction of the transport of carbon to the oceans and instead release it as CO2 to the atmosphere, this would have a climate impact within the 100 year time horizon. Cole, J. J., Y. T. Prairie, N. F. Caraco, W. H. McDowell, L. J. Tranvik, R. G. Striegl, C. M. Duarte, P. Kortelainen, J. A. Downing, J. J. Middelburg, and J. Melack. 2007. Plumbing the global |
| 13043 | 7 | 46 | 32 | 46 | 32 | Emissions of CH4 can be heavily influenced by upstream unrelated anthropogenic sources or activities, e.g., unreated releases of sewage. This has been observed in reservoir and run-of-river projects. | Taken into account. This is an important aspect but unfortunately, we do not have time to cover this here. It would be nice |
| 5163 | 7 | 46 | 32 | 46 | 32 | delete "run-of-the-river plants" or rephrase "and not" (good language?) | Accepted. Expression has been deleted. |
| 13044 | 7 | 46 | 33 | 46 | 33 | interfere' should be changed to 'influence' | Taken into account. We have replaced "interfere with" with "change" |
| 13045 | 7 | 46 | 33 | 46 | 33 | The word 'stopping' is incorrect. Reservoirs may influence the pattern of transport, but they do not stop the flow of biomass. | Accepted. This was incorrectly stated and has been modified. |
| 13046 | 7 | 46 | 34 | 46 | 35 | Accumulation of carbon does not 'slow' anaerobic digeestions. This sentence doesn't reflect current scienfitic knowledge, and furthermore, it doesn't make sense. | Rejected. In this sentence, 'slow' is an adjective, not a verb. We talk about |
| 13047 | 7 | 46 | 35 | 46 | 36 | The sentence beginning 'At the same time...' is erroneous. In the case where there are low level outlets, power stations may draw from the low-level anoxic water, which can increase methane exchange with the atmosphere, but this has nothing to do with surface water. | Taken into account. The original sentence was factually correct, but the reviewer points out that in addition to an exchange of gas between the surface water and the atmosphere, hydropower |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5164 | 7 | 46 | 35 | 46 | 35 | "---or after decommissioning." When mentioning decommissioning, there is at least a need for a reference . Historically few hydropower reservoirs have been decommissioned due to the very long life time of this technology. The SRREN found only two decommission examples globally and warned they might not be representative (SRREN 5.6.3.1) | Accepted. Reference to decommissioning has been removed also in the interest of space. Please note that the point is that the biomass that accumulates is likely to degrade and that it is a question of whether it degrades to CO2 or CH4. In addition, the question is |
| 5165 | 7 | 46 | 35 | 46 | 35 | Sentence saying "--,power stations also affect --": This is too categorical - they do not allways do this. Chanudet et. al found very low or no degassing in two reservoirs in Laos even when CH4 was found in the deep layers - (Chanudet V, et al, Gross CO2 and CH4 emissions from the Nam Ngum and Nam Leuk sub-tropical reservoirs in Lao PDR, Sci Total Environ (2011), doi:10.1016/j.scitotenv.2011.09.018). | Rejected. The existence of a single case among many examined (including two in the paper cited) does not contradict this statement. The paper does not prove that there is no effect even in the case of the Nam Ngum reservoir. The paper |
| 13048 | 7 | 46 | 37 | 46 | 37 | The concept of 'net flux' has been introduced here without any definition. Net flux represents the true impact of a water body which may then be allocated to its various water users, including hydropower among others. This approach has not been applied in the published literature to date but the scientific community recognizes the need to develop a methodology for this. | Taken into account. The sentence has been deleted. The original text included a reference to the only project where the next flux was measured. However, due |
| 5166 | 7 | 46 | 37 | 46 | 37 | "--the net flux of GHG." Ad: suggest footnote: "Net emissions are defined by the SRREN as Gross emissions minus pre impoundment emissions minus unrelated anthropogenic sources (SRREN ch 5.6.3.2 page 47 first sentence) An approach to unrelated anthropogenic sources and to the ghg issue could be found in the IEA Annex XII: managing the carbon balance in reservoirs (Draft), and in the IHA Measurement Field Guide | Accepted. At this point, we keep the reference to net emissions. However, this is a problematic term, as reservoirs take up and release GHGs. |
| 17373 | 7 | 46 | 38 | | | can act both as a sink… | Not clear what this comment refers to |
| 13049 | 7 | 46 | 38 | 46 | 38 | The word 'boreal' should be changed to 'cool' and the word 'significant' should be removed entirely. In the database of the UNESCO/IHA GHG Project, there are no examples of reservoirs that are 'signficant' sources of GHG. | Taken into account. Boreal has been removed. The cited reference shows that some projects have significant, even |
| 3791 | 7 | 46 | 38 | 46 | 38 | Replace "temperature" by "temperate". | Accepted. |
| 5167 | 7 | 46 | 38 | 46 | 39 | "in Tropical regions ---"this sentence state that anoxia and ghg emissions allways will happen in the tropical zone - this is not so, in Laos an old reservoir was found to be a sink, see: Chanudet V, et al, Gross CO2 and CH4 emissions from the Nam Ngum and Nam Leuk sub-tropical reservoirs in Lao PDR, Sci Total Environ (2011), doi:10.1016/j.scitotenv.2011.09.018 | Accepted. The explicit reference to tropical regions has been removed. The text now cites a specific review paper which illustrates the wide range of |
| 13050 | 7 | 46 | 39 | 46 | 39 | Regarding 'tropical regions' the UNESCO/IHA GHG Project has recently confirmed that the key influencing parameter on GHG transport and exchanges is temperature. It is an over-simplificaton to allocate performance to any region, tropical or otherwise. | Taken into account. Language changed. |
| 5168 | 7 | 46 | 40 | 46 | 40 | "--- leads to ---" - should say "can" or "may"(?) lead to - since the anoxia will not allways happen - factors like shape of reservoir basin, removal of forest to secure sirculation by wind and how the reservoirs are operated may secure oxygenation. Thi sstatement is not supported by the SRREN - ref is lacking | Accepted. Language changed. |
| 13051 | 7 | 46 | 41 | 46 | 41 | An older reservoirs' should be removed. GHG uptake can happen regardless of age. | Rejected. No reference is provided |
| 5169 | 7 | 46 | 41 | 46 | 41 | "Without ---": check logic in sentence | Accepted. Language changed. |
| 5170 | 7 | 46 | 42 | 46 | 42 | "Reported GHG ---" : this i snot correct - the SRREN say that "The majority of lifecycle GHG emission estimates for hydropower cluster between about 4 and 14 g CO2eq/kWh, but under certain scenarios there is the potential for much larger quantities of GHG emissions, as shown by the outliers" (5.6.3.1 page 44) - So the sentence here needs to be changed, it gives the impression that there exist a general range, valid for all HPP reservoirs of 0-150. The high end is definitely not found often (there are more than a million reservoirs globally, only a few have been investigated - it is important to have a correct picture of this issue, esp since it is not completely resolved.) | Accepted. Language changed to make clear that this is emissions that have been reported in the literature. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13052 | 7 | 46 | 43 | 46 | 44 | The average age of reservoirs in many countries is in excess of 100 years. There are very few examples of decommissioning and it is misleading to reference these as having the highest values of GHG emissions. | Accepted. The sentence has been deleted. Please note that the original sentence referred to one specific study discussed in SRREN and is valid for that study, it was not claimed that this was an important issue everywhere. However, it is an issue that has not been |
| 5171 | 7 | 46 | 43 | 46 | 44 | "-- the decomposition from silt after decommissioning, ---" :as mentioned - the SRREN gives a clear caveat here | Accepted. Decommissioning is removed. |
| 13053 | 7 | 46 | 44 | 46 | 46 | We consider the value estimated by Barros et all (41gCO2E/kWh) to be gross emissions that have not been discounted to account for the true net impact of a reservoir and its (multiple) purposes. However, even with this exageration of gross emissions this figure confirms that hydropower is among the lowest sources of GHG per unit of energy produced. | Taken into account. This opinion of the reviewer is not supported by the literature, which rather points into the opposite direction, as noted in the |
| 5172 | 7 | 46 | 44 | 46 | 46 | "Barros et al.---" the estimates in Barros et al is Gross emissions based on data collection from the literature, ref the definition on Net emissions given in the SRREN (see another comment to this paragraph) - the Gross estimate does not sort out what is due to nature and what is due to the man-made reservoir, and not what is due to unrelated anthropogenic sources (UAS). one should at least stress that Barros et al is a gross estimate --- since both pre-impoundment and UAS should be substracted the net should be expected to be less than the gross. | Accepted. "Gross" was inserted. |
| 9656 | 7 | 46 | 46 | | 48 | How can the range be 0-40g/Kwh for the LCA? Surely 0 is not true - there must be emissions from construction materials? A definition of what is included for each of the technologies should be included to make the comparison between them | This is a range provided in SRREN and cited here. It may be that dams indeed are built for other purposes and power generation has close to no impact, or that there is a net uptake of CO2 in the |
| 13054 | 7 | 46 | 46 | 46 | 48 | The term 'fossil GHGs' is not a commonly used term. We take it this is intended to mean emissions related to construction, but the rate of emissions on line 47-48 do not carry a meaningful unit. I.e., 0-40g/kWh of what? If carbon, it seems extraordinarily high. This is the only reference we've see that indicates construction is a meaningful factor in a life cycle assessment of hydropower. | Taken into account. CO2 was added. The ranges quoted here are supported by the literature that is cited. |
| 10073 | 7 | 46 | 5 | | | The reported range for nuclear is not correct:<br>According to the given source, the harmonized range is 3.7 to 110g CO2/kWh, depending on the type of reactor. The mean values vary between 11 and 18g CO2/kWh, and the range between the 25th and the 75th quartile is: as published 5.6 to 53g CO2/kWhand harmonized 6.2 to 33g CO2/kWh.<br>In addtion, it is mentioned that "Depending on conditions (decreasing global uranium market-average ore grade), median life cycle GHG emissions could be 9 to 110 g CO2-eq/kWh by 2050." | We meant to report the interquartile range, as we did for the other technologies, and the cited numbers are from SRREN, but it is correct that the numbers from Warner differ slightly. However, they are smaller, not larger as |
| 9231 | 7 | 46 | 38 | 46 | 38 | Change temperature region by temperate or warm regions | Taken into account |
| 5173 | 7 | 47 | 10 | 47 | 10 | "--run-of-the-river " - given the comments to the last paragraph on the previous page (page 46) - delete run-of-the -river and leave only Hydropower. | Accepted. "run-of-the-river" replaced by "many cases". See also comment 13055 |
| 2839 | 7 | 47 | 16 | 47 | 19 | This discussion here should point out that levelised costs are not a good basis for comparison between intermittent and inflexible sources (ie most low carbon sources) on the one hand and dispatchable sources on the other, since the value of electricity is time dependent. Bringing the point in as an afterthought in relation to infrastructure four pages later means it can easily be lost. | Taken into account - a description of the shortcomings and caveats of the LCOE concept has been added in the main text after figure 7.10 as well as in the |
| 5955 | 7 | 47 | 17 | | | The LCOE concept applies to electricity, not "energy" per se. | Rejected - some sources (e.g. the SRREN) use LCOE for non electrical |
| 6452 | 7 | 47 | 2 | 47 | 2 | Spelling error: short (not 'sort') | Accepted |
| 3792 | 7 | 47 | 2 | 47 | 2 | Typo error. Replace "sort-term" by "short-term". | Accepted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7740 | 7 | 47 | 21 | 47 | 24 | The sentence talks about renewable energy and states that related technologies are presented in Figure 7.12, which also presents nuclear, which is not a renewable source of energy. Please, review the text accordingly. | Rejected - the text does not say that only renewables are shown. |
| 18216 | 7 | 47 | 22 | | | Add to text: The levelised costs of many low carbon energy supply technologies have changed considerably since the release of the AR4. Even compared to the data recently published in the IPCC's SRREN (IPCC, 2011a), the decline of LCOE of important renewable energy (RE) technologies has been significant. Figure 7.12 depicts the LCOE evolution of those electricity supply technologies that Bloomberg New Energy Finance has been tracking in the past three years. The decline of LCOE of important renwable energy (RE) technologies has been significant. In the last four years the costs of renewable energy have declined significantly, especially photovoltaic (up 49%) wind (up 17%). CCS technology reduces the efficiency of power plants by 11% and increases costs by 30%. Nuclear plants have become very costly investment, but operating costs are quite low, producing zero emissions. | Rejected - after a short motivation based on renewable energies, the paragraph constrains itself to the introduction of the figure. Details for single technologies are discussed in other paragraphs. |
| 18217 | 7 | 47 | 22 | | | Alternative paragraph:<br>The levelised costs of many low carbon energy supply technologies have changed considerably since the release of the AR4. Even compared to the data recently published in the IPCC's SRREN (IPCC, 2011a), the decline of LCOE of important renewable energy (RE) technologies has been significant. Figure 7.12 depicts the LCOE evolution of those electricity supply technologies that Bloomberg New Energy Finance has been tracking in the past three years. In the last four years the costs of renewable energy have declined significantly, especially photovoltaic (up 49%) wind (up 17%). CCS technology reduces the efficiency of power plants by 11% and increases costs by 30%. Nuclear plants have become very costly investment, but operating costs are quite low, producing zero emissions. | Rejected - after a short motivation based on renewable energies, the paragraph constrains itself to the introduction of the figure. Details for single technologies are discussed in other paragraphs. |
| 5143 | 7 | 47 | 9 | | 11 | What's about  for the geothermal and ocean energy technologies? | Rejected. Studies are either higher (deep geothermal) or not sufficient |
| 13055 | 7 | 47 | 9 | 47 | 11 | The qualification of only run-of-river hydropower is not supported by text or references anywhere in this section, nor anywhere in the SRREN report.  The phrase 'run-of'river' should be removed so that the sentence indicates that wind, solar, nuclear and hdyropower can provide electricity with less than 5% of the lifecycle GHG emissions of coal power.  The vast majority of hydropower will fit in this category, not just run-of-river. | Accepted. |
| 13504 | 7 | 47 | 9 | 47 | 11 | Text : "The literature reviewed in this section shows that a range of technologies can provide electricity with less than 5% of the life-cycle GHG emissions of coal power: wind, solar, nuclear and run-of-the-river hydro power." I would expect that Renewable Gas (the class of emerging gas fuels that includes Renewable Hydrogen made from "spare" wind and solar capacity, refined and upgraded Biogas, and Syngas from such processes as gasification) when properly developed will be in this group also. | Rejected. No literature reference has been provided to support this claim. |
| 4784 | 7 | 47 | 9 | 47 | 11 | Proposition to replace the sentence "The literature reviewed in this section shows that a range of technologies can provide electricity with less than 5% of the life-cycle GHG emissions of coal power: wind, solar, nuclear and run-of-the-river hydropower" by "The literature reviewed in this section shows that a range of technologies can provide electricity with less than 5% of the life-cycle GHG emissions of coal power: wind, solar, nuclear, run-of-the-river hydropower and some reservoir hydropower". The storage (water & energy) provided by reservoir hydropower will be a key element for climate change issues (mitigation & adaptation). | Accepted. "run-of-the-river" replaced by "many cases". See also comment 13055 |
| 18543 | 7 | 47 | | | | It would be very helpful to have one summary sub-section that includes a comparison of LCOEs across RE, CCS, nuclear and to the extent possible, infrastructure costs. This would also be a major output of Ch 7 that could feed into the technical summary and SPM. | Rejected - space constraints do not allow for this comparison. In addition, the data ranges are too broad to allow |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4358 | 7 | 47 | 14 | | | As the section titel indicates, this section discusses "costs" of mitigation measures. However, a holistic, social-cost analysis of electricity cannot only focus on the average generation costs, but needs to take into account when and where electricity was generated (see my comment on LCOE). Even if a coal plant is "cheaper" as measured in average generation costs than a gas plant, that doesn't mean that it is not socially (and privately) cost-optimal to employ a gas plant (or, indeed, a mix of coal and gas plants). This is mainly due to the different variable-to-fixed cost ratios of technologies, or, in the case of solar/wind power, due to the fluctuating nature of the underlying resource. | Taken into account - a description of the shortcomings and caveats of the LCOE concept has been added in the main text after figure 7.10 as well as in the methodical annex. |
| 4356 | 7 | 47 | 14 | | | LCOE is a missleading metric when comparing dispatchable technologies with fluctuating generators, or when comparing different dispatchable generators with varying variable-to-fixed cost ratios. The reason is that electricity is not an homogenous good over time, that means that its value (private as social) depends on the point of time it is produces. Since different technologies produce at different times (e.g. peakers only at times of high prices), comparing average generation costs is highly missleading. However, trends over time are of utmost importance, of course. I propose to a) highlight this fundamental shortcoming in the text and b) change the figure such that it focuses on development over time rather than cross-technology comparison. Development over time by itself is impressive and interesting enough!<br>See Joskow, Paul (2012): “Comparing the Costs of intermittent and dispatchable electricity generation technologies”, American Economic Review 100(3), 238–241. | Taken into account - the caveats concerning the use of LCOE are emphasized by a footnote which refers to the respective discussion of these shortcomings in the Methodological Annex. In addition, caveats that should be observed while interpreting LCOE are mentioned after figure 7.10 |
| 4357 | 7 | 47 | 14 | | | References regarding renewables are limited to IPCC, IEA, and Bloomberg NEF; that seems somewhat flawed | Rejected - the cited sources are reliable ones. The reviewer is asked to provide further material that can be considered |
| 4452 | 7 | 48 | | 48 | | This graph needs a label on the x-axis | Taken into account. The units are given |
| 18215 | 7 | 48 | | | | Comment: In this figure should include costs program Implementation educational and UREE measures by region. And if not exactly apply to this figure, Similarly it should be mentioned in the text of Chapter 7 the mitigation option climate change through programs formal education from childhood, which contribute to the formation of men and Women more environmentally responsible and less consumerist. | Rejected - the figure only shows technologies cost. The general comment refers to behavioural aspects of consumers, which are to be treated in |
| 10074 | 7 | 48 | | | | As LCOE from RES change very fast, a regular update of this figure is encouraged. | Accepted - this is done. |
| 18080 | 7 | 48 | | | | The figures for nuclear seems very low. In an interview with Daily Telegraph 12/8 2012, EDF CEO de Rivaz is talking about cost around £140/MWh (US$ 225/MWh) to build Hinkley Point in the UK - more than double the highest point of the nuclear cost range in the graph. No power company will confirm that you can build new nuclear at anything close to the range indicated in the graph. Various reports for Hinkley put the cost at £7 billion per reactor (1,600 MW each) or £4,375/MW (US$ 7,100/MW). See http://www.telegraph.co.uk/finance/newsbysector/energy/9470555/EDF-chief-Vincent-de-Rivazs-nuclear-vision-aims-to-inspire-a-generation.html | Taken into account - the cost of nuclear power plants were updated according to the newest available cost data from the BNEF data base. Whereas the highest of these are close to the given specific capital expenditures, the derived LCOE deviate from the ones given in the |
| 15949 | 7 | 48 | | 48 | | Why not take the cost figures from figure 7.13 for fossil generation with CCS and include them in this figure - it would make for some useful comparisons | Taken into account. Chart is changed. |
| 5174 | 7 | 48 | | 48 | | Small Hydro/Large hydro on the Y-axis : use same wording as the SRREN: Large Scale Hydro or Small Scale Hydro- since nobody actually knows what small or large hydro is (no globally accepted definitions based on MW! SRREN ch 5.3.1 and 5.4.3.4) | Taken into account - a size limit of 10MW is used for small hydro. Text revised. |
| 10557 | 7 | 48 | | | | This is from a single reference. Better to assess the literature and produce own data and revise text accordingly. Why is nuclear such a small range for example? I don’t believe it | Taken into account - additional sources were used to describe the cost of nuclear power plants. The nuclear range |
| 9232 | 7 | 48 | | 48 | | To limited the title: Figuer 7.12 Levelised cost in $/MW.h of electricity for commercially available fossil and nuclear power plants as well asrenewable energy technologies as observedfor the second quarter of 2012 (and for the secondquarter of 2009) The rest of parragraph send to foot page | Accepted - text revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12329 | 7 | 48 | 1 | | | The figure is interesting. It is, however, unclear how the cost of carbon is taken into consideration. Annex II states that carbon costs are included in LCOE. Does this mean that for coal fired plants the blend include European production with EU ETS pricing? If so, what are the assumptions about EU ETS prices? It would be useful to add a similar figure (or two) that includes carbon pricing for all fossil energy production. The point would be to show that fossil fuel power plants are operating without having to pay for their pollution costs and that, as this changes, their competitive advantage would change quite significantly. We suggest two scenarios; one with a carbon price of $20 and on at $100 per tonne CO2. | Taken into account - the cost of carbon has been excluded from the results. There is a still on going process to collect additional literature and data concerning gas and coal fired power plants in the context of the recent changes in the gas markets. The final draft will show how for coal and gas fired |
| 3793 | 7 | 48 | 1 | 48 | 8 | I am surprised with some of the results, in particular biomass gasification. Can you report where there are commercially operating power plants based in this technology? | Taken into account - numbers have been revisited and confirmed by the Bloomberg New Energy Finance database. Please provide material that |
| 13202 | 7 | 48 | 1 | | | The cost of nuclear nergy in France has recently been estimated by the "Cour des Comptes", the highest finantial juridiction in France, to 60 $/MWh, including the post Fukushima safety improvements. This value is significantly below the lower end of the bracket shown in the figure | Taken into account - IEA data now are used for nuclear. The lower end of them (referring to reactors in Korea) is below the number mentioned here. Without additional material the reliability of the |
| 10558 | 7 | 48 | 14 | | | Could add a sub-heading "Renewable Energy" here and also for "Fossil fuels and CCS" and "Nuclear" below where relevant to aid the reader. | Taken into account - the different figures are merged to become a single one. Subheadings therefore are no |
| 11942 | 7 | 48 | 15 | | | "PV proces fell…" Need reference. | Taken into account - the underlying text |
| 15543 | 7 | 48 | 9 | | 13 | Should also mention sensitivity to economic projections. | Accepted - text revised |
| 2786 | 7 | 48 | 9 | 48 | 27 | The BNEF references are generally directionally right but they do not take into account country specific costs and factors and so can be quite misleading if applied to a particular situation. The data basically shows that everything but STG and Marine are between $100 and $200 / MWh and I would say that is the granularity that you can use generic global data at. | Rejected - BNEF does take into account country specific conditions. |
| 4785 | 7 | 48 | | | | This figure is very interesting. However it could be interesting to define what is the size limit between small and large hydropower. Please also refer to IRENA, 2012 publication on LCOE with recent values provided. Year of the $ expressed for LCOE? | Taken into account - a size limit of 10MW is used for small hydro. IRENA, 2012 is cited. The dollars are those in |
| 10559 | 7 | 49 | 1 | | | A variety of….? Be specific. | Rejected - the diagram shows all of them. Repetition is not feasible due to space constraints. The underlying text |
| 18081 | 7 | 49 | 16 | 49 | 16 | Delete (if the cost of carbon is reflected in the market). To indicate that onshore wind should be less competitive than e.g. solar thermal or PV is incorrect. In Turkey, New Zealand, Brazil and other places, onshore wind is winning tenders at lower prices than any of the mentioned technologies, as well as gas. In Brazil's 2011 tender wind power contracts were awarded at BRL 100 / MWh (US$ 50 / MWh). | Taken into account - the questioned text has been deleted. |
| 17374 | 7 | 49 | 17 | | | onshore wind power plants… | Taken into account - comment is obsolete. Text has been deleted. |
| 2787 | 7 | 49 | 17 | 49 | 19 | The sentence compares the cost of supply of energy and the value of energy consumption which are two different things (say for PV on a rooftop). PV panels on a rooftop rely on the grid and associated systems as much as a remote large-scale power generator and so I believe that the comparison made is erroneous and can be misleading. | Taken into account - the underlying text has been deleted due to space constraints. The comment is obsolete. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9597 | 7 | 49 | 20 | | | Please, add following information as RE is already competitive; Grau[1] reviewed the adjustments of the feed-in tariff for new solar photovoltaics(PV) installations in Germany and developed an analytic model to simulate weekly installations of PV systems≤30kW(35% market share in 2010) based on project profitability and duration. The model shows the need for (i) more frequent tariff reductions (ii) and an appropriate choice of adjustment response parameters. The analysis shows that adjustment schemes with more frequent tariff reductions would have reached development targets in 2011 more effectively.<br>[1]Thilo Grau Responsive adjustment of feed-in tariffs to dynamic PV technology development ( 2012 ) German Institute for Economic Research (DIW Berlin) Discussion Papers 1189<br>http://www.diw.de/documents/publikationen/73/diw_01.c.392871.de/dp1189.pdf | Rejected - comment is misplaced. The discussion of the feed-in tariff refers to chapter 7.11. Unfortunately, the comment cannot be taken into account there, because it addresses a very special aspect of the feed-in tariff system. These details cannot be discussed due to space restrictions. |
| 17751 | 7 | 49 | 23 | | | replace "fuel" by "plant" | Accepted - text revised. |
| 6800 | 7 | 49 | 23 | 49 | 34 | Similar comment as before. The costs and efficiency penalties associated with carbon capture and storage make it sound like this is a technology available today. It is well into the future. | Taken into account - The fact that commercial CCS power plants are not |
| 6193 | 7 | 49 | 23 | 49 | 24 | "Applied to fossil-fuelled power plants, CCS reduces the fuel efficiency of those plants. Typical efficiency differences projected for 2015 are on the order of 8 - 11 % points." the 8-11% points is a very misleading way to express changes, as its significance depends greatly on the starting efficiency. This would be better expressed as a change in overall efficiency, e.g., a change from 40% to 36% would be a 10% drop, not 4 percentage points. | Rejected - it is common scientific practice to express absolute changes of % values by %-points. |
| 6453 | 7 | 49 | 23 | | | See also Page et. al. (2009) for energy penalty data and discussion | Rejected - publication cannot be considered without additional |
| 17752 | 7 | 49 | 24 | | | replace "differences" by "penalty" | Accepted - text revised. |
| 7741 | 7 | 49 | 3 | 49 | 22 | This whole paragraph replicates what has already been published in the SRREN. What is the purpose of this? Shouldn't the AR5 provide newer findings? | Taken into account - the purpose of this paragraph is to provide a summary of the cost of renewable energies in comparison to the development of other low carbon technologies. Part of the |
| 2840 | 7 | 49 | 3 | 49 | 22 | The quotation here is selective. One could as easily quote different passages from IPCC 2011a – eg “the current levelized cost of electricity (LCOE) from solar PV is generally still higher than wholesale market prices” (p 380) “Commercial markets are not yet driving marine energy technology development” (p 522) “Though the cost of wind energy has declined significantly since the 1980s, policy measures are currently required to ensure rapid deployment in most regions of the world” (p 583) and so on – to give a completely different impression. The unbalance in the text obscures the important fact that, with some notable exceptions, most renewable sources in most parts of the world are not competitive and require subsidies. If life were otherwise, the problem of decarbonisation would be easier to deal with | Taken into account - text revised. |
| 10560 | 7 | 49 | 5 | 49 | 22 | Could add there is a cost related to integration but largely unknown for most technologies (Ref SRREN Ch 8) | Rejected - integration costs are discussed in the same section (a couple |
| 13505 | 7 | 49 | 20 | 49 | 22 | Text : "Although the gas prices went down in the last few years in many regions, the increase in capital expenditures and operation and maintenance costs is explaining the raising LCOE of natural gas combined cycle power and coal-fired power plants." For those countries with extensive gas grid and related infrastructure, it will be of benefit to invest in Renewable Gas, to displace carbon in the gas supplies, but also, potentially, to reduce the impact of potentially rising costs of the raw fuel. Lifecycle investment and operations and maintenance will still be necessary, but increasing availability of low carbon gas fuels, at reasonably low costs, should remove the operating risk of choosing to continue with gas-fired electricity generation. | Rejected - comment is misplaced. Power to gas or biogas are discussed in chapter 7.5 and 7.6, respectively. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17203 | 7 | 5 | 1 | 7 | 20 | The summary does not note the emission reduction potential of the energy sector and sub-sectors within. A useful reference is Luderer L, Pietzcker RC, Kriegler E, Haller M, Bauer N (2012): Asia's Role in Mitigating Climate Change: A Technology and Sector Specific Analysis with ReMIND-R. Energy Economics Special Issue on the Asian Modeling Exercise. Accepted for publication. | Rejected - space constraints do not allow a deep dive here |
| 11844 | 7 | 5 | 1 | 5 | 3 | The opening sentence is ambiguous - it is not clear what the 45% refers to. Grammatical errors may be the source of some of the ambiguity | Taken into account - text has been deleted. Comment is obsolete. |
| 6243 | 7 | 5 | 1 | | | price, tax ans subsidies trends are missing | Rejected- space constraints do not allow for a consideration of these very specific |
| 7475 | 7 | 5 | 1 | 87 | 24 | I have already submitted my comment on this chapter (upload document 218). However, I don't think my general comments were uploaded. I repeat them here.<br>First some background information. I have had over 40 years experience in renewable energy, especially biomass energy. I have worked in over 50 countries on biomass energy surveys, wood consumption/timber trends studies, renewable energy supply & demand, biomass inventories and the environment. I have lived in Africa and Asia for 17 years.<br>Some of my recent publications, which are pertinent to this chapter, are:<br>Openshaw, K (2010a). Employment generation by biomass energy and its contribution to poverty alleviation in Malawi and other developing countries. Biomass and Bioenergy Journal 34, 2010. Elsevier, Oxford, England UK.<br>Openshaw, K (2010b). Can biomass power development? Gatekeeper Series 144, April 2010. The International Institute for Environment and Development (IIED), London, England UK.<br>Openshaw, K (2011a). Biomass as a benign energy source. Chapter 52 in Encyclopedia of Agrophysics. Eds. J. Glinski, H. Horabik, J. Lipiec. Springer.com/agrophysics. P.O. Box 17, 3300 AA Dorrdrecht, the Netherlands.<br>Openshaw, K (2011b). Supply of woody biomass, especially in the tropics: is demand outstripping sustainable supply? The International Forestry Review, Vol. 13(4), 2011. Ed. A.J. Potinger, the Crib, Dinchope, Craven Arms, Shropshire, SY7 9JJ UK. Published by the Commonwealth Forestry Association.<br>Barnes D.F., Priti Kumar, Keith Openshaw (2012). Cleaner hearths, better homes: new stoves for India and the developing world. Oxford University Press. The World Bank. ESMAP (energy sector management assistance programme). ISBN 0-19-807836-6.<br>Openshaw, K (2012). Remote sensing of biomass: principles and applications. Submitted for publication to the second sustainable world forum. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7476 | 7 | 5 | 1 | 87 | 24 | Biomass energy is the only energy form that is treated in two ways, namely 'traditional' and 'modern'. This separation infers that 'traditional' biomass energy is non-sustainable and has to be substituted as quickly as possible for 'modern' biomass and other forms of renewable energy (RE). For example, P. 18 line 14 states that biomass and waste (demand) are growing at 2% per annum including traditional and modern ---. P. 57, line 8. "Providing clean, affordable and reliable modern energy services is also at the heart of development challenges in many developing countries ---". P. 57 line 12 "over 3 billion people are estimated to lack access to modern fuels for heating and cooking ---". P 58 line 6 "The provision of access to clean, efficient, affordable and reliable energy services entails multiple co-benefits ---". Also, footnote 1 on page 9 talks about more comprehensive coverage of energy resources, including non-commercial ones (i.e. traditional ones).<br>Granted unprocessed biomass has a lower energy value per unit weight and is more difficult to control than liquid and gaseous fuels. But charcoal is lumped with fuelwood, residues and dung as traditional. Charcoal is a processed smokeless biomass fuel that has an energy value on par or better than most coals and has never been 'non-commercial'. To denigrate some biomass as traditional, infers that the people using it are handicapped! In my opinion, there should be no distinction with types of biomass as inputs for different end uses. | Rejected - the distinction between traditional and modern biomass is used in many peer-reviewed articles and in energy statistics. |
| 7477 | 7 | 5 | 1 | 87 | 24 | Chapter 7 keeps on mentioning energy access to modern fuels. But what it really means is access to electricity, for most people do have access to kerosene for cooking and lighting and many have access to LPG and even natural gas, especially in urban and peri-urban areas. However, for the rural population, if biomass is available within a reasonable collection area, most will use it in preference to fossil fuels. Kerosene is used sparingly for lighting in the absence of electricity and sometimes as a starter fuel for charcoal etc. | See section and references in 7.9.1.2 |
| 7479 | 7 | 5 | 1 | 87 | 24 | Although much fuelwood, residues and dung are collected, some are sold to households, the service sector and industry or grown specifically for industry (wood for tea drying) or industrial residues used for heat and steam (bagasse). Commercial biomass production is an important source of income and employment, especially for rural people. (Openshaw, K 2010a). It is estimated that about 30 million people worldwide are employed (full time) in the growing/managing of trees, and the production, transport and trade of biomass to sell so-called non-commercial energy to households and non-households. This is 26 times larger than that specified on Page 67, lines 6-12 and 2.5 times larger than the forecast for 2030! Rather than encouraging the shift away from 'traditional biomass energy' the chapter should be promoting it, for it is one important way to help poverty alleviation. | The move away is motivated by two concerns: unsustainable harvests and high PM emissions during combustion. |
| 7480 | 7 | 5 | 1 | 87 | 24 | Throughout the chapter the sustainability of supply of RE is mentioned and Figure 7.9 depicts global technical potentials of RE sources. For biomass the technical potential range is from a minimum of 50 EJ to a maximum of 500 EJ. I don't know how these figures were derived, but the net primary production (NPP) of terrestrial biomass is about 53 GtC/yr, equivalent to about 2000 EJ (Openshaw, K 2011b – citing Melillo et al 1993). The total NPP is approximately 4000 EJ including NPP in oceans and other water bodies).<br>For wood alone, the accessible NPP is an estimated 343 EJ (total 404 EJ) and the current demand for all wood products is an estimated 66 EJ. Thus, much more annual wood yield could be used without making inroads into the tree capital. (Openshaw, K. 2011b). However, P 26, lines 33/34 state "Because the theoretical potential does not take into account energy conversion losses or deployment barriers, the theoretical potential is of relatively little practical use". For biomass energy, I think this statement is wrong. Local people know their resources and if given some simple training (and tools) they could manage them more effectively, especially if they have control over them and have expanded markets. □ | Rejected - the bioenergy potential data are based on the IPCC SRREN. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7481 | 7 | 5 | 1 | 87 | 24 | More will be said about this when discussing the Bioenergy Annex, pages 88 to 96. However, the impression is left here and in Chapter 11 that cutting down trees is reducing the forest capital (deforestation) when most is harvesting, unless land is being cleared for pastoral and arable agriculture. If the annual capture of CO2 by biomass is not used, it reverts back to atmospheric CO2 (the carbon cycle). If you don't use it, you lose it!<br>The use of crop and tree residues and such crops as Panicum sp. (switchgrass) and Miscanthus sp. (silvergrass) as a feedstock for ethanol production, is being promoted as are waste products or crops that do not compete with food crops. But, the breaking down of cellulose to simple sugars is not easy and not very efficient. Page 33 line 8 states that "lignocellulose-based transport fuels (to provide ethanol) are at a pre-commercial stage". However, the thermal breakdown of cellulose to liquid and gaseous products has been practiced for centuries. One of the first building blocks for the organic chemical industry was wood alcohol (methanol) and this can be used as a liquid fuel directly, or turned into petrol (gasoline) or diesel. Likewise, another product of dry distillation is gengas (CO + H2). This can be used to make motor fuels etc. It may be cheaper and more efficient to go this route, rather than the ethanol route for lignocelluloses products. Also, these products can be burnt directly in boilers to produce heat, steam and/or electricity. Moreover, if wood is the feedstock, the ash is a valuable fertilizer, for it has a relatively high content of potassium (K). □ | Noted - comment is obsolete as the bioenergy annex has been moved to chapter 11. |
| 7482 | 7 | 5 | 1 | 87 | 24 | It was also stated that silvergrass does not require much if any N fertilizer (P 90 line 19). Its average yield is about 14-15 dry t/ha with a rainfall of about 1500 mm. (Energy value 16.6 GJ/t. – 5% ash content). This will require 70-75 kg N/ha to maintain productivity: similarly for switchgrass.<br>Carbon capture and store (CCS) figures prominently in this chapter. Yet the costs are high and technical problems, plus leakage risks have not been solved. About 25% of the generated energy is used to compress and 'purify' the CO2. Pipelines have to be built to suitable storage sites and both have to be monitored for leaks. It may be cheaper to grow (woody) biomass to store an equivalent amount of useful energy. What is more, the annual yield from a managed plantation with an equal representation of all age groups, when fully operational, will give a product that can be used to generate electricity etc. Surely, this is better than burning coal? | Noted - comment is obsolete as the bioenergy annex has been moved to chapter 11. |
| 7850 | 7 | 5 | 1 | 7 | 20 | This executive summary is a good example how every paragraph includes a reference to tzhe underlying subchapter as well as a statement on the uncertainty in the calibrated IPCC-language. | Noted. |
| 2783 | 7 | 5 | 1 | 5 | 7 | The beginning of this sectionis quite garbled and I couldn't quite figure out what the start of the first paragraph was trying to say | Taken into account - text has been deleted. Comment is obsolete. |
| 2938 | 7 | 5 | 1 | 5 | 3 | "The energy sector...provides only 45 % of energy-related GHG emissions." So where are the other 55% ? | Taken into account - text has been deleted. Comment is obsolete. |
| 3766 | 7 | 5 | 13 | 5 | 13 | "are not yet sufficient". As written the message states that the policies in effect will be able to curb GHG emissions in the energy sector. Is this the purpose of the sentence? | Taken into account - text has been deleted. Comment is obsolete. |
| 4803 | 7 | 5 | 14 | 5 | 14 | I am not familiar with 450ppmv CO2eq - could you explain in a footnote for non-experts? | Taken into account - text has been deleted. Comment is obsolete. |
| 18160 | 7 | 5 | 16 | | | By 2050, growth in population, economic activity and energy access is expected to give rise to a 1.6 to 2.5 fold increase in energy use and energy related GHG emissions in business-as-usual scenarios [7.12, high agreement; medium evidence]. Fossil fuel resources are abundant and cost competitive with other energy forms. Since the industrial revolution, fossil fuel combustion released almost 400 Gt C into the atmosphere. Left hydrocarbon reserves alone contain two to four times that amount of carbon. | Noted - the comment repeats the original text. Please clarify on what you are commenting on. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18158 | 7 | 5 | 16 | | 23 | Delete: By 2050, growth in population, economic activity and energy access is expected to give rise to a 1.6 to 2.5 fold increase in energy use and energy related GHG emissions in business-as-usual scenarios [7.12, high agreement; medium evidence]. Fossil fuel resources are abundant and cost competitive with other energy forms. Since the industrial revolution, fossil fuel combustion released almost 400 Gt C into the atmosphere. Left hydrocarbon reserves alone contain two to four times that amount of carbon. Therefore, limits or constraints on fossil fuel availability cannot be relied upon to limit global GHG concentrations to levels consistent with the Copenhagen Accord [7.4, high agreement; robust evidence]. Comment: The Bolivarian Republic of Venezuela does not consider the Copenhagen Accord as a legitimate document of the UNFCCC, and bad could be used as official reference. | Taken into account - the reference to the Copenhagen Accord account has been replaced by the Cancun Agreement. The remaining part which has nothing to do with the Accord, however, is not deleted. |
| 18159 | 7 | 5 | 16 | | 23 | Alternative paragraph: | Rejected - comment is unclear. Please |
| 4802 | 7 | 5 | 16 | 5 | 23 | Expected increase in energy use: are these values comming from governments/ accademia / both? | Taken into account - text has been deleted. Comment is obsolete. |
| 10042 | 7 | 5 | 16 | 5 | 17 | According to SRREN Chapter 10.3 there are scenarios which indicate a possibility to increase the energy demand significantly less than 1.6 times. Please more resources | Taken into account - text has been deleted. Comment is obsolete. |
| 4774 | 7 | 5 | 18 | 5 | 18 | Please add "still" in the sentence. Proposition "Fossil fuel resources are still abundant and …" | Taken into account - text has been deleted. Comment is obsolete. |
| 12316 | 7 | 5 | 18 | 5 | 19 | Please consider to add to the sentence : … other energy forms, as long as their externalities, i.e. GHG emissions, are not included. | Taken into account - text has been deleted. Comment is obsolete. |
| 11911 | 7 | 5 | 18 | | | fossil fuels are cheaper than most other energy forms. So they are more than "cost competitive" | Taken into account - comment is obsolete. Text has been deleted. |
| 12154 | 7 | 5 | 18 | 5 | 18 | The sentence "...Fossil fuel resources are abundant..." is too simple considering the relevance of the AR5. I understand that it'll be better to use..."...Fossil fuel resources are abundant, typically located...". Includind the term "typically located" is very important because the no uniform distribution in the terrestrial crut is fundamental any context. | Taken into account - text has been deleted. Comment is obsolete. |
| 10486 | 7 | 5 | 19 | | | "has" released | Taken into account - text revised. |
| 3383 | 7 | 5 | 2 | 5 | 5 | Puzzling and long first sentence. I sign of what is coming. There must be better ways to define the "energy sector" presented in this chapter from the remaining 55% "energy-related GHG emissions" (transport, industry, buildings... treated in the subsequent three chapters?) . | Taken into account - text has been deleted. Comment is obsolete. |
| 2388 | 7 | 5 | 2 | 5 | 2 | put percentage of energy sector emissions in parantheses in first line | Rejected - comment seems to be misplaced. It is not clear what the |
| 12315 | 7 | 5 | 2 | 5 | 5 | This sentence is somewhat confusing. Please define what is included in the energy sector. It is also unclear what percentage of emissions are the result of fugitive methane emissions etc. The sentence might benefit from being split into several sentences. | Taken into account. The scope of chapter corresponds to definition of energy industries in the IPCC inventory |
| 15789 | 7 | 5 | 2 | 5 | 5 | First sentence is too long | Taken into account - text has been deleted. Comment is obsolete. |
| 9626 | 7 | 5 | 2 | 5 | 5 | This first sentence is confusing - does the energy sector provide 45% of total global emissions or do the activities listed contribute 45% to energy related emissions? If it is the latter, what contributes the remaining 55% of energy related emissions? | Taken into account - text has been deleted. Comment is obsolete. |
| 13282 | 7 | 5 | 2 | 5 | 5 | There are two problems with this sentence (the first of the Executive Summary): a) it does not make grammatical sense ("...it provides only part of energy-related GHG emissions in form both fugitive emissions in fuel extraction...") and b) it only makes logical sense that 45% of energy-related emissions are in the energy sector if one understands that the energy sector is not in fact the entire energy system, but specific types of energy use (presumably heat and power generation) - it is essential that the energy sector is defined here for this to make sense | Taken into account - text has been deleted. Comment is obsolete. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6162 | 7 | 5 | 2 | 5 | 5 | The energy sector is the largest contributor to global GHG emissions, but it provides only part (45%) of energy-related GHG emissions is a confusing sentence. Perhaps rephrase as "Energy extraction, conversion, storage, transmission and distribution processes, collectively comprise the energy sector and is the largest contributor to global GHG emissions." | Taken into account - text has been deleted. Comment is obsolete. |
| 3767 | 7 | 5 | 2 | 5 | 2 | Check "45% contribution". | Comment is obsolete. Statement has |
| 4800 | 7 | 5 | 2 | 5 | 5 | This first paragraph is not clear for a reader that has not read the rest of the document. | Taken into account - text has been deleted. Comment is obsolete. |
| 5144 | 7 | 5 | 2 | | 5 | unclear sentence | Taken into account - text has been deleted. Comment is obsolete. |
| 10483 | 7 | 5 | 2 | | | Suggest reword opening sentences…... contributor to "annual" global GHG emissions. It provides 45% of energy-related GHG emissions in the form of both fugitive methane emissions in fuel extraction and distribution and .... [ the word "transportation" can be confusing] BUT does the 45% include Transport? The whole chapter needs to check whether transport is included or not in many statements. | Taken into account - comment is obsolete. Text has been deleted. |
| 2391 | 7 | 5 | 20 | 5 | 20 | replace word left with word remaining | Taken into account - text revised. |
| 13283 | 7 | 5 | 20 | 5 | 20 | The word 'Left' is not standard English in this context - suggest 'Remaining' | Taken into account - text revised |
| 5145 | 7 | 5 | 20 | | 21 | unclear meaning | Taken into account - text revised |
| 11912 | 7 | 5 | 20 | | | "left" is awkward. "Remaining" is the correct word | Taken into account - text revised. |
| 10487 | 7 | 5 | 20 | | | Delete "Left" so becomes "Hydrocarbon reserves contain….." | Taken into account - text revised. |
| 7724 | 7 | 5 | 21 | 5 | 23 | Suggest replace "Copenhagen Accord" by "Kyoto Protocol". | Accepted- It was replaced by |
| 18161 | 7 | 5 | 21 | | 23 | Add to paragraph: Therefore, constrains limits or constraints on fossil fuel availability cannot be relied upon to limit global GHG concentrations to levels consistent with the Copenhagen Accord [7.4, high agreement; robust Evidence]. | Rejected - comment is unclear. Please clarify |
| 18162 | 7 | 5 | 21 | | 23 | Alternative paragraph:Therefore, constrains limits or constraints on fossil fuel availability cannot be relied upon to limit global GHG concentrations to levels consistent with the Copenhagen Accord [7.4, high agreement; robust evidence | Rejected - comment is unclear. Please clarify |
| 10488 | 7 | 5 | 21 | | | Delete "or constraints" | Taken into account - text revised. |
| 2392 | 7 | 5 | 22 | 5 | 22 | why refer to levels in copenhagen accord here and previously to 450ppmv. Chose one and stick with it. | OK. It was replaced by internationally |
| 15936 | 7 | 5 | 22 | 5 | 22 | shouldn't this cite the Cancun Agreements rather than the Copenhagen Accords, since the latter were never adopted by the UNFCCC, merely 'noted'. | Taken into account - text revised |
| 10489 | 7 | 5 | 22 | | | Not sure if all readers will understand "the Copenhagen Accord" so could add "to limit global temperature rise to below 2oC." | Taken into account - text revised. The legally binding Cancun Agreement now |
| 2820 | 7 | 5 | 24 | 6 | 17 | These paragraphs understate the scale of the challenge (see detailed comments below). They also read oddly after paragraph 1, which notes that despite a wide array of mitigation policies, we are not on track. I would have expected to see some explanation for this failure. | Taken into account - text has been rewritten considerably. Comment is obsolete. |
| 18037 | 7 | 5 | 24 | 5 | 24 | Define "low carbon" | Rejected - low carbon is a usual |
| 6163 | 7 | 5 | 24 | 6 | 4 | This paragraph reads like a grocery list. While there are a lot of concerns the ES needs to address, this would be better if it were split it apart and the transitions smoothed, or turned into a table or more readable figure. As an example, from 5,31 to 5,34 we move from emissions reductions from replacing old coal plants with new gas generation to a comparison of the technical renewable potential to primary energy supply. Not only is “RE” not previously defined, but these two things seem only tangentially connected. | Taken into account- ES has been rewritten |
| 16770 | 7 | 5 | 24 | 8 | 4 | I don't find these paragraphs that helpful as part of the executive summary -- it reads a bit like a list without real context and I don't see how this is helpful to policymakers or the public. In this chapter, I find sections 7.12.3 and 7.13 the most important parts and likely most helpful to negotiators who should have better understanding of this pathways concept. | Taken into account - general statements were replaced by quantitative ones when possible. |
| 3769 | 7 | 5 | 24 | 5 | 28 | Long sentence and no clear meaning. | Taken into account - text has been deleted. Comment is obsolete. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12155 | 7 | 5 | 25 | 5 | 25 | It's more polite to use "relevant", than "deep". | Rejected - the text is about deep emissions reductions, i.e., those higher |
| 3768 | 7 | 5 | 27 | 5 | 27 | "Reduced production cost". It should be more useful to add a plot showing past costs and a trend line for the scenario. | Taken into account - text has been deleted. Comment is obsolete. |
| 18163 | 7 | 5 | 28 | | 30 | Replace: Although there may be constraints at a regional level, and for individual technologies, at the global level, the combined technical potential of low carbon technologies in the energy supply sector is not the factor limiting their widespread deployment high, despite their limited widespread deployment [7.4, medium agreement; robust evidence]. Alternative paragraph: Although there may be constraints at a regional level, and for individual technologies, at the global level, the combined technical potential of low carbon technologies in the energy supply sector is high, despite their limited widespread deployment [7.4, medium agreement; robust evidence]. | Rejected - the global potential might be high, but it does nevertheless allow to achieve high renewable market shares at some locations. The chosen phrasing has been improved to clarify this. |
| 2393 | 7 | 5 | 29 | 5 | 30 | strange wording about technical potential not being the limiting factor. Of course not that is true by definition. Rephrase. | Taken into account - text has been deleted. Comment is obsolete. |
| 2389 | 7 | 5 | 3 | 5 | 3 | word form is incorrect there | It is not clear why it is incorrect. |
| 15935 | 7 | 5 | 3 | 5 | 3 | should read '…emissions in the form of both fugitive methane emissions from fuel….' | Taken into account - text has been deleted. Comment is obsolete. |
| 11909 | 7 | 5 | 3 | | | "in form of"? | Taken into account - comment is obsolete. Text has been deleted. |
| 4095 | 7 | 5 | 30 | 5 | 36 | The bland statements about the combined technical potential of local carbon technologies not being a constraint; the regional technical potential of RE as a whole being a multiple of global primary energy supply requirements, do not stand up to examination. There should be here and elsewhere in this chapter a proper examination of the power densities of the various forms of renewable energy (a la Vaclav Smil). There should be a proper examination of the implications of these (a la Frederick - Ted - Trainer). There should be, somewhere in this chapter and reflected in the Executive Summary, an examination of each source/form of RE. Only CSP with UHVDC transmission has fair technical potential to meet the chapter's claims. The IPCC Special Report on RE did not withstand careful critical scrutiny (e.g.the work of Graham Sinden is referenced, without mention of the fact that other authors - David MacKay, Chief Scientific Advisor to UK DEFRA (2009), Michael Jefferson in 'Energy Policy' (2008) and IAEE Spring 2012 Bulletin, et al have shown his findings to be at odds with evidence provided by wind energy operators and the Met Office.) | Reject - As the Executive Summary is severely space limited, we simply do not have the space here to go into details on the various literatures. However, many of these controversial issues are addressed in the various sections of the chapter - the idea that technical potential may be constrained by competition, declining resource quality with deployment, land use issues, etc. We do stand by the so-called bland statements as a solid reflection of the literature on technical |
| 12317 | 7 | 5 | 31 | 5 | 33 | Please consider to move the sentence "Significant and relatively…." to line 45 before the sentence about CCS. | Rejected - the text is about fuel shifting, which is different to CCS. |
| 12318 | 7 | 5 | 31 | 5 | 33 | When describing the advantage of fuel switching, we would like to see a comment about the danger of carbon lock-in (ref section 7.10.5) and the importance of CCS (ref section 7.5.1. line 40-42). | This is discussed at section 7.10.5, but space constraints do not allow to |
| 15754 | 7 | 5 | 31 | | 33 | While this may be true, what is the likelihood that China would retire recently built coal plants anytime soon? Also, replacing the internals of a coal plant (I assume boilers and steam turbines) with a natural gas fired turbine with duct heating doesn't sound as inexpensive as this makes it out to be. | Taken into account - cost statements were deleted. |
| 11759 | 7 | 5 | 31 | 5 | 33 | Energy must be chosen taking into not only enviromnet but also economy and energy security. To avoid the misunderstanding, [prvided the economy and energy security is not taken into account] should be added after this sentence. Also refer to No.4. | Rejected - space constraints do not allow to qualify efforts to reduce GHG. The cost statement, however, has been |
| 6244 | 7 | 5 | 31 | | | better reference to low cost | Taken into account - comment is obsolete. No cost information is given |
| 10653 | 7 | 5 | 31 | 5 | 33 | Add a statement coal can be chosen from the view point of energy security. | Rejected - the paragraph is about options to mitigate climate change. Space constraints do not allow for mentioning all side-effects everywhere. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11845 | 7 | 5 | 32 | 5 | 33 | Current research is demonstrating the potential for unconventional natural gas sources to result in high fugitive methane emissions. This seems to suggest there is significant risk of failing to meet mitigation goals by relying on/investing in natural gas fired power plants to reduce GHG intensity of electricity emissions when upstream (extraction) emissions are accounted for. In fact this very issue is addressed in 7.5.1 - it might be worth noting this earlier in the chapter, since it seems a bit inconsistent. | Taken into account - text revised. |
| 2394 | 7 | 5 | 33 | 5 | 34 | what does regional technical potential as a whole mean? | Taken into account - text has been deleted. Comment is obsolete. |
| 6245 | 7 | 5 | 33 | | | Why just efficient gas and not a first step more efficient coa, the text states that there are merits in chaging less efficient coal by more efficient coal plants.l | Taken into account - switching to coal is now mentioned as well |
| 15937 | 7 | 5 | 33 | 5 | 33 | I believe 'regional' here should be 'global' | Taken into account - text has been deleted. Comment is obsolete. |
| 10490 | 7 | 5 | 33 | | | Suggest new para at "The regional…." and at line 41. | Taken into account - text revised. |
| 7713 | 7 | 5 | 33 | | | RE means 'renewable energy'? | Taken into account - text revised. |
| 15755 | 7 | 5 | 34 | | | This seems very optimistic regarding potential of RE supply | Taken into account - text has been deleted. Comment is obsolete. |
| 13284 | 7 | 5 | 36 | 5 | 38 | Presumably RE was nearly half of new nameplate (i.e. peak) GW installed; however on average RE technologies will tend to operate at a much lower load factor (e.g. <20% for PV, around 30% for onshore wind) than fossil capacity operating at baseload, so TWh generation from RE installed in 2011 is likely to be still consderably lower than that from new fossil plant (RE share might be e.g. 20-25%). Given that this is arguably a more accurate reflection of the share of new capacity, it would be worth adding this (probably in addition to the GW share, not instead) | Taken into account - text has been deleted. Comment is obsolete. |
| 6221 | 7 | 5 | 36 | 5 | 38 | npmic maturity | Rejected - comment is unclear - please |
| 15790 | 7 | 5 | 37 | 5 | 38 | "RE accounted for almost half of all the new electricity generating capacity added globally" - because fastest growing RE is intermittent solar and wind, actual kWh generated , not capacity installed, is the key metric since need to take the low capacity factors into account. Thus added kWh will be much less than 50%. Check IEA WEO 2011 (or 2012) for up to date data. | Taken into account - text has been deleted. Comment is obsolete. |
| 14540 | 7 | 5 | 4 | 5 | 4 | Replace 'a' by 'is' | Rejected - comment seems to be misplaced. It is not clear what the |
| 9467 | 7 | 5 | 41 | 5 | 45 | This part lacks good balance, listing only negative opinions about nuclear power. Its positive factors such as cost effectiveness and low CO2 emission in life cycle should be added. | Taken into account - there is now a positive qualifier that emphasizes that nuclear is able to provide carbon free electricity. It is however not true that |
| 15756 | 7 | 5 | 41 | | | Is nuclear considered renewable energy in this context? | Taken into account. RE, CCS and nuclear now have separate paragraphs. |
| 18164 | 7 | 5 | 41 | | 45 | Replace: Resolutions on many issues remain for the continued use and further expansion of nuclear energy worldwide as a response for mitigating climate change, including efforts to improve overcome most of its the safety, economics, resource sustainability, waste management, and proliferation concerns. Significant efforts are underway to develop new fuel cycles and reactor technologies that address the concerns of nuclear energy use, and the fusion reaction, trying to reduce the unsolved problems of nuclear energy use. Alternative paragraph: Resolutions on many issues remain for the continued use and further expansion of nuclear energy worldwide as a response for mitigating climate change, including efforts to overcome most of its safety, economics, resource sustainability, waste management, and proliferation concerns. Significant efforts are underway to develop new fuel cycles and reactor technologies and the fusion reaction, trying to reduce the unsolved problems of nuclear energy use. | Taken into account - text has been rephrased to increase its readability. Fusion technology is not taken into account as it is not yet demonstrated to be feasible on a commercial scale. |

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| 11760 | 7 | 5 | 41 | 5 | 43 | Adding the [Meanwhile nuclear energy would be still cost effective compared with others(Tidball et al. 2010), ] before this sentence is well ballanced.<br>1.R. Tidball et al.:[Cost and Performance Assumptions for Modeling Electricity Generation Technologies], send attachment by another e-mail. | Taken into account - there is now a positive qualifier that emphasizes that nuclear is able to provide carbon free electricity. It is however not true that |
| 9501 | 7 | 5 | 41 | 5 | 45 | It was shown only the disadvantages of nuclear power, advantages should be shown like cost efficiency , smallness of life-cycle co2 emission (less than PV), reliability, energy security.<br>[1] R. Tidball et al. (2010) Cost and Performance Assumptions for Modeling Electricity Generation Technologies,(attached on email) | Taken into account - there is now a positive qualifier that emphasizes that nuclear is able to provide carbon free electricity. It is however not true that |
| 9589 | 7 | 5 | 41 | 5 | 45 | Please, provide merits of nuclear power in exective summary likewise CCS and RE technologies; nuclear power is stemmed from the need to cost-effectively satisfy rapidly growing electricity demand in the emerging economies, as well as efforts to achieve energy and environmental policy objectives, including mitigating greenhouse-gas emissions and providing a secure, diversified and lowcost electricity supply. (WEO 2011, IEA) | Taken into account - there is now a positive qualifier that emphasizes that nuclear is able to provide carbon free electricity. It is however not true that nuclear is chapter than other mitigation |
| 18165 | 7 | 5 | 45 | | 48 | Add to paragraph: It is argued that... the capture and storage of CO2 (CCS) provides a means by which fossil fuel emissions can be reduced, with applications including can be dramatically reduced. Applications include most large point sources of CO2 emissions, e.g. fossil fuels production sites, power plants, refineries, chemical processing plants and cement kilns; but CCS lack yet of any kind of evaluation process, using a “large geologic storage capacity” to introduce and keep trapped huge amounts of CO2, regardless of the social and enviromental consequences. Alternative paragraph: It is argued that the capture and storage of CO2 (CCS) provides a means by which fossil fuel emissions can be reduced, with applications including most large point sources of CO2 emissions, e.g. fossil fuels production sites, power plants, refineries, chemical processing plants and cement kilns; but CCS lack yet of any kind of evaluation process, using a “large geologic storage capacity” to introduce and keep trapped huge amounts of CO2, regardless of the social and environmental consequences. | Rejected - It is not at all clear what text this comment is referring to nor is it clear what perceived problem this comment is trying to address. It is not true that CCS "lack of any kind of evaluation process…" |
| 5738 | 7 | 5 | 45 | 5 | 45 | I think it should be made clear that CCS technology is not mature therefore "CCS MAY provide a means by…" | Rejected -- no scientific evidence or publications offered to support this comment. As the more detailed text in the body of Chapter 7 (as opposed to the few sentences allotted to this topic in the ES), CCS components are mature. There is no economic rationale to deploy CCS systems at present as they can only be used to reduce CO2 emissions. The term "can" is a sufficient caveat for the executive summary. These "may" |
| 10491 | 7 | 5 | 45 | 6 | 4 | Change line 45 to "Carbon dioxide capture and storage (CCS) ….". This section seems biased - what about risks, legal liability, costs, loss of available power generated etc? | These other issues for CCS are dealt with throughout the chapter. The executive summary can not bring |
| 5130 | 7 | 5 | 48 | | | The statement "all of the components of integrated CCS system are in use" needs to be substaintiated by references | Taken into account. Please see section 7.5.5 where this issue is addressed in much more detail than is possible in an Executive Summary. The Executive Summary is summarizing what is in the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4096 | 7 | 5 | 48 | 5 | 49 | Storage capacity has been shown to be a constraint well within a century in previous Assessments. | Rejected - not supported by the broad body of peer reviewed literature. Please see section 7.5.5. Yes this is true but we have accumulated new knowledge since the previous IPCC assessments were published. That society learns more as we move forward in time is a good and fortunate thing. The sections on CCS in the chapter discuss this in detail. The executive summary can not bring |
| 4521 | 7 | 5 | 48 | 5 | 48 | While components are in use, integrated systems have not been applied to most applications. Suggest adding "…are in use, but integrated systems have not been applied to most potential applications." Otherwise this statement gives a distorted view of the maturity of CCS technology. | Accepted. The text in the ES has been revised to bring forward this nuance more explicitly. |
| 17356 | 7 | 5 | 48 | | | exist and are in use… | Taken into account - text revised. |
| 2390 | 7 | 5 | 5 | 5 | 6 | swings in our political systems? Rephrase or delete | Taken into account - text has been deleted. Comment is obsolete. |
| 14541 | 7 | 5 | 5 | 5 | 5 | pre-sets? | Not clear comment. There is no such |
| 3765 | 7 | 5 | 5 | 5 | 5 | "our economy". What does it means? Be more precise using "global economy" for example. | Taken into account - text has been deleted. Comment is obsolete. |
| 4801 | 7 | 5 | 5 | 5 | 15 | It would be helpful for people not familiar with previous documents to have some infor on the dates covered in the AR4 and AR5. | Taken into account - text has been deleted. Comment is obsolete. |
| 10484 | 7 | 5 | 5 | | | Needs a statement to clarify where Chapter 7 stops and chapters 8, 9, 10 begin. Maybe "Use of the transport fuels, heat and electricity produced are discussed in Chapters 8 (Transport), 9 (Buildings) and 10 (Industry)." | Taken into account - comment is obsolete. Text has been deleted. The introduction now clarifies this point as |
| 18156 | 7 | 5 | 7 | | 10 | Replace: "decarbonize the global fuel mix" by "rationalize the energy sector". Comment: The failure to rationalize the energy sector, i.e., to implement a better fuel use in transport, industry, etc.; driving a progressive rational and efficient use of energy, diversification of energy sources, technologies and system configurations (including ICT, DG, smart grids, etc.). In this framework, decarbonization is at best a piece of the whole picture of energy and development. | Taken into account - text has been deleted. Comment is obsolete. |
| 18157 | 7 | 5 | 7 | | 10 | Altervative paragrapah: Energy-related GHG emissions continue to grow; they have increased even faster in the last decade than the three decades previous to this period [7.3, high agreement; robust evidence]. Rapid economic development along with the failure to rationalize the energy sector has driven most of the acceleration in emissions growth in the last decade. | Taken into account - text has been deleted. Comment is obsolete. |
| 10485 | 7 | 5 | 8 | | | TSU needs to standardise Exec Summary formats. E.g. should "7.3" be here or not? | Noted. |
| 16768 | 7 | 5 | 9 | | | Suggest insertion of "has driven demand for energy services" after "economic development" as this helps more clearly decouple economic development as a culprit in growing emissions (we don't want to give impression we dislike economic development). | Taken into account - comment is obsolete. Text has been deleted. |
| 16769 | 7 | 5 | 9 | | | Suggest we delete "decarbonize the global fuel mix" and replace with "deploy low and non-emitting energy technologies". Analysis cited in chapter 7 -- point made that CCS is important component of lower cost mitigation paths. Saying we want to decarbonize the global fuel mix misses that point or negates it and is not supported elsewhere in report via economic analysis. | Taken into account - comment is obsolete. Text has been deleted. |
| 11910 | 7 | 5 | 9 | | | better to say "failure to move toward decarbonzing the …" Sounds less negative and pejorative | Taken into account - comment is obsolete. Text has been deleted. |
| 6161 | 7 | 5 | | 6 | | The ES isn't effective in explaining the overall arguments and goals of the chapter. This should be clearly established from the opening paragraph. The first sentence is exceptionally egregious – a massive run-on with multiple basic grammatical errors and little clear direction. This section needs to be rewritten to clearly explain the conclusions reached are, and how they are arrived at. | Taken into account - the ES has been completely written in order to increase it s accessibility. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12314 | 7 | 5 | 1 | | | Please consider to use shorter paragraphs to make the Executive Summary easier to read. (See chapter 5 for format). | Taken into account - text has been revised. |
| 9236 | 7 | 5 | 18 | 5 | 19 | Is very stron the sentence:"Fossil fuel resources are abundant and cost competitive with other energy forms" Is necessary said that is true only for the externalities yet are not internalizate in the cost of the fossil fuel and the carries energetics | Taken into account - text has been deleted. Comment is obsolete. |
| 13451 | 7 | 5 | 20 | 5 | 21 | Text : "Left hydrocarbon reserves alone contain two to four times that amount of carbon." There is mounting evidence to suggest that not all reserves can be converted into fossil fuel products within the current economic system - particularly in certain regions and for certain fuel types. Of special concern is the stress on global coal supplies from rapidly increased demand for power generation from China and India. Also, the weaknesses in the global oil supply are a risk to sustainable trade relationships. The cost of the fuel may not indicate the full extent of production inflexibility (scarcity), owing to the importance of energy in all economies, leading to suppressed prices either through policy or market manipulation. | Noted - unfortunately space constraints do not allow a extended discussion of these issues in the ES. |
| 17282 | 7 | 5 | 31 | 33 | | In section 7.5.1, it is clearly stated that emssions from NGCC are too high to meet long-term stabilization targets. If the mitigation potential of gas-fired power plants is mentioned, this part of the story should make it to the executive summary as well. | Taken into account - text revised. |
| 9237 | 7 | 5 | 31 | 5 | 33 | The affirmation is true but unrealistic in the case of replacing coal fired power plants with modern, highly efficient gas fired ones, because China and India will not renounce to use the indigenous coal for to use gas imported if nobady give some guaranties or incentives, or in the actual conditions of technologies transfers | Rejected - the paragraph is about technical options. It does not judge whether there is a willingness to change |
| 10999 | 7 | 5 | 41 | 5 | 43 | It is quite unfair since there are only negative point of views regarding nuclear energy. Nuclear energy has also the advantage in terms of cost and low CO2 emission, so such the advantage should be described equally. | Taken into account - there is now a positive qualifier that emphasizes that nuclear is able to provide carbon free electricity. It is however not true that |
| 8843 | 7 | 5 | 42 | 5 | 43 | Why are the issues that nuclear energy has to put effort into improving put in the order that they are? Namely, what justification is there for putting safety first instead of economics? Surely alphabetical order would be preferable. | Rejected - the sequence does not mean that some are more important than others. |
| 8844 | 7 | 5 | 45 | 5 | 46 | Even though the next sentence addresses the issue, it may be preferable to note from the outset that CCS addresses "fossil fuel emissions" from large point sources. If a vehicle runs on natural gas, there is little CCS can do with a multiplicity of point sources. | Rejected - space constraints do not allow to emphasize everything in the ES. That CCS is applied to large point |
| 7012 | 7 | 5 of 135 | 18 | 5 of 135 | 19 | Modify sentence beginning in line 18, for the following one: "Fossil fuel resources are relatively abundant compared to other energy forms". | Taken into account - text has been deleted. Comment is obsolete. |
| 7013 | 7 | 5 of 135 | 22 | 5 of 135 | 22 | Substitute "Copenhagen Accord" for "Kyoto Protocol", or "IEA's Scenario 450". I propose to completely delete from the Report the phrase "Copenhagen Accord", because it hasn´t been subscribed, nor ratified by many countries, especially developing ones, which represent the major part of IPCC members. | Taken into account - text revised. Copenhagen Accord is replaced by the Cancun Agreement. |
| 7014 | 7 | 5 of 135 | 24 | 5 of 135 | 24 | Add "zero," after the first word of this line. | Rejected - there is a difference between low carbon and zero carbon |
| 7015 | 7 | 5 of 135 | 29 | 5 of 135 | 29 | Add "zero and", after the word "of", and before the word "low", at the final part of the line. | Rejected- it is standard to use low carbon in the sense that it includes zero |
| 7016 | 7 | 5 of 135 | 41 | 5 of 135 | 45 | Delete all text from the beginning of line 41 to the phrase "of nuclear energy use.", which ends the paragraph, beginning line 45, because it isn't relevant to stress the further expansion of nuclear energy, taking into account the current prices of nuclear electricity, as well as the overall risks associated to this technology. | Rejected- nuclear is a mitigation option. The ES does not have to judge whether it will be used or not in the future. |
| 10075 | 7 | 50 | | | | Please add the fuel cost assumptions for coal and gas as LCOE depend on it. | Taken into account - the cost of carbon has been excluded from the results. There is a still on going process to collect additional literature and data concerning gas and coal fired power plants in the context of the recent |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11862 | 7 | 50 | | 51 | | These pages can be significantly reduced in length. Also, rather than showing table 7.13 which include industrial CO2 emitters, why not convert these values to be comparable to values reported in 7.12? As a reader what I want to know is whether coal (or NGCC for that matter) is cheaper than renewable sources. That isn't answered by what is reported in table 7.13 or the text. | Accepted - the text is revised accordingly. |
| 18082 | 7 | 50 | | | | To indicate prices for CCS at $117-131 is way off compared to the budgets of the demonstration projects and the general consensus on what CCS would costs if it were operational anywhere. Some peer reviewed documentation would be helpful or fact checking with the developers. Otherwise delete. | Rejected - the reviewer is asked to provide some literature to support his assessment. |
| 18544 | 7 | 50 | | | | Blast furnce steel production and cement production are topics that belong rather in Chapter 10. Please liaise with Ch 10 authors accordingly. | Taken into account - the CCS of industrial processes are not shown anymore. They are to be treated in the |
| 9491 | 7 | 50 | 1 | | | For the levelised cost of production the same "logic" must be applied to both power generation and industrial applications; i.e. the cost of production WITH CCS must be the sum of the cost WITHOUT CCS plus the cost of CCS. E.g. the cost of sement with CCS FOAK should be 100 - 122 USD/tonne cement (not 34 USD). | Taken into account - the CCS of industrial processes are not shown anymore. They are to be treated in the |
| 11863 | 7 | 50 | 12 | 52 | 7 | This section on nuclear comes out of nowhere - jumping from RE, to CCS, to nuclear in this section without transitions makes it hard to follow. Also it seems like the 3 paragraphs on nuclear can be shortened and the key data and conclusions stated more simply. | Accepted - the text is revised accordingly. |
| 3794 | 7 | 50 | 12 | 51 | 7 | Too much attention dedicated to nuclear power as compared with other conventional and RE sources. This occurs here and in many other parts of this Chapter | Accepted- the discussion of nuclear now is presented in a more concise way. |
| 18083 | 7 | 50 | 15 | 50 | 18 | EDF CEO de Rivaz is talking about cost around £140/MWh (US$ 225/MWh) to build Hinkley Point in the UK - more than double the highest point of the nuclear cost range in the graph. http://www.telegraph.co.uk/finance/newsbysector/energy/9470555/EDF-chief-Vincent-de-Rivazs-nuclear-vision-aims-to-inspire-a-generation.html | Taken into account - the cost of nuclear power plants were updated according to the newest available cost data from the BNEF data base. Whereas the highest of these are close to the given specific capital expenditures, the derived LCOE deviate from the ones given in the |
| 10076 | 7 | 50 | 16 | | | LCOE calculated by Bloomebrg only cosisder CAPEX and fuel prices. This should be made clearer. | Rejected - the BNEF's LCOE analysis does take into account the O&M costs, both fixed costs ($/MW) and variable |
| 18084 | 7 | 50 | 19 | 50 | 21 | These ranges (US$ 42-137) should be reflected in figure 7.12. They are more in line with current reality in the power sector. | Accepted - the figure is revised accordingly. |
| 17375 | 7 | 50 | 19 | 50 | 21 | in the range of 42 - 48 USD/MWh (Korea) to 97 – 137 USD/MWh (Switzerland). | Accepted - the text is revised |
| 3795 | 7 | 50 | 19 | 50 | 27 | Use coherently MWhel or MWh. Not both. | Accepted - the text is revised |
| 3796 | 7 | 50 | 19 | 50 | 27 | How is possible to understand total nuclear electricity cost at US$ 47/MWh in South Korea, when only back-end costs are US$ 52.33/MWh | Rejected - the given back-end costs are $ 2.33 per MWh and not 52.33 per MWh |
| 10561 | 7 | 50 | 20 | | | Fig 7.12 shows $90-100/MWh present costs - does not seem consistent with projected costs of $42-137/MWh | Taken into account - the chart is updated to show the entire cost range of |
| 2788 | 7 | 50 | 20 | 50 | 20 | $42-$137 / MWh for LCOE for nuclear looks extremely low compared to what we are hearing it may cost in the UK and what the recent Finnish and French experiences will come out at. I would look for other references or caveat it. At these costs the only reasonable thing to do is to go for nuclear power. | Rejected - the recent cost estimate in UK, Finland and France are quite close to the upper boundary. The lower |
| 9598 | 7 | 50 | 27 | 51 | 2 | Please, delete here due to duplication of page 50, line 16 to 18 after indicative. | Taken into account - a repetition now is |
| 4453 | 7 | 50 | 5 | 50 | 11 | Explain the difference between cost of CO2 avoided and cost of CO2 captured. | Taken into account - costs of CO2 captured are not discussed anymore. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13507 | 7 | 50 | 23 | 51 | 2 | Text : "Back-end costs include spent fuel storage, reprocessing and disposal and are estimated at $2.33 per MWhel...Not included in the levelised costs presented here are the costs associated with low probability - high consequence events such as nuclear accidents and limited operator liability." The extensive and expensive clean up costs of both the Chernobyl and Fukushima Dai-ichi nuclear power plant accidents suggests that decommissioning nuclear reactors and disposing of their radioactive waste stores is for a minority of possible scenarios very much more costly than normal end-of-life procedures - and may interfere with business viability, with knock-on effects on the industry as a whole. For example, there is a lack of qualified nuclear power engineers, considered a direct side-effect from the nuclear power anxiety of the late 1980s. | Noted - the chapter says that the cost associated with the related low probability events are not taken into account in the LCOE. |
| 9233 | 7 | 50 | 3 | 50 | 3 | After industrial applications to add "Note" | Taken into account - text has been deleted. Comment is obsolete. |
| 13506 | 7 | 50 | 9 | 50 | 11 | Text : "The additional LCOE costs exhibited by CCS plants (compared to traditional fossil fueled power plants) are to be compared with the LCOE increase of the latter once significant CO2 costs (e.g., via carbon taxes or permit prices) are to be taken into account." To my mind there is a risk that significant CO2 charging is unattainable, through any policy mechanism or treaty - "significant" in this sense meaning a level of CO2 charging/pricing/taxation that could facilitate/stimulate/incentivise a change of direction in energy plant investment. I remain to be convinced that any mechanism in the economy can be used to leverage a carbon price sufficiently high to enable widespread Carbon Capture and Storage. | Rejected no evidence/publications are provided to support the comment. Reviewer is expressing personal opinion about how future climate mitigation policy will evolve. |
| 4454 | 7 | 51 | 15 | 52 | 11 | This section could be shortened and combined with previous discussions on infrastructure limits, particularly expansion of the transmission network and power plant siting. | Rejected - This material is meant to be presented in the context of the levelized cost comparison, it wouldn't make sense to move it to another section, as suggested by many other comments |
| 10077 | 7 | 51 | 15 | | 43 | Even an electricty system without any RES needs back-up and balacing capacity. There is no reference what these costs are pr MWh. | Rejected - These costs are pretty minor in existing energy markets. They will be more substantial for resources with low capacity credits. The present section focuses on a range of incremental costs |
| 18085 | 7 | 51 | 15 | 51 | 43 | This paragraph only gives the estimated additional balancing cost for one technology (wind). Provide the figures for other technologies to have a fair comparison. | Accepted - We have searched for additional estimates of balancing costs for other technologies, but peer reviewed literature is very limited so we will not be able to present a comprehensive comparison. We have, however, added |
| 2789 | 7 | 51 | 22 | 51 | 22 | I would be inclined to caveat the costs of balancing. These costs look very low and even today in the UK the cost of commercial balancing is double these figures and we are at nothing like 30% penetration | Accepted - We are reporting the peer reviewed literature faithfully here; however, there are some studies that show higher costs, typically the result of various institutional barriers. We added a caveat that costs may be higher in some |
| 9599 | 7 | 51 | 23 | | | Please, describe here correctly as EDF operates nuclear plants with load following, which means a flexible operation. | Accepted - text deleted. |
| 10564 | 7 | 51 | 31 | | | Could add ref to SRREn ch 8 again here after "contentious" | Accepted - the text is revised |
| 10078 | 7 | 51 | 36 | | 39 | The additional transmission costs for wind are mentioned, but not those for other large scale power plants. These data are available from Transmission operators and should be specified as well. | Rejected - no peer-reviewed assessments of transmission costs for |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9600 | 7 | 51 | 39 | 51 | 40 | Please, delete here due to duplication of page 40, line 40 to 45. | Accepted - At line 39-40 page 51 add that the transmission costs of nuclear and CCS are not expected to be high on a $/MWh basis due to the base loaded nature of these technologies. This |
| 10562 | 7 | 51 | 7 | | | Is also the case for large hydro. Could mention | Rejected -the paragraph refers to economic aspects of nuclear usage. The economics of renewable energies are |
| 10563 | 7 | 51 | 8 | | | If add sub-headins as suggested above add one here "Infrastructure" | Rejected - space constraints do not |
| 13508 | 7 | 51 | 40 | 51 | 43 | Text : "If mitigation technologies can be deployed near demand centres on the distribution network or if these are intended to serve isolated autonomous systems, those technologies may defer or avoid transmission and distribution needs, potentially reducing infrastructure costs relative to a BAU scenario." For this reason, rather than transporting carbon dioxide away for Carbon Capture and Storage, it seems sensible to attempt to recycle waste carbon dioxide at the point of its production - siting Renewable Gas and biorefinery (for liquid renewable fuels) facilities close to gas power plants would be recommended. | Noted - the comment is valid, but the information is to specific to be taken into account in the report. It refers to technical aspects, not to the costs of transmission lines discussed here. |
| 2841 | 7 | 52 | 12 | 53 | 21 | The discussion of renewables here is unbalanced. While technology costs for renewables do tend to go down over time, the capacity cost curve tends to go up, for the obvious reasons that the cheapest sources and sites tend to be used first (as pointed out on p 28) and integration costs increase with the level of penetration. How this balances out depends on the situation. There is only passing recognition of this inherent tension, in the last paragraph of 7.8.2.2. But it is not a marginal or exceptional situation, as the text implies. In Europe, for instance, as far as the main renewable sources are concerned, we have got almost to the end of the capacity curve for hydro, as remaining sites are increasingly environmentally sensitive, and we are on the upward sloping part of the capacity cost curve for wind as incremental investment moves increasingly offshore. In the US, the marginal cost of meeting an RPS increases rapidly with volume according to at least one study (Crane et al. Energy Policy 39 (2011) 2730-39). Again, the authors may not agree with this assessment but they should at least recognise the underlying tension and the debate. | Rejected - the dependency of integration costs on the market penetration is discussed. The LCOE chart (figure 7.12) shows decreasing and increasing costs depending on the technology. There is no bias in the discussion. |
| 11864 | 7 | 52 | 12 | 53 | 21 | As with the preceding section, this one is hard to follow. It jumps from topic to topic with long quotes from other source for most of the text. If the goal is just list facts/data then a bulleted list with key findings from each of the quotes would be preferable. | Accepted - text is changed. |
| 18218 | 7 | 52 | 13 | | | Add to text: Altrough recently detailed studies on CCS costs have been published, the assessment of the cost of large scale plants is still plagued by many difficulties. The CCS technology has been applied to commercial scale projects, however, is not built into any plant carbon, steel or cement therefore large scale costs still have many uncertainties. The costs of renewable energy have been falling steadily since various factors such as best in manufacturing processes and operations, as well as the economic scale. Not so with nuclear plants, whose competitiveness is thought decrease after Fukishima events. Finally, it should be clear that learning cost reduction as a fail safe, the increase of raw materials in recent years has adversely affected the cost of offshore wind power plants and nuclear plants.<br>Alternative paragraph:<br>The CCS technology has been applied to commercial scale projects, however, is not built into any plant carbon, steel or cement therefore large scale costs still have many uncertainties. The costs of renewable energy have been falling steadily since various factors such as best in manufacturing processes and operations, as well as the economic scale. Not so with nuclear plants, whose competitiveness is thought decrease after Fukishima events. Finally, it should be clear that learning cost reduction as a fail safe, the increase of raw materials in recent years has adversely affected the cost of offshore wind power plants and nuclear plants. | Rejected - the paragraph to which the comment refers is addressing the cost of CCS solely. The cost aspects of nuclear and renewables are discussed in other paragraphs. Mixing all technologies would destroy the logical sequence of the section. From a content point most of view the statements referring to nuclear and renewable energies are given in the respective paragraphs. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18086 | 7 | 52 | 13 | 52 | 14 | It would helpful to a reference to cost/kWh from the references study in the text - or a range from the studies. | Accepted - the numbers of these studies are taken into account in a revised |
| 6454 | 7 | 52 | 13 | 52 | 24 | See also Page et. al. (2009) for discussion on the paucity of real data | Rejected - publication cannot be considered without additional |
| 3404 | 7 | 52 | 27 | | 28 | It is wrong-unfair to "pick up a winner" in this example. Delete from "e.g…." I could produce tens of respected references with a different opinion about where R&D has to go to reduce cost… | Taken into account - the comment is obsolete, the underlying text has been |
| 16836 | 7 | 52 | 3 | | 4 | It is unclear what this sentence means: "Whether costs will be higher for …." | Accepted - text is changed. |
| 6194 | 7 | 52 | 33 | 52 | 43 | It's unclear what this lengthy series of quotes is doing here – if there's another place that makes arguments for the market viability of renewable technologies, point to it in a reference or footnote rather than in this method. | Accepted - text is changed. |
| 9657 | 7 | 52 | | | | Would read better to adress each tehnology in the same order in each section (applies to all sections) | Accepted - text is changed accordingly. |
| 6195 | 7 | 52 | | | | The purpose of this section is unclear – why experience curves for ethanol? Many of the other conclusions fall on the obvious side – that nuclear power may increase post-Fukushima is not surprising. Cut. | Taken into account - the experience curve for ethanol is removed. In order to allow for a balanced treatment of the historic cost evolution and short-term |
| 4455 | 7 | 52 | 12 | 52 | 32 | The continued discussion on CCS barriers, costs and potentials could be combined with paragraphs on previous pages. | Rejected - the TSU has asked us to constrain cost discussions to chapter |
| 10079 | 7 | 53 | | | | Why is there no figure on cost developments for the different thermal power plants? | Noted - there is no figure on the cost development of thermal power plants as their cost evolution has been quite stable |
| 2790 | 7 | 53 | 1 | 53 | 3 | There is recent work by the Crown Estate in the UK on offshore wind cost reduction in the coming years which would be a better reference to use than BNEF | Noted - the literature will be assessed once more information on the source is |
| 17376 | 7 | 53 | 14 | | | offshore wind and… | Accepted - text is revised. |
| 16837 | 7 | 53 | 21 | | | It may be helpful to add to end of paragraph: "To conclude this section, it should be stated that under a CO2 constraint that includes a CO2 price, the cost of operating conventional, high emitting technologies increases. Experience demonstrates that as low emitting technologies evolve as they deploy, their costs decrease. This combination causes low emitting technologies to become competitive vs. high emitting technologies, thereby becoming preferred by investors and consumers." | Rejected - the text is not supported by the text (see Figure 7.12) - the LCOE of some low carbon technologies rise. |
| 17753 | 7 | 53 | 22 | | | the title of the section is "economic potential", but the subsequent discussion is on estimates | Noted - it is unclear what the reviewer |
| 16125 | 7 | 53 | 23 | 54 | 2 | The uncertainty of fossil, nuclear and renewable resources are fairly different in nature : on fossils it is partly an interest in states or firms to leave uncertainty on the resource; on renewable energy the evolution of technology and industrialization, but also uncertainties in local acceptation by decision makers dominate; in the case of nuclear, financing and acceptance are key. Thus a bias affecting cost curves mixing the three types of resources. | Accepted - cost curves for fossil fuels are deleted. |
| 18087 | 7 | 53 | 3 | 53 | 5 | We should not talk about "grid parity" in a section that deals with LCOE. Comparing cost of a technology with the retail price (which is more oftenthan not a reflection of political dictate) makes no sense. Use LCOE - also for PV. | Rejected - from a macroeconomic perspective LCOE should not be compared with grid prices. However, for private investors who are capable to |
| 11548 | 7 | 53 | 3 | | | Please compare this with what you said on p47l20-22. | Noted - the text is not contradicting. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6700 | 7 | 53 | 6 | 53 | 12 | Even if the price of nuclear power will increase, it will not lose its cost-competitiveness against other energies. But this text make impressions that nuclear power is inferior to CCS and renewable energies. This text should be deleted. | Rejected - The text does not state that nuclear power is inferior to CCS and renewable. The verbal quotation of a IEA paragraph says that "the relative economics of nuclear power compared with other generating technologies may deteriorate". On many places on earth, the bunch of other technologies mainly includes conventional ones (gas, coal, hydro). New renewables and CCS are not mentioned here explicitly. At various |
| 4456 | 7 | 53 | 6 | 53 | 12 | This paragraph repeats much of what has already been discussed in the context of barriers to deploying nuclear-powered electricity generation plants. | Accepted - text is revised. |
| 16124 | 7 | 53 | 6 | 53 | 12 | Costs of nuclear may also be driven up by exit of more suppliers, e.g. Siemens of Germany or one or several suppliers in Japan. | Noted - this seems obvious, but no literature is provided to support the |
| 11770 | 7 | 53 | 6 | 53 | 12 | These sentence should be deleted. It is too much uncertain expression. | Taken into account - the view expressed by the IEA is conserved, while the other statements are deleted. In order to allow for a balanced assessment Joskow is cited, who does not expect a major |
| 9509 | 7 | 53 | 6 | 53 | 12 | delete this paragraph - Global nuclear generation will be expanding after Fukushima Daiichi accident (The Future of Nuclear Power After Fukushima/Agstract in page 1)(attached on email) | Taken into account - the view expressed by the IEA is conserved, while the other statements are deleted. In order to allow for a balanced assessment Joskow is cited, who does not expect a major |
| 10661 | 7 | 53 | 6 | 53 | 12 | Please delete this sentence because it is vague with a lot of "may"s. | Taken into account - the view expressed by the IEA is conserved, while the other statements are deleted. In order to allow for a balanced assessment Joskow is cited, who does not expect a major |
| 18545 | 7 | 53 | 6 | 53 | 12 | The focus on the economic situation for nuclear post-fukushima seems strange. Why is there no more general discussion of historical trends or declining costs for nuclear? | Taken into account - the view expressed by the IEA is conserved, while the other statements are deleted. In order to allow for a balanced assessment Joskow is cited, who does not expect a major |
| 10000 | 7 | 53 | 6 | 53 | 12 | This part should be deleted completely because the content often uses "may" word and looks speculated. The effects on nuclear plants of Fukushima accident appear to be quite modest at the global level, as described in (Joskow, 2012, page1).<br><br><Reference><br>[1] Joskow, P.L. & J.E. Parsons (2012). The Future of Nuclear Power After Fukushima. MIT Center for Energy and Environmental Policy Research Working Paper 2012-001. | Taken into account - the view expressed by the IEA is conserved, while the other statements are deleted. In order to allow for a balanced assessment Joskow is cited, who does not expect a major change in the economics of nuclear power. |
| 18088 | 7 | 53 | 8 | 53 | 8 | Replace "may decide" with "have decided". Siemens stopped in 2011; RWE stopped in 2012; EON and RWE polled out of UK nuclear in 2012. | Taken into account - the underlying text has been deleted due to space |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8845 | 7 | 53 | 3 | 53 | 5 | The FOD states, "By 2020, grid parity (i.e., competitiveness with grid retail prices) of PV can be expected in many countries provided that sufficient policy support is available (IPCC, 2011a)". It may be worth explaining, perhaps in a footnote, that while residential or small commercial PV systems are competing with the delivered retail price of electricity through the grid -also known as "socket parity" - larger-scale PV systems may be assessed against wholesale generation, sometimes refered to as "busbar parity". Furthermore, Bazilian et al.(2012) note that "contrary to the view that the arrival of grid parity is still decades away, numerous studies have concluded that solar PV grid parity has already been achieved in a number of countries/regions", citiing articles by Breyer and Gerlach (2010), Zweibel (2010), Branker et al. (2011) and Darling et al. (2011). [Bazilian, Onyeji, Liebreich, MacGill, Chase, Shah, Gielen, Arent, Landfear, Zhengrong. Reconsidering the Economics of Photovoltaic Power, BNEF. 2012] [Breyer, C., Gerlach, A., 2010. Global Overview on Grid-Parity Event Dynamics. Presented at the 25th EU PVSEC/WCPEC-5, Valencia.] [Branker, K., Pathak, M.J.M., Pearce, J.M., 2011. A review of solar photovoltaic levelized cost of electricity. Renewable and Sustainable Energy Reviews 15, 4470–4482] [Darling, S.B., You, F., Veselka, T., Velosa, A., 2011. Assumptions and the levelized cost of energy forphotovoltaics. Energy Environ. Sci. 4, 3133–3139.][Zweibel, K., 2010. Should solar photovoltaics be deployed sooner because of long operating life at low, predictable cost? Energy Policy 38, 7519–7530.] | Accepted - text is revised. |
| 8846 | 7 | 53 | 3 | 53 | 5 | Bazilian et al.argue that, "Grid parity is now largely an outdate concept […] it is not useful in real-world power sector decision [...] it does not take into account the value of solar PV to the broader electrical industry." The "value of (distributed, non-utility) solar PV to the broader electricty industry" is elucidated by Keyes and Wiedmen (2012) and can include: avoided energy costs; avoided capacity costs; avoided line losses; avoided fuel volatility;and, avoided transmission and distribution costs. [Bazilian, Onyeji, Liebreich, MacGill, Chase, Shah, Gielen, Arent, Landfear, Zhengrong. Reconsidering the Economics of Photovoltaic Power, BNEF. 2012] [Keyes and Wiedman, Interstate Renewable Energy Council, "A Generalized Approach to Assessing the Rate Impacts of Net Metering", January 2012] | Rejected - space constraints do not allow to go into the details here. |
| 11001 | 7 | 53 | 6 | 53 | 12 | It is seriously problematic since negative indications regarding nuclear energy are described on supposition. Explanation based on clear facts is necessary and important. | Taken into account - the view expressed by the IEA is conserved, while the other statements are deleted. In order to allow for a balanced assessment Joskow is cited, who does not expect a major |
| 18644 | 7 | 54 | | | | Page 54: Once again a comment on MACs. Here they are said to be a useful summary mechanism but more sophisticated modeling of how supply and demand markets work and interact with each other is required for an analytical underpinning of mitigation policy. | Taken into account - Chapter 6.3.4 with its consistent and sophisticated modelling is now referred back to. |
| 11865 | 7 | 54 | 1 | 54 | 2 | A useful comparator to what? This is an odd statement, and the reported values aren't compared to anything. | Taken into account - this text is removed as this paragraph has been deleted for reasons of space with reference now made to section 7.4, and the broader |
| 3798 | 7 | 54 | 10 | 54 | 10 | Typo error. Replace "sort-term" by "short-term". | Editorial |
| 10080 | 7 | 54 | 12 | | 16 | The uranium cost are for mining. How much would it change if enrichment is added? What is the energy neded for the enrichement, and which energy source will be used? | Taken into Account - the underlying text on nuclear costs has been removed due to space constraints due to space |
| 9601 | 7 | 54 | 28 | 55 | 1 | Please, move here to page 49 in Chapter 3. | Taken into account - Table 7.5 has been deleted for reason of space and to better link to the MAC discussion in Chapter 3 |
| 4457 | 7 | 54 | 3 | 54 | 16 | Resource estimates for various fossil-fuels have been discussed already. | Taken into Account - the underlying text on fossil fuel resources has been removed due to space constraints, and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16127 | 7 | 54 | 3 | 54 | 27 | Maybe the two paragraphs are redondants and could be summarized in one sentence. | Taken into Account - the underlying text on fossil fuel resources has been removed due to space constraints, and |
| 9658 | 7 | 54 | 3 | | 16 | Is it necessary to repeat this? | Taken into Account - the underlying text on fossil fuel resources has been removed due to space constraints, and |
| 16838 | 7 | 54 | 3 | | 27 | Can your replace this with a graph or table with short explanation? The lists embedded in a paragraph are less helpful. | Taken into Account - the underlying text on fossil fuel resources has been removed due to space constraints, and |
| 10565 | 7 | 54 | 3 | 54 | 16 | EJ or ZJ issue again | Noted - EJ are preferred as one can span the largest (coal) to smaller types |
| 2791 | 7 | 54 | 35 | 54 | 37 | Another weakness of the MAC curve approach is that they tend to look at the simple NPV of the investment rather than what it actually takes to make an investment decision. Real life experience of the MAC curve tends to be very different from the theoretical ones published. | Taken into account - these additional details are referenced back to the discussion in chapter 3 (3.10.2) |
| 3797 | 7 | 54 | 6 | 54 | 8 | Please, clarify what costs are included in oil production cost. Does it include exploration and transportation to refineries? | Taken into Account - Essentially yes, the text has been reviewed for clarity (and in |
| 9234 | 7 | 54 | 13 | 54 | 13 | Nuclear resources don't in table 7.2, it is in table 7.3 | Taken into Account - this discussion is removed for reasons of space, referring |
| 13509 | 7 | 54 | 4 | 54 | 6 | Text : "Total resources of hard coal and lignite (IEA, 2011g) are very large (Table 7.2), and are estimated to cover future demand for many decades at up to 400,000EJ." Although there may be large reserves of coal, they are not necessarily economically viable to mine. If strong coal demand continues, it could be that future demand will not be met, and that even current demand might not be met "for many decades" to come. Some researchers are pointing to Peak Coal being imminent (for example, "A global coal production forecast with multi-Hubbert cycle analysis", Patzek and Croft, Energy 35 (2010) pp 3109 - 3122). | Taken into account - This section has been removed and now refers to section 7.4.1 Note that the overwhelming majority of IPCC and other global scenario and forecast studies find coal supply to be abundant in the decades to come. However there is a small literature on the possible future date of peak coal |
| 13511 | 7 | 54 | 40 | 54 | 42 | Text : "The use of consistent and transparent scenarios (Chapter 6) is one mechanism to make the MAC more transparent to policy makers." MAC curves suffer from one problem that is not discussed here : there is an underlying assumption that the costs of carbon in the graphs can be imposed by a combination of regulatory and general policy means. Since there are many competing forces that will oppose high carbon prices, it is unlikely that the cost of carbon will be higher than $20/t in today's dollar values. If the price of carbon does rise above that, it will be because the general economy has devalued, and so even if the carbon price does reach the region of $40/t, it will no longer be possible to incentivise the decarbonisation prospects given by today's MAC curves, because everything will cost more in number terms. It is more likely that the cost of energy in general will create a pseudo-carbon price, rather than it being created by a deliberate policy suite. This will come about as the cost of low carbon energy drops to be less than high carbon energy prices. I think it very unlikely in any eventuality that a carbon price instituted by policy, tax or other governance measure, will raise the value of carbon dioxide to the region of $100/t. I think the cost of carbon in tax or credit trade terms will remain marginal, and the signal of a carbon price or tax will continue to be lost in the economy. | Rejected - no publication provided to support this assertion. It is not just a tenant of environmental economics that a government can price a public externality such as GHG emissions (via a tax or a trading system), it is also a practical element as well and experience with GHG and CO2 pricing is discussed in section 7.12.1. It does not hold that imposing a carbon price will raise the value of "everything" - only those resources and technologies that have substantial carbon requirements in their construction and use will rise and this price increase will be relatively much |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13510 | 7 | 54 | 6 | 54 | 8 | Text : "Technically recoverable reserves of oil (summarized in Figure 7.8) and Table 7.2) have been classified into a production cost curve with 18,300EJ at a cost of <$40/barrel to 39,700EJ at a cost of <$100/barrel (IEA, 2010c)." It is possible that even at this higher end of oil prices, that much oil will remain unrecovered. Since the global economy is so dependent on oil, any price change has to be absorbed, and will cause inflation in general, or contraction in some economic sectors - both of which will affect how much oil can be produced. | Rejected - no publication provided to support this assertion. In fact it has been striking how the rise in global oil prices over the last 10 years has had such a muted impact of global inflation. Furthermore, any rise in global oil prices should boost the investment in relevant economic sectors for oil and hence help to increase supply capacity. However |
| 10277 | 7 | 55 | | 55 | | MAC is not estimated in energy systems, but also in other sectors. I do not think that the table is better to be located in Chapter 7. | Rejected - comment no longer relevant as table 7.5 has been deleted. |
| 4458 | 7 | 55 | | 55 | | This table does not show the MAC of specific technologies. Therefore, the reader cannot assess quickly or easily the relative costs of different technologies and their abatement potential (mass of CO2). | Rejected - comment no longer relevant as table 7.5 has been deleted. |
| 16126 | 7 | 55 | | | | Very useful table and explanations | Rejected - comment no longer relevant as table 7.5 has been deleted. |
| 17811 | 7 | 55 | | | | The following paragraph - I have been unable to delete - as accidentally copied - please delete. The point which was under development that there are many forms of transition from very developed to non developed - even in hour developed we have pockets of poverty and gaps in access to energy | Rejected. Not clear what the reviewer is suggesting here. |
| 2235 | 7 | 55 | 1 | 55 | 1 | In the first line of the table it should be changed to "Expert, BU model" as the McKinsey model is a bottom-up model of the power sector and with expert inputs; and change author to "McKinsey" (instead of Naucler/Enkvist) | Rejected - this comment is no longer relevant as this table has been deleted |
| 18089 | 7 | 55 | 16 | 55 | 16 | Add ", renewables and efficiency" after "natural gas" | Rejected. The statement represents a specific example of coal to natural gas |
| 18219 | 7 | 55 | 19 | | 23 | Add to text: The challenges to achieve energy security differ for developed and developing countries (Cherp et al., forthcoming). In addition to securing energy services in the expanding industrial and service sectors, the drive for improved energy services for increasing food security, health, education, and living conditions of the poorest is an important dimension of energy security in developing countries (Kuik et al., 2011). The challenges to achieving energy security differ for developed countries and developing ones. For the latter needs energy supply growth is much higher and therefore the contribution of renewable energy may not be sufficient and will increase reliance on local resources and specific social priorities of the nation As the largest integrated RES ratios in existing power grids, these exert a greater pressure on the stability of the network. Comment: It is important to note the point of view of developing countries in this matter.<br>Alternative paragraph:<br>The challenges to achieving energy security differ for developed countries and developing ones. For the latter needs energy supply growth is much higher and therefore the contribution of renewable energy may not be sufficient and will increase reliance on local resources and specific social priorities of the nation. As the largest integrated RES ratios in existing power grids, these exert a greater pressure on the stability of the network. | Taken into account. This section has been rewritten to reflect this request. |
| 2842 | 7 | 55 | 25 | 56 | 3 | Not clear why lack of trade is said to contribute to diversity; a priori, it reduces it by restricting access to indigenous sources only. | Taken into account. Text has been rewritten to reflect this request. |
| 6197 | 7 | 55 | 25 | 56 | 2 | "With renewable energy resources more evenly distributed around the globe than fossil fuels (WEC, 2007) and being, in general, less traded on the world market, renewables can contribute to diversify the portfolio of supply options." the statement is correct, but limited. In addition to the effect of renewables on the immediate markets, their presence anywhere helps to reduce pressure everywhere on globally-traded commodities. | Taken into account. Text has been rewritten to reflect this request. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6196 | 7 | 55 | 8 | 55 | 13 | "Policies for improving energy security tend to focus on the interconnected factors of availability of resources, affordability of energy services, efficiency of energy use, and minimizing energy-related environmental degradation. In meeting these criteria of energy security holistically, there will be trade-offs between technology options that are effective along one dimension, which will have implications for other aspects of security." These statements point to both the importance and complexity of energy security issues. These points could be enhanced by incorporating concepts embodied in the "Index of U.S. Energy Security Risk" (Institute for 21st Century Energy, 2011, http://energyxxi.org/energy-risk-index). This index reflects a comprehensive methodology for identifying, quantifying, tracking, and projecting U.S. Energy Security Risks. The methodology takes into account 37 individual metrics that collectively define sub-indexes for Geopolitical, Economic, Reliability, and Environment risks, which in turn define the composite U.S. Energy Security Risk Index. The methodology and data are transparent, primarily using U.S. Energy Information Administration statistics to quantify risks as far back as 1970. Additionally, using forecasts such as those in EIA's Annual Energy Outlook, energy security risks are projected out at least twenty years into the future. | Rejected - space constraints do not allow to go into the details here. |
| 3455 | 7 | 55 | | 64 | | General comment: it should be included a subsection devoted to analyse the opportunities that energy efficiency proccess have | Rejected. Chapter 7 addresses energy supply. |
| 2792 | 7 | 55 | 5 | 63 | 42 | If you are looking for ways to cut down the Chapter, I personally wasn't sure that this section added much to the debate. | Rejected - reviewer should provide more specific information what should be deleted. According to the approved |
| 6198 | 7 | 55 | | | | The connections to climate change ar unclear. In this section there are multiple full-page graphs which don't seem necessary. Cut, if connections cannot adequately be justified. | Accepted. Adjusted according to the suggestion. Some sentences that do not have connections with climate change |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9602 | 7 | 55 | | | | Please, add nuclear contribution on energy security as follows; in the journal STAIR published by the University of Oxford (UK), Ilnyckyj points out that [1] two factors have resuscitated interest in nuclear power throughout the developed world: high hydrocarbon prices and concerns about climate change. He also argues that [2] political support for nuclear energy exists for several reasons, among them concerns about maintaining secure access to energy. He further notes that [3] the most significant uranium producers globally are Canada and Australia, states likely to be stable suppliers, in contrast with some of the volatile regimes exporting hydrocarbon fuels. Certainly, states such as the U.S., France, and Japan would prefer to be able to secure long-term contracts for access to fuel from rich and stable democracies, as opposed to facing the need to buy [fossil] fuels at volatile prices from states facing both significant internal and regional security challenges.<br>Similarly, in a 2011 peer-reviewed article Corner et al. state that [4] with global energy consumption predicted to increase substantially in the short to medium term, and serious question marks over the longevity of traditional (fossil-fuel based) energy sources, the notion of 'energy security' has become an increasingly important part of energy policy debates; although securing energy has always been a central goal for national governments, energy security has become particularly prominent in discussions about energy policy and environmental sustainability in recent years. Furthermore, the link between energy security and nuclear power is not particularly new. Energy security was part of the justification for the building of the world's very first commercial nuclear reactor at Calder Hall, Cumbria in 1956 and the decision to greatly expand the UK's Magnox reactor program following the Suez crisis. A further program of British nuclear power stations in 1979 again included energy security as a primary motivation. However, while societies have always asked questions about the security of energy supplies, it is only relatively recently that the concept of energy security has played such a prominent role in public policy debates about energy. Spurred on by the parallel debate about climate change, energy security has become an increasingly visible component of the nuclear discourse [5].<br>[1] M. Ilnyckyj (2009) Climate Change, Energy Security, and Nuclear Power, STAIR 4:2 (2009)<br>[2] Ibid.<br>[3] Ibid<br>[4] Adam Corner, Dan Venables, Alexa Spence, Wouter Poortinga, Christina Demski, and Nick Pidgeon (2011) Nuclear power, climate change and energy security: Exploring British public attitudes, Energy Policy 39 (2011)<br>[5] Ibid<br>See downloaded file "Ilnyckyj 2009.pdf" and "Corner Venables 2011.pdf" | Rejected. The text is a discussion about energy security and not about a specific technology |
| 11943 | 7 | 55 | 12 | | | What does "holiostically" mean in this context?? I don't think the usage is correct here. | Accepted. The term 'holistically' has |
| 17934 | 7 | 55 | 12 | 55 | 13 | Usage of the term 'trade-off' is not consistent with agreements reached in Wellington (p. 35) whereby the term 'trade-off' might convey the impression "that a balancing of positive and negative side-effects of mitigation measures is being carried out... Such decision-making aspects" should be left to the policy chapters. | Rejected. It makes perfect sense to talk about 'trade-offs' in the context of energy security. It is relevant in this section. |
| 4786 | 7 | 55 | 13 | 55 | 16 | This sentence is wrong or partlty right "Such trade-offs include the construction of regional interstate natural gas pipeline and hydroelectric projects that are aimed at enhancing availability of supply, but may be accompanied by unintended social and environmental impacts". This sentence should be more balanced or remove as not all HPPs have negative impacts. Indeed there are numerous example of good practices for trans-boundary hydropower projects (examples could be provided on request). If the project is developed in a sustainable way, using adequate guidelines, the trans-boundary approach should have been undertaken! Reference to international sustainable guidelines, such as the Hydropower Sustainability Assessment Protocol from International Hydropower Association could be relevant (+ IPCC/SRREN as reference). | Taken into consideration. The section has been re-written to address this request |
| 6701 | 7 | 55 | 4 | | | It should be noticed that nuclear energy contributes to energy security. | Rejected. The text is a general statement about energy security and not |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11771 | 7 | 55 | 4 | 56 | 7 | In this section, energy security for nulcear power should be mentioned. Ilyckyj indicates most significant uranium producers, Canada and Australia, states likely to be stable suppliers, in contrast with some of the volatile regimes exporting hydrocarbon fuels. Also once fuel rods charge into the reactor, it is possible to operate approximately one year.Such merits should be added.<br>1.M. Ilnyckyj:[Climate Change, Energy Security, and Nuclear Power], send attachment by another e-mail. | Rejected. This is a general statement about energy security and not reflecting on specific technology |
| 10662 | 7 | 55 | 4 | 56 | 7 | In this section, role of nulcear power should be mentioned. Ilyckyj indicates most significant uranium producers, Canada and Australia, states likely to be stable suppliers, in contrast with some of the volatile regimes exporting hydrocarbon fuels. Also once fuel rods charge into the reactor, it is possible to operate approximately one year.Such merits should be added.<br>1.M. Ilnyckyj:[Climate Change, Energy Security, and Nuclear Power], send attachment by another e-mail. | Rejected. This is a general statement about energy security and not reflecting on specific technology |
| 9371 | 7 | 55 | 4 | | | This section should also mention the importance of nuclear power plant from the energy security perspective. | Rejected. The text is a discussion about energy security and not about a specific |
| 11538 | 7 | 55 | 5 | | | The authors may wish to consider to frame the issue of energy security at different scales: global, regional, national, sectoral, individuals/family. This may help to structure the problem and aspects policies may be aimed at. | Rejected. This is outside the scope of the chapter |
| 9620 | 7 | 56 | 1 | | | Please, insert the following sentense after (WEC, 2007); and renewables are supplied by balancing services of flexible generation, smart grids, strong interconnections between grids or energy storage technologies, such as pumped hydro, compressed-air and large-scale batteries.(IEA, WEO 2011) | Taken into consideration. The text has been deleted in the interest of having a shorter and sharper section |
| 11944 | 7 | 56 | 1 | | | Use WEC 2010. It is a much newer survey of resources. Other than year, same reference | Noted |
| 11946 | 7 | 56 | 13 | | | Think you mean just return, not "marginal return" | Taken into consideration. The section has been re-written to address this |
| 11541 | 7 | 56 | 13 | 56 | 15 | This may be misleading. The figure shows indeed that (eg 2005 data) that up to 100 GJ a higher HDI is associated with a higher energy consumption. However, beyond that there is not even a marginal increase in the data points, it is only because the fitting curve is monotone that you draw that conclusion. Similarly in the lower half: beyond 2.5 tC there is no trend, at most a negative trend: this is an artefact of the fitting curve. | Accepted. The text has been adjusted to address the reviewer's question. |
| 18220 | 7 | 56 | 15 | | 17 | Furthermore, for constant energy and carbon levels the HDI increases over time, indicating that certain levels of human development are achievable in an increasingly efficient manner (Steinberger and JT Roberts, 2010).<br>Comment: It is possible to achieve high levels of impact of life without necessarily increasing power consumption as outlined in the design capitalist. With a policy of rational use of energy can meet this goal.<br>Alternative paragraph:<br>Furthermore, for constant energy and carbon levels the HDI increases over time, indicating that certain levels of human development are achievable in an increasingly efficient manner (Steinberger and JT Roberts, 2010). | Rejected. The reviewer's amended sentence is identical to the one in the chapter. |
| 4460 | 7 | 56 | 18 | 56 | 32 | Elements in this paragraph repeat earlier discussions of cost-competitiveness and LCOE of electricity generation from various energy sources. | Accepted. The sentence has been deleted |
| 18090 | 7 | 56 | 20 | 56 | 20 | write "hydro, wind or solar" | Taken into account. Wind has been added but small-scale remains. |
| 18091 | 7 | 56 | 20 | 56 | 20 | Replace "can be" with "are in many places" | Accepted. The text has been adjusted to reflect the reviewer's suggestion. |
| 18092 | 7 | 56 | 22 | 56 | 24 | Mentioning nuclear while excluding (some) grid-based renewables contradicts previous sections and does not seem to be in accordaance with the electricity cost of new capacity? Add "onshore wind" after "fossil fuel based generation". Delete "along with nuclear". Unclear sentence: "less costly options" than what? Delete reference to externalities. | Taken into account. The section has been re-written to reflect this request |
| 3799 | 7 | 56 | 22 | 56 | 22 | "Fossil fuel based generation are often the less costly option". I understand this is only true for coal or, in special circumstance, for NG if there is no exportation market for this fuel. | Taken into account. The section has been reflect the reviewer's request. |
| 10081 | 7 | 56 | 23 | | | change "are often the less …." to were often the less …."<br>This would be in line with Figure 7.12 (updated with Q3 202 values) | Taken into consideration. The text has been deleted in the interest of having a |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18093 | 7 | 56 | 24 | 56 | 26 | Delete or adjust the sentence: Comparing levelized cost with energy prices is comparing apples and oranges - especially since this sentence reltes to the previous sentence which talks (more correctly) about the cost of new build cpaacity. Levelized cost of many conventional technologies are higher than existing energy prices in many markets, as well - energy prices are to a great extent a function of policy, rather than technology costs. In a section that seems to describe the competitiveness of the various technologies it is confusing that electricity prices (which are often subject to taxes, regulation or other politically motivated tampering) enters the picture. We need to decide whether we want the paragraph to be about energy poverty or cost competitveness of technologies. Including both elements in one makes the readercon fused and makes her draw the wrong conclusions, from what seems to be intended with the paragraph. | Accepted. The sentence has been deleted. |
| 10082 | 7 | 56 | 25 | | | existing energy prices: Does this include fuel subsidies and other suport mechanisms mentioned by the Joint report by IEA, OPEC, OECD and World Bank on fossil-fuel and other energy subsidies: An update of the G20 Pittsburgh and Toronto Commitments<br>http://www.oecd.org/env/49090716.pdf | Taken into consideration. The text has been deleted in the interest of having a shorter and sharper section |
| 18094 | 7 | 56 | 25 | 56 | 32 | Delete "renewable" in line 25. LCOE of all technologies are higher than the retail prices in markets with regulated prices - and that is most markets of the word, including the EU (referenced in line 30). If you want to make reference to energy affordability and fuel powerty in the EU (which is probably not the worst affected place on the globe), the main reason for the emerging problem should be clarified: it is rising gas prices! The section is structured to give the impression that renewables cause fuel poverty, by confusing prices and cost, while ignoring that gas prices are the reason for the worstening of the situation. | Taken into account. The section has been re-written to reflect this request |
| 4459 | 7 | 56 | 26 | 56 | 32 | There have been criticisms of the fuel poverty threshold of 10% of household income [cite] | Taken into account. The section has been re-written to reflect this request |
| 16128 | 7 | 56 | 29 | | | Boardman 2010 is not in the bibliography | Noted. |
| 11539 | 7 | 56 | 29 | 56 | 32 | Suggest to delete - if you want to shorten text | Accepted. The text has been deleted in the interest of having a shorter and |
| 9603 | 7 | 56 | 3 | | | Please, replace limit with alleviate and remove the heavy as the following reason; the contribution of variable renewables to the adequacy of a system is often significantly lower (per MW of installed capacity) than that attributable to other energy options. Because only a fraction of total capacity has a high probability of running consistently, variable renewables have limited capacity value. (IEA, WEO 2010) | Taken into consideration. The text has been deleted in the interest of having a shorter and sharper section |
| 16840 | 7 | 56 | 31 | | | What is the formal definition of "sustainable energy"? Is not the goal CO2 emissions reduction? | Taken into consideration. The section has been re-written to address this |
| 16841 | 7 | 56 | 32 | | | Would it be helpful to add to end of paragraph: "It may be noted that as household incomes increase as economies grow that the "affordable" energy bill can include a growing share of low emitting energy supply." | Taken into consideration. The text has been deleted in the interest of having a |
| 9372 | 7 | 56 | 5 | 56 | 7 | Renewable energy resources are not technologically stable enough and having higher shares of them do not necessarily improve energy security. Therefore, it should be deleted. | Rejected. The text does not read as the reviewer indicated. In fact, the text partly agrees with what the reviewer has |
| 11945 | 7 | 56 | 6 | | | What does "stability" mean in this context? | Taken into consideration. The text has been changed to 'system stability' |
| 16839 | 7 | 56 | 9 | | 10 | Is this true? Have you demonstrated that it is not instead that higher levels of development drive greater energy use -- energy availability may be needed for development, but it does not in itself drive development. | Accepted. The text has been adjusted to address the reviewer's question. |
| 17935 | 7 | 56 | 4 | | | Please insert 'domestic' between 'existing' and 'reserves' to clarify the sentence. | Taken into consideration. The sentence has been taken off in a new section |
| 9659 | 7 | 56 | | | | I think this is an appropriate section to discuss the issues around developing countries not having the financial, technical or institutional capacity to manufacture or install RE. The financial and Eurozone crisis have impacted significantly on the funding and support available. | The financial barriers are discussed in 7.10.2. The correctness of the second part of the comment can not be assessed due to lack of references |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15130 | 7 | 56 | 18 | 56 | 18 | It seems to me that is neccessary to explain as weel that in a lot of developing countries, in rural areas, the highest percentage of expenditure on energy respect to the level of income, is observed in the population that has the lowest income and expenditure on energy. As well is neccesary consider that to attend the needs of energy for cooking important areas of forests are deforested, it means emission of GEI | Taken into consideration. This issue is picked up in a separate box on least developing countries |
| 11542 | 7 | 56 | 8 | | | This section should be coordinated with Chs 2-4 authors | Taken into consideration. |
| 18221 | 7 | 57 | | | | Comment: The table and the quoted text makes clear that maintaining patterns of energy production and consumption of the capitalist system, achieve less and less impact on the human development index (high energy consumption patterns, and declining incidence in IDH). This indicates that energy savings and an appropriate policy for the reduction of GHG, in developed countries, only marginally sacrifice the welfare of their inhabitants. | Noted |
| 11540 | 7 | 57 | 12 | | | define 'modern' | Rejected. This is a reference to reflect a common use of work in energy literature to mean the opposite of traditional, i.e.. Informal harvesting of bioenergy, and |
| 11947 | 7 | 57 | 5 | | | "per capita" not "per capital" | Noted |
| 4651 | 7 | 58 | | 58 | | I would argue with the number of 2.663 billion people dependent on biomass for cooking. My estimate is about 3 billion. Also, many people in developed countries rely of biomass for heating the house and water. The stove may also be used for cooking and beverage preparation! Thus, a figure for cooking and heating should be well in excess of 3 billion. The population in Africa may well double by 2050 to reach 2 billion. If nothing is done to increase agricultural productivity, the effect on biomass resources (and water availability) may be serious. | Rejected. The reviewer does not produce the reference apart from his own estimate |
| 4652 | 7 | 58 | 6 | 58 | 6 | ”The provision of access to clean, efficient, affordable and reliable energy services entails multiple benefits ---“. There is no such thing as ‘efficient’ energy. It is the way it is used that determines efficiency. Leaving a light on all day and night is generally not an efficient use of electricity! Granted unprocessed biomass usually has a lower energy value than other forms of energy, and at present it is mainly used in relatively inefficient devices. However, there is considerable scope for improving their efficiency and lowering pollution from them, see Barnes D.F., Priti Kumar, Keith Openshaw (2012). The above statement implies that current biomass use is bad. But its use in existing and new forms will be around indefinitely and be a major RE. This is not conveyed in this chapter. | Rejected. This is intended to suggest system efficiency, i.e. using improved cook stoves is more efficient use of resources than traditional systems. Also what the reviewer is suggesting to add is way beyond the scope of the chapter |
| 11948 | 7 | 58 | 4 | | | It is really "population distribution" not population. Figure would be improved is total population without access was shown. As such it is somewhat meaningless. | Accepted. |
| 17937 | 7 | 58 | 8 | | | Please add 'for GHG mitigation' after 'renewable energy' to clarify that is is about co-benefits of GHG mitigation rather than energy policy. | Accepted. |
| 17828 | 7 | 59 | | | | The development of the environment and health effects of energy is rather disappointing - we invite to consider the following papers: Markandya in Lancet 2007 and 2009; Kirk Smith in Global energy assessment and Menne and Kreisel, energy and health in the European Region (forthcoming) | Taken into account. The GEA chapter was already cited, the Markandya paper has been added to the list of similar |
| 17754 | 7 | 59 | 28 | | | replace "important source" by "major emitting source" | Rejected. I can see what this is getting at; distinguishing anthropogenic emissions from other sources, but I do |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13204 | 7 | 59 | 29 | 59 | 30 | This sentence should be clarified : what is meant by categories ? An estimate of the number of deaths would be more informative,showing that coal is the most dangerous energy source for humanhealth | Rejected. The sentence says that fossil fuel causes a large number of different types of impacts and that overall fuel use explains these impacts well. To explain this study in detail would require more space than we have available here, but going to the abstract of the reference provided will tell the reviewer exactly |
| 11772 | 7 | 59 | 30 | 59 | 32 | Nox and Sox ,dust removal technologies for coal power plant have already been established so there are no big difference of condition between coal power and others. [especially coal combustion] should be deleted. | Rejected. No reference cited clearly demonstrate that reducing coal combustion offers the largest co-benefits |
| 16843 | 7 | 59 | 30 | | | Suggest adding after "fossil fuel combustion," the following: "from sources with no pollution control technology" Many coal fueled power plants operate with very low emissions of other pollutants if they have the appropriate technologies and are operated correctly. | Rejected. Thank you for the suggestion. We would like to explore this further, but there are several issues and we are under very tight space constraints here. |
| 10001 | 7 | 59 | 30 | 59 | 32 | This part should be deleted totally. Generation facility that has impacts on human health and ecosystem is not only coal fired power plant. For example, wind power plant has also impact on the environment. Therefore, it is not appropriate to mention only about coal combustion. | Rejected. Coal clearly has the highest impacts, even cleaner coal technologies still have relatively high impacts |
| 9373 | 7 | 59 | 30 | 59 | 32 | It should be deleted because the risks related to health and ecosystem are not exclusive to coal combustion but common to any kind of energy use. | Rejected. Coal clearly has the highest impacts, even cleaner coal technologies still have relatively high impacts |
| 11543 | 7 | 59 | 33 | 60 | 3 | Could be streamlined | Rejected. The comment was too brief to |
| 16129 | 7 | 59 | 35 | 59 | 37 | SRREN did not compare nuclear and renewable energy, but did the full assessment of the latter. The two kinds of resources do not have the same kind of advantages or drawbacks, in particular regarding irreversibilities and long term impacts. Nuclear should appear in another sentence. | Taken into account. SRREN did review all published LCAs of nuclear power, but did not take into consideration other environmental assessments, as it did for the renewables. Language has been |
| 9660 | 7 | 59 | 35 | | 43 | By not mentioning what the impacts of RE and nuclear energy are in this report and simply referring to the SRREN, it gives an unbalanced view in comparison to fossil fuels. | Rejected. The claim for an unbalanced treatment would need to be better substantiated. Here, additional material demand is discussed. There is no space |
| 7742 | 7 | 59 | 36 | 59 | 37 | In nluclear,again, being treated as renewable energy here? | Taken into account. Nuclear is treated as an energy source with low GHG |
| 18095 | 7 | 59 | 39 | 59 | 40 | It would be difficult to find a study justifying this sentence. Renewables have significantly lower environmental and health effect than fossil fuels, including gas. Replace "have impacts comparable to clean natural gas systems and much lower than coal or oil" with: "have impacts much lower than coal, gas or oil". | Taken into account. SRREN did review all published LCAs of nuclear power, but did not take into consideration other environmental assessments, as it did for the renewables. Language has been |
| 16844 | 7 | 59 | 39 | | | Suggest adding after "pollutants" the following: "many of which can be controlled at a reasonable costs with pollution control technology." | Rejected. A longer discussion would be necessary here. Emissions are still substantial even after SOTA pollution |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11867 | 7 | 59 | 44 | 59 | 44 | While it is true that some energy technologies require special materials, I don't think it is defensible to say they need "additional materials". For example, steel and concrete use in nuclear power plant construction outstrips the mass required for just about every other application (except perhaps large hydro) but certainly biomass power plants. Rare earths are used in permanent magnets - and while such magnets are used in wind turbines, they are used in greater volume in consumer electronics (and perhaps in hybrid and electric vehicles in the future...which are best referred to as energy efficiency technologies).These are just 2 examples that seem to contradict the statement regarding "renewable energy technologies...require additional materials". Anyway, the point is that while the issue of critical energy materials is important, it needs to be reframed in terms of "energy technologies" rather than "renewable energy technologies". | Rejected. The reviewer should consult the cited references to see an analysis of these issues. |
| 16845 | 7 | 59 | 44 | | 46 | This analysis very likely leaves out the fact that as inputs become more scarce from existing sources that the price increases -- when this occur, more costly supply sources are then exploited so that you never actually "run out of" the particular material. Before you run out, prices go up and you look elsewhere for supply --- if prices go and stay really high, you find a different material or figure out how to do w/much less of it. | Rejected. For some metals, this is correct. For other metals, there are real access issues because you either reach the mineralogical barrier or because the metals are co-produced with other metals whose demand may not increase. See the literature cited here and the references therein for a more detailed treatment of these concepts. In |
| 16842 | 7 | 59 | 5 | | | Would it be helpful to policymakers to see this at end of paragraph? "The fact that local economies can grow while absorbing the higher cost of renewable energy resources may provide some evidence that economic growth can still occur with a modest CO2 price that would drive lower cost CO2 reductions." | Rejected - please provide peer-reviewed literature that supports the statement. |
| 5956 | 7 | 59 | 6 | | | Balance: It should be acknowledged that the health benefits of access to secure energy/electricity supplies signficantly outweighs the damages associated with electricity production (as evidenced by life expectancy rates). While a discussion of the relative health impacts of different technologies has value, net health impacts (improvement) deends on their relative costs (affordability) | Taken into account - Please note that the benefit of energy access is extensively discussed in section 7.9.1. We cannot afford to repeat this here. Also, this section compares different |
| 4787 | 7 | 59 | 35 | 59 | 36 | I am not sure that "nuclear" issue was addressed in the report SRREN … the renewable technologies presented were: bioenergy, direct solar energy, goethermal energy, hydropower, ocean energy, wind energy | Taken into account. SRREN did review all published LCAs of nuclear power, but did not take into consideration other environmental assessments, as it did for the renewables. Language has been |
| 17938 | 7 | 59 | 40 | 59 | 41 | It would help to clarify that the impacts do not relate to GHG emissions but to other impact categories. Additionally, particularly bioenergy technologies (rather than RE technologies in general) have a range of ecological impacts. | Taken into account. SRREN did review all published LCAs of nuclear power, but did not take into consideration other environmental assessments, as it did for the renewables. Language has been |
| 13203 | 7 | 59 | 6 | 62 | 26 | Rather than having those two paragraphs, It woiuld more policy relevant to devote one paragraph to health effects and a second one to environmental effects and to discuss in each paragraph the possible effects of normal fuctionning and technical risks | Rejected. There are many different impacts and no way to aggregate ecosystem-related ones into a single category, so that a presentation on a |
| 12625 | 7 | 6 | 1 | 6 | 1 | The statement "unevenly distributed" needs clarification as it is a relative term. It should also be referenced. | Rejected - unevenly simply means that there are different storage capacities at |
| 12668 | 7 | 6 | 1 | 6 | 1 | The statement "unevenly distributed" needs clarification as it is a relative term. It should also be referenced. | Rejected - unevenly simply means that there are different storage capacities at |
| 15757 | 7 | 6 | 1 | | 2 | This sounds expensive. What would the carbon price have to be to make this economic? | Taken into account - comment is obsolete. Text has been deleted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15801 | 7 | 6 | 1 | 6 | 4 | Moving CO2 by ship will not be practical given trasnport costs. Also biomass-CCS ill be limited in impact due to limited supply to meet demand and air quality control issues | Taken into account - the first comment on ships is obsolete. Text has been deleted. Issues related to bioenergy |
| 18168 | 7 | 6 | 12 | | 17 | Comment:.....for least developed countries, their dissemination will imply a massive technology transfer coupled with financial support. In favourable settings, some of the low carbon energy supply technologies are already economically competitive: for example, larger-scale RE power supplies can be competitive with fossil fuel alternatives, while smaller-scale hydropower, solar photovoltaics, and modern bioenergy systems can sometimes be less expensive than other alternatives to increasing energy access in off-grid, remote and rural areas [7.8, medium agreement; medium evidence]. Comment: Although it is stated Actually, it would be equally valid mentioned to developing countries (not only the least developed) relative the issue of technology transfer and financial support necessary for the dissemination of technology mitigation. Such as it appears in the text, it suggests that businesses Commercial are ahead of the technology transfer agreements and financial support. | Taken into account - comment is obsolete. Text has been deleted. |
| 18169 | 7 | 6 | 12 | | 17 | Alternative paragraph: In favourable settings, some of the low carbon energy supply technologies are already economically competitive: for example, larger-scale RE power supplies can be competitive with fossil fuel alternatives, while smaller-scale hydropower, solar photovoltaics, and modern bioenergy systems can sometimes be less expensive than other alternatives to increasing energy access in off-grid, remote and rural areas [7.8, medium agreement; medium evidence]. | Taken into account - comment is obsolete. Text has been deleted. |
| 16771 | 7 | 6 | 12 | | | Suggest you insert "or purchases" after "technology transfer" -- the agreement could include trade in emissions with BAU paths for developing countries which would provide the means to pay for the technology purchases. Technology movement need not depend on the goodwill of the wealthier countries. | Rejected- a technology transfer will be required anyway - independent of the source of the financial means to pay for it. The financial transfers stated may well |
| 13034 | 7 | 6 | 13 | 6 | 17 | The sentence beginning with "In favourable settings....." implies that only small-scale hydropower can be cost competitive and only in off-grid locations. The sentence could be improved by splitting into two sentences and rephrasing as follows: "In favourable settings, some of the low carbon energy supply technologies are already economically competitive: for example, larger-scale RE power supplies including hydropower, wind energy, and others can be competitive with fossil fuel sources. In addition, smaller-scale projects including hydropower, solar photovoltaics, and modern bioenergy systems can sometimes be less expensive than other alternatives to increasing energy access in off-grid, remote and rural areas." | Taken into account - comment is obsolete. Text has been deleted. |
| 18039 | 7 | 6 | 15 | 6 | 16 | Small wind should be added here.<br>Used with diesel generators, the cost of the turbine are often much lower than the extra fuel costs that would be incurred without the turbine. | Taken into account - comment is obsolete. Text has been deleted. |
| 5939 | 7 | 6 | 17 | 15 | | The inference that large scle RE systems can be competitive with fossil fuel technologies is subject to a number of qualifications. In particular in relation to variable RE sources, this statement does not appear to encompass the total costs of ensuring continuity of supply | Taken into account - text has been deleted. Comment is obsolete. |
| 18170 | 7 | 6 | 18 | | 23 | Comment: Power production is the largest single emitting sector (40% of energy-related GHG emissions) and it will play a major role in transformation scenarios with deep cuts of GHG emissions [7.12, high agreement; robust evidence]. The diverse characteristics of various forms of low-carbon energy supply suggest that combinations of options rather than a single dominant source will minimize the cost and technical integration challenges of achieving low GHG concentrations. Comment: It is necessary to promote integrated planning of energy use of different regional energy options, so that traditional sources of fossil energy and alternative energy sources complement each other, achieving greater energy efficiency to better meet the challenges related to the emissions of greenhouse gases. | Taken into account - comment is obsolete as the referenced text has been deleted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18171 | 7 | 6 | 18 | | 23 | Alternative paragraph: Power production is the largest single emitting sector (40% of energy-related GHG emissions) and it will play a major role in transformation scenarios with deep cuts of GHG emissions [7.12, high agreement; robust evidence]. The diverse application characteristics of various forms of low-carbon energy supply suggest that combinations of options rather than a single dominant source will minimize the cost and technical integration challenges of achieving low GHG concentrations. | Taken into account - comment is obsolete as the referenced text has been deleted. |
| 5940 | 7 | 6 | 18 | 33 | | Lack fo clarity as to what is being stated | Taken into account - text has been deleted. Comment is obsolete. |
| 6164 | 7 | 6 | 18 | 6 | 20 | Tie back to page 5, lines 2-3. Perhaps rephrase as "Among the energy sector activities of energy extraction, conversion, storage, transmission and distribution processes, power production is the largest single activity." | Taken into account - comment is obsolete as the referenced text has been |
| 6444 | 7 | 6 | 18 | 6 | 18 | The sentence should begin: "Electric power production…" or "Electricity production…"since power is a generic term. I suggest the use of the word 'power' be considered carefully throughpout the report and that 'electricity' or electric power' are used when electric power is what is meant . See also page 13, ln 4; page 16, ln 6; page 18, ln 29; p75, ln 10 | Rejected - power is a term that is well known in the energy sector literature. |
| 5146 | 7 | 6 | 18 | | 33 | This paragraph could be made more to the point - it is difficult to understand - for instance the sentence starting a line 25: what is ment by " --- will necessitate systemic changes in the remaining set of ---" the relationship between "key low GHG ---" and "remaining" needs clearifying (ES needs to have a precise, easy to comprehend message - this is not always so) | Taken into account - the entire paragraph has been rephrased in order to address concerns of this and other reviewers. |
| 10492 | 7 | 6 | 18 | | | Page 6 states energy sector has 45% of energy-related GHG emissions yet here states 40% for power generation alone - BUT page 15 line 16 says 40% is "electricity and heat generation alone". So which is correct? And what is the 5% for? Not transport. Need to check. | Taken into account - text has been deleted. Comment is obsolete. |
| 14407 | 7 | 6 | 2 | | | This sounds more upbeat on CCS than the usual view | Accepted - text on CCS has been |
| 5131 | 7 | 6 | 22 | | 24 | The sentence is not clear! | Taken into account - comment is obsolete as the referenced text has been |
| 2395 | 7 | 6 | 24 | 6 | 27 | That is one strange sentence. Shorten and rephrase | Taken into account - comment is obsolete as the referenced text has been |
| 18172 | 7 | 6 | 24 | | 33 | Add to paragraph: The unavailability of any one key low GHG energy supply option will necessitate systemic changes in the use of the remaining set of low GHG resources, technologies and demand measures, for emissions will rise, increasing both marginal and total cost of achieving a prescribed emissions limit [7.12, high agreement; medium evidence]. Infrastructure and integration issues vary by mitigation technology and region, and while they are not generally technically insurmountable, such issues must be carefully considered in energy supply planning and perations to ensure reliable and affordable energy supply and may require changes in patterns of energy production and use. and consumer expectations, and result in higher energy costs [7.6, medium agreement; robust evidence]. These factors may also apply to deployment of fossil fuels [7.4, high agreement; robust evidence]. | Taken into account - the entire paragraph has been rephrased in order to address concerns of this and other reviewers. |
| 18173 | 7 | 6 | 24 | | 33 | Alternative paragraph: The unavailability of any one key low GHG energy supply option will necessitate systemic changes in the use of the remaining set of low GHG resources, technologies and demand measures, for emissions will rise, increasing both marginal and total cost of achieving a prescribed emissions limit [7.12, high agreement; medium evidence]. Infrastructure and integration issues vary by mitigation technology and region, and while they are not generally technically insurmountable, such issues must be carefully considered in energy supply planning and operations to ensure reliable and affordable energy supply and may require changes in patterns of energy production and use. | Taken into account - the entire paragraph has been rephrased in order to address concerns of this and other reviewers. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6793 | 7 | 6 | 28 | 6 | 29 | "Infrastructure and integration issues vary by mitigation technology and region, and while they are not generally technically insurmountable…" Grid integration of renewable energy is far from insurmountable. Numerous utility studies have shown grid integration costs of less than a half-cent US per kWh for penetrations up to 25%. In the U.S. many utilities have easily met many renewable energy penetration goals associated with renewable portfolio standards far ahead of schedule. And installing the infrastructure is a welcome opportunity when jobs are badly needed. | Rejected - space constraints do not allow to go into the details in the ES |
| 4097 | 7 | 6 | 3 | 6 | 3 | At every point in this chapter the source of bioenergy needs to be provided in view of the already seriously adverse effects of using some forms for bioenergy/biofuel purposes - including impacts on food availability, food prices, social stability, and water resources. | Taken into account - there is a new annex to chapter 11 which deals with the issues related to bioenergy usage. Space constraints however, do not allow |
| 3770 | 7 | 6 | 31 | 6 | 31 | "consumers expectations". Usually the consumer is only concerned with the availability of some energy services and not with the primary energy sources. Thus, "consumer expectations" must be better clarified. | Rejected - some options to deal with variable input from RE sources are realized at the consume level (e.g. |
| 3771 | 7 | 6 | 32 | 6 | 33 | This sentence is not necessary. It is already included in the previous one. | Accepted - text revised. |
| 15802 | 7 | 6 | 34 | 6 | 41 | Co-benefits are valuable but how do you quantify these, both physically and economically? Just talking about these will drive technology deployemtn or convince policy makers. | Noted - the fact that co-benefits are hard to quantify does not mean that they are |
| 18174 | 7 | 6 | 34 | | 40 | Add to paragraph: There are often co-benefits from the use of mitigation technologies in the energy supply sector, such as reduction of air pollution, employment opportunities, lower energy production related fatality rates, better energy security, improved energy access and reduced vulnerability to price volatility [7.9, high agreement; robust evidence]. At the same time, however, many low carbon technologies can have substantial negative ecological impacts, though social and cultural appropriate technology selection, in the context of neighborhood itsthose impacts can be mitigated to a degree through the appropriate selection, design and siting of the technology [7.9, high agreement; robust evidence]. Comment: Meaning the territorial (in a geographical wide sense) and environmental (in its whole sense) conditions of the project. | Taken into account - the entire paragraph has been rephrased in order to address concerns of this and other reviewers. |
| 18175 | 7 | 6 | 34 | | 40 | Alternative paragraph: There are often co-benefits from the use of mitigation technologies in the energy supply sector, such as reduction of air pollution, employment opportunities, lower energy production related fatality rates, better energy security, improved energy access and reduced vulnerability to price volatility [7.9, high agreement; robust evidence]. At the same time, however, many low carbon technologies can have substantial negative ecological impacts, though social and cultural appropriate technology selection, in the context of neighborhood. | Taken into account - the entire paragraph has been rephrased in order to address concerns of this and other reviewers. |
| 5327 | 7 | 6 | 34 | 6 | 37 | The co-benefits of “employment opportunities” and “better energy security” are highly questionable. Where does the alleged high evidence come from? Employment effects are predicted mostly by bottom-up models, but not by CGE models. If energy becomes more expensive through deployment of renewable energy, aggregate employment typically goes down.<br>Energy security: Coal is highly abundant on the world market and prices are rather stable. (This is a driver for global warming). By contrast, the supply of renewable energy, notably wind and solar is highly volatile, leading to additional costs for storage and/or backing up of energy supply gaps by flexible power plants, notably gas turbine power plants. So the increase of energy security by the deployment of renewable energy sources is highly questionable. Where is the evidence from scientific research? | Taken into account - the dispute on this issue now is shown in chapter 7.10.4. The level of confidence of the paragraph in the ES has been reduced. The wording however is the same as it is true that job creation opportunities exist. Lost jobs are counted under "negative impacts" a couple of lines later. |
| 12029 | 7 | 6 | 35 | 6 | 35 | There must be both positive and negative opportunities for employment. | Rejected - co-benefits comprise employment opportunities. Lost jobs are to be counted under negative side- |
| 12917 | 7 | 6 | 35 | 6 | 35 | add 'cost savings' | Rejected - in general low carbon technologies are still more expensive |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6222 | 7 | 6 | 36 | 6 | 36 | Many mitigation technologies increase price volatility - cf negative power prices in FRG due to excess wind | Rejected - what is meant here are the prices of imported energies. |
| 16772 | 7 | 6 | 36 | | | Can you somehow highlight the "vulnerability to price volatility" point? This is important and could be overlooked. | Taken into account. |
| 18040 | 7 | 6 | 37 | 6 | 40 | Because the term "low-carbon technoologies" is not defined (which it should be), the statement becomes very unclear. I suggest splitting the sentence up in 1) renewables; 2) Nuclear; 3) CCS (and other technologies that may be defined as "low carbon"). I would question whether RE technologies can have "substantial" negative impacts (locally, perhaps). Nuclear and CCS are the technologies that can have "substantial" impacts, as stated on 61 whic says: "Concerning maximum consequences, those renewable sources clearly outperform all other technologies because their decentralised nature strongly limits their catastrophic impacts". | Rejected - not supported by the broad body of peer reviewed research. The reviewer is reading the term "low-carbon technologies" in a very narrow manner that is not consistent with how the term is applied throughout Chapter 7 or for that matter in previous IPCC assessments. If "low-carbon technologies" includes biomass plantations producing 100 EJ/year then there is literature that speaks to significant ecological concerns that |
| 6792 | 7 | 6 | 37 | 6 | 38 | Saying "many low carbon technologies can have substantial negative ecological impacts " significantly overstates the case. Renewable technologies generally have low impacts. The 2010 US National Academy study on the true cost of the US energy system stated that environmental impacts costs of renewables were assumed low. | Rejected - not supported by the broad body of peer reviewed research. The reviewer is reading the term "low-carbon technologies" in a very narrow manner that is not consistent with how the term is applied throughout Chapter 7 or for that matter in previous IPCC assessments. If "low-carbon technologies" includes biomass plantations producing 100 EJ/year then there is literature that speaks to significant ecological concerns that |
| 10044 | 7 | 6 | 4 | | | CCS high agreement, robust evidence? | Rejected - the reviewer's comment is not supported by the peer reviewed literature. There is a large literature that speaks to the potential for biomass + CCS to create negative emissions. This hasn't been done in practice as there is no disincentive on venting GHG to the atmosphere that is stringent enough to call for measures like this. As more |
| 2396 | 7 | 6 | 40 | 6 | 41 | last sentence makes no sense at all. | Taken into account - text has been |
| 18176 | 7 | 6 | 40 | | 46 | Add to paragraph: Additionally, at high penetration, GHG emissions from low carbon technology can act to limit penetration if a low GHG stabilization target is desired [7.8, high agreement; robust evidence]. Considerable populations do not have access to modern energy resources and technologies, especially in Africa and Asia [7.3, high agreement; robust evidence]. Providing universal access to modern affordable energy services will require understanding of local conditions, and removing of different kind of barriers removing different cultural, institutional and legal barriers, but not necessarily lead to any significant changes in GHG emissions [7.9, high agreement; limited evidence]. | Taken into account - the entire paragraph has been rephrased in order to address concerns of this and other reviewers. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18177 | 7 | 6 | 40 | | 46 | Alternative paragraph: Additionally, at high penetration, GHG emissions from low carbon technology can act to limit penetration if a low GHG stabilization target is desired [7.8, high agreement; robust evidence]. Considerable populations do not have access to modern energy resources and technologies, especially in Africa and Asia [7.3, high agreement; robust evidence]. Providing universal access to modern affordable energy services will require understanding of local conditions, and removing of different kind of barriers removing different cultural, but not necessarily lead to any significant changes in GHG emissions [7.9, high agreement; limited evidence]. | Taken into account - the entire paragraph has been rephrased in order to address concerns of this and other reviewers. |
| 13285 | 7 | 6 | 40 | 5 | 41 | It is not clear what this final sentence of the paragraph means - if it means that residual emissions from coal CCS generation might still be too high to be consistent with stringent emissions limits, this could be made clearer (possibly with an example) | Taken into account - text has been deleted. |
| 16773 | 7 | 6 | 40 | | 41 | This reference to section 7.8 should be corrected -- reading 7.8 shows there are significant problems insofar as it 1st claims that life-cycle analysis of lower carbon techs could result in increased emissions because of the energy used to make these technologies, but then later in section makes the very good point that as the system lowers it's emissions these estimates do not apply. This section seems flawed and inclusion of this point in the summary is not helpful. | Taken into account - text has been deleted. Comment is obsolete. The underlying text in chapter 7.8.1 has been improved. |
| 3772 | 7 | 6 | 40 | 6 | 41 | Sentence is not clear. | Taken into account- text has been deleted. Comment is obsolete. |
| 5147 | 7 | 6 | 40 | | 41 | there is a kind of paradox or bewildering message in this sentence - it states that low carbon technologies are not low carbon - also "Additionally --" points back to the previous sentence , however there is no direct link between "negative ecological impact" and GHG emissions from low carb techs - sentence should be rephrased to clearify message | Taken into account - text has been deleted. Comment is obsolete. |
| 2397 | 7 | 6 | 42 | 6 | 46 | This needs a more sensitive treatment. It should read sub-Sharan Africa first of all. Second it is not a matter of removing the barriers mentioned alone, that is a small sub set of the issue. | Taken into account - the entire paragraph has been rephrased in order to address concerns of this and other |
| 2398 | 7 | 6 | 42 | 6 | 46 | At least one of my publsihed papers in 2010 2011 or 2012 should be cited in the access sections. | Taken into account - references are not shown in the ES. In 7.9.1. the work of |
| 5132 | 7 | 6 | 42 | | | what are "modern energy resources" ? Should it be "modern energy services"? | Accepted - text revised. |
| 4776 | 7 | 6 | 42 | 6 | 46 | I don't always agree with this paragraph, as it clearly depends on the choice of the technology. Indeed the cheapest power technology could emit more GHG emissions than other technologies (low- or no-CO2) | Taken into account - the entire paragraph has been rephrased in order to address concerns of this and other |
| 16774 | 7 | 6 | 42 | | 46 | Should qualify the statement that improving access to energy resources does not necessarily lead to changes in emissions -- should use this as opportunity to say "provided such systems rely on lower emitting energy technologies." If these populations are served with older coal technology (as an example) it is very true that emissions could increase significantly. | Taken into account - the entire paragraph has been rephrased in order to address concerns of this and other reviewers. |
| 12543 | 7 | 6 | 45 | | | The wording is somewhat misleading. Universal access to affordable low carbon energy resources would "not necessarily lead to any significant changes in GHG emissions," it is true (emphasis added). But it is more likely, and of course more desirable, that the considerable amount of the world's population unserved or poorly served at present gain access to modern affordable low-emission energy services, substituting solar PV and other resources for high-emission high-cost ones (biomass for cooking, diesel, gasoline, bunker fuels, coal) that tend to move down the income ladder as they are displaced by lower-emission resources. While their emissions would increase slightly, that would be greatly outweighed by the emissions reduction from adoption of clean technologies and resources across societies as a whole. | Taken into account - the entire paragraph has been rephrased in order to address concerns of this and other reviewers. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18178 | 7 | 6 | 47 | | 49 | Add to paragraph: To increase social acceptance of low-carbon technologies, a variety of some procedures have been shown to be effective, such as: ensuring a wide distribution of that accurate and unbiased information about the technology, its impacts and benefits, and its interplay with other technologies is widely distributed; aligning the expectations and interests of different stakeholders; adjusting to the local societal context; adopting benefit sharing mechanisms; obtaining explicit support at the local and national levels prior to development; building collaborative networks, and developing mechanisms for articulating conflict and engaging in negotiation. | Taken into account - text revised. |
| 18179 | 7 | 6 | 47 | | 49 | Alternative paragraph: To increase social acceptance of low-carbon technologies, a variety of some procedures have been shown to be effective, such as: ensuring a wide distribution of accurate and unbiased information about the technology, its impacts and benefits, and its interplay with other technologies is widely distributed; aligning the expectations and interests of different stakeholders; adjusting to the local societal context; adopting benefit sharing mechanisms; obtaining explicit support at the local and national levels prior to development; building collaborative networks, and developing mechanisms for articulating conflict and engaging in negotiation. | Taken into account - text revised. |
| 15758 | 7 | 6 | 48 | | | "accurate and unbiased information" is critical but is very often lacking with respect to a fair assessment of renewable energy costs and potential to displace fossil energy | Noted - unfortunately space constraints do not allow to go into all details in the |
| 4804 | 7 | 6 | 5 | 6 | 17 | Main generation source in South America (developing countries) is hydro which is already a clean technology, thus, mitigation is not needed in the same level as for developed countries where fossil is much more important. | Taken into account - comment is obsolete. Text has been deleted. |
| 4775 | 7 | 6 | 8 | 6 | 11 | For me "public acceptance" and "economic competitiveness" are included in sustainability concerns. Please be consistent for all AR5. | Taken into account - comment is obsolete. Text has been deleted. |
| 18166 | 7 | 6 | 8 | | 17 | Add to paragraph: Factors such as sustainability concerns, public acceptance, systems integration and infrastructure constraints, and economic competitiveness may limit the deployment of individual low carbon options well before technical potential limits are reached. For least developed countries, their dissemination will imply technology transfer and joint development, a massive technology transfer coupled with financial support. In favourable settings, some of the low carbon energy supply technologies are already economically competitive: for example, larger-scale RE power supplies can be competitive: with fossil fuel alternatives, while smaller-scale hydropower, solar photovoltaics, and modern bioenergy systems can sometimes be less expensive than other alternatives to increasing energy access in off-grid, remote and rural areas larger-scale RE power supplies can be competitive with fossil fuel alternatives, while smaller-scale hydropower, photovoltaic and modern bioenergy systems can increase energy access, so as other services, in off-grid, remote and rural areas. | Taken into account - comment is obsolete. Text has been deleted. |
| 18167 | 7 | 6 | 8 | | 17 | Alternative paragraph: Factors such as sustainability concerns, public acceptance, systems integration and infrastructure constraints, and economic competitiveness may limit the deployment of individual low carbon options well before technical potential limits are reached. For least developed countries, their dissemination will imply technology transfer and joint development, coupled with financial support. In favourable settings, some of the low carbon energy supply technologies are already economically competitive: for example, larger-scale RE power supplies can be competitive: larger-scale RE power supplies can be competitive with fossil fuel alternatives, while smaller-scale hydropower, photovoltaic and modern bioenergy systems can increase energy access, so as other services, in off-grid, remote and rural areas. | Taken into account - comment is obsolete. Text has been deleted. |
| 4098 | 7 | 6 | 8 | 6 | 9 | Shouldn't the issue of intermittency be specifically mentioned here - rather than presumably elided under 'systems integration'? Again it would be appropriate to mention the challenges of low power densities. | Taken into account - intermittency and low power densities are some of the aspects that are part of the integration issues discussed in chapter 7.6. These issues are now summarized in an |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12156 | 7 | 6 | 9 | 6 | 9 | I think that it's opportune and necessary to include "cultural aspects" in the context of the focused factors. | Taken into account cultural aspects are discussed in chapter 7.9. There is now an extended paragraph on these aspects |
| 18498 | 7 | 6 | | | | The discussion of developing countries (lines 12-13 and 43-45) seems to miss the importance of decoupling growth (including an increase in energy access) and GHG emission increases, whereas mitigation of emissions is more of a priority for developed countries. The discussions of technology transfer and barrier removal would need to fit into that overarching framework. | Rejected - space constraints do not allow to highlight every interesting point. |
| 17887 | 7 | 60 | | | | please refer to the WHO analysis of the Chernobyl accident as well as Fukushima - consult www.who.int | Taken into account. Please note that there are no formal reports or publications on Fukushima. There is an evaluation of Chernobyl on |
| 11868 | 7 | 60 | 1 | 60 | 3 | Again, these studies addressed very particular materials, and I strongly believe that some qualification of the statement is required for example "…in the future could increase the energy cost and…" There are other futures that could be envisioned -for example robust recycling infrastructure due to increased value for critical materials as well as signficant reductions in critical material use per unit energy generated (i.e. the kinds of significant reductions we've seen in solar panels and even electronics in terms of material use). | Taken into account: Cite Norgate and Eckelman work |
| 16846 | 7 | 60 | 1 | | 3 | If the energy includes the cost of CO2 via a CO2 price, the CO2 in the life cycle should be accounted for. | Taken into account. |
| 17755 | 7 | 60 | 11 | | | delete the words "that is not well represented in the literature" - this is not correct | Accepted. The passage has been added. |
| 12549 | 7 | 60 | 13 | | | A useful reference: Jordan Macknick, Robin Newmark, Garvin Heath, and KC Hallett, 2011. A Review of Operational Water Consumption and Withdrawal Factors for Electricity Generating Technologies. NREL/TP-6A20-50900 | Taken into account. This section to be revised based on some of this new data. |
| 10084 | 7 | 60 | 16 | | | Fukushima-Daiichi Block 1 to 4 | Accepted |
| 4824 | 7 | 60 | 26 | 62 | 24 | This section should be subdived by technology to ease reading and quick comparison of risks by technology | Editorial comment. |
| 11869 | 7 | 60 | 32 | 61 | 28 | This first paragraph of 7.9.3 seems to be a continous list of potential accidents from different types of power generation systems. It is, however, incomplete. For example, while coal extraction deaths from collapses and underground explosions are high, the number of miners that die from exposure to coal dust, CO, etc. is probably much larger. Ignoring this but then listing exposure to coal fired power plant pollutants seems like an incongruency. Also, while coal is bad for air quality and consequent emissions in the US (as indicated by the quote in the paragraph), there are many other places, like China, where air pollutants from coal combustion are much worse and likely cause more illness/death. Overall, this section on risk seems like it need a great deal of refinement, including a plan for how to discuss risks from different fuels/technologies. Further along, in the third paragraph, the list of nuclear accidents comes after what seems to be a summary of risks, and mention of chernobyl and fukushima. This whole section needs reorganization to clarify the desired background information and key points/concepts the authors want to convey. I suspect it could be very much shortened if this was done. | Taken into account. Please note that pollution issues are addressed in section 7.9.2 |
| 4821 | 7 | 60 | 34 | 60 | 34 | Add full stop after "may take place" | Editorial comment. |
| 16849 | 7 | 60 | 36 | | 38 | Is this claim of 10,000 deaths substantiated via other studies? It is very controversial and pushed hard by advocacy community -- other high quality citations could strengthen the point. | Accepted. Sentence deleted. These deaths are not due to major accidents. |
| 13205 | 7 | 60 | 37 | 60 | 37 | This figure of 10 000 coal related deaths is not reflected in figuer 7.17 | Taken into account. These were not accidental deaths and the sentence has |
| 9661 | 7 | 60 | 38 | | | von Hippel et al., 2011 is not in the reference list | Accepted. Sentence deleted. |
| 7743 | 7 | 60 | 4 | 60 | 9 | Water consumption is also considerably increased by CCS capture plant. | Accepted. Water use added as an issue in the paragraph on CCS. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9281 | 7 | 60 | 4 | 60 | 10 | This statement seems subjective and unbalanced as it does not seem to attempt to estimate a net benefit-cost position of the application of CCS (i.e. what constitutes an 'environmental burdens' remains vague and undefined. The analytical methodology seems contestible too as there is clearly no attempt to capture either the environmental benefits or a time value (i.e. discounting)). Suggest deleting. | Taken into account. Note that the discussion here is not meant to address the environmental benefits obtained by reducing climate change. However, since a recent analysis looked at just |
| 2276 | 7 | 60 | 4 | 60 | 10 | This paragraph on CCS does not mention recent concerns about potential health and environmental effects of from release of amines or amine degradation products ("nitrosamines") from post-combustion capture processes to the ambient, and that these have been addressed excessively in scientific research (summary of references can be found e.g. in the ZEP amine report (http://www.zeroemissionsplatform.eu/downloads/985.html). | Reject. The nitrosamines issue is not explicitly mentioned here because the potential magnitude of this impact is smaller than that of other health impacts of these power plants and the fuel |
| 16847 | 7 | 60 | 4 | | 8 | This seems incorrect or is not coming across clearly -- in a world with a CO2 price, if cost are internalized as they are in modeling, CCS still appears as a cost effective mitigation strategy. The points made here are inconsistent with other sections of this document and Chapt 6. | Rejected. This must be based on a misunderstanding. The section is on ecological and health impacts other than those caused by climate change. The sentence clearly states that "the |
| 3800 | 7 | 60 | 4 | 60 | 8 | Please, include as negative impacts of CCS the necessity of further increase in primary energy sources consumption. | Rejected. There is not much space here to deal with ecological and health effect. We hence do not want to add another |
| 13056 | 7 | 60 | 41 | 60 | 44 | For context, the date of the Shimantan dam failure (1975) should be included at a minimum. Furthermore, a note on substantial improvements in hydropower construction and safety regulations since the 1970s around the world should also be included (similar to what's included for crude oil releases into maritime environments, see p. 62, lines 12-13 in same chapter). As well, China is today considered to be one of the best performers in terms of dam safety, their reputation in this regard is well-supported by the internationl engineering community. Furthermore, it is IHA's understanding that there was no installed hydropower capacity at these dams at the time of failure, so to assert that hydropower has the highest accident related external costs is a misrepresentation of the facts. | Accepted. Date added. |
| 5175 | 7 | 60 | 41 | 60 | 44 | the statement lack references. - the statement here is too categorical, it is difficult to see that the logical conclution from the SRREN is what is stated here. Ref also the text on this in the SRREN SPM | Accepted. The passage has been revised, but we had to shorten it; there is not enough space to treat this as the |
| 16130 | 7 | 60 | 44 | 61 | 2 | The presentation of nuclear risk, in particular the Chernobyl accident, is too controversial. Other estimates such as the TORCH report indicate fatalities in a much higher bracket. | Editorial comment? Please provide correct references if you think we have |
| 4822 | 7 | 60 | 44 | 60 | 44 | What about Fukushima? | Taken into account. Please note that the discussion of nuclear risk has been |

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| 9604 | 7 | 60 | 45 | 61 | 2 | Please, rewrite the text, in particular for numbers, with using following information; At this time there are no reliable estimates available of the collective dose due to Fukushima. However, it should be pointed out that estimates of the radioactivity releases from Fukushima show that the releases are low compared to Chernobyl. France's national nuclear regulator IRSN published a comprehensive report in 2012 on the radioactive releases from the Fukushima accident. It found that the releases of radioactive iodine isotopes (of which iodine-131 is one of the most significant in terms of environmental and dosimetric impact) were on the order of a few hundred PBq, which is around ten times lower than the Chernobyl accident [1]. It also found that releases of cesium-137 (which will persist the longest in the environment with its half-life of 30.1 years), were estimated to be 21 PBq, accounting for around one-fourth of the cesium-137 released by the Chernobyl accident [2].<br>[1] IRSN (2012) "Fukushima, one year later: Initial analyses of the accident and its consequences," March 12, 2012, p. 47, lines 22-24.<br>[2] IRSN (2012) "Fukushima, one year later: Initial analyses of the accident and its consequences," March 12, 2012, p. 48, lines 7-10. http://www.irsn.fr/EN/publications/thematic/fukushima/Pages/overview.aspx | Accepted. The text has been revised. However, we prefer citing peer-reviewed journal papers over agency reports. Thank you for the references in any case. |
| 10083 | 7 | 60 | 45 | 61 | 2 | Please add a reference | Accepted. References have been added. |
| 9476 | 7 | 60 | 46 | 61 | 2 | Reference source of the estimation about premature death by Chernobyl accident (9,000 to 33,000) should be written.<br>Cardis et al [1] estimated the number of deaths from various cancers caused by radiation from the Chernobyl accident through the year 2065.<br>The study showed that numbers of deaths of all cancers other than leukemia, thyroid and nonmelanoma skin cancers, leukemia and breast cancer are 14,100, 1,650 and 2,100 respectively.<br>[1] E. Cardis et al. (2006) Estimates of the cancer burden in Europe from radioactive fallout from the Chernobyl accident, International Journal of Cancer 119 | Accepted. Thank you for the reference! |
| 9510 | 7 | 60 | 46 | 61 | 2 | There are not enough evidences about " premature death between 9000 to 33000 people ". And this text cause the incorrect imagination of many premature death by Fukushima accident. It should be pointed out that estimates of the radioactivity releases from Fukushima show that the releases are low compared to Chernobyl. France's national nuclear regulator IRSN published a comprehensive report in 2012 on the radioactive releases from the Fukushima accident. It found that the releases of radioactive iodine isotopes (of which iodine-131 is one of the most significant in terms of environmental and dosimetric impact) were on the order of a few hundred PBq, which is around ten times lower than the Chernobyl accident [1]. It also found that releases of cesium-137 (which will persist the longest in the environment with its half-life of 30.1 years), were estimated to be 21 PBq, accounting for around one-fourth of the cesium-137 released by the Chernobyl accident [2].<br>[1] IRSN (2012) "Fukushima, one year later: Initial analyses of the accident and its consequences," March 12, 2012, p. 47, lines 22-24.<br>[2] IRSN (2012) "Fukushima, one year later: Initial analyses of the accident and its consequences," March 12, 2012, p. 48, lines 7-10.(http://www.irsn.fr/EN/publications/thematic/fukushima/Pages/overview.aspx) | Accepted. The text has been revised. |
| 6429 | 7 | 60 | 5 | 60 | 5 | This is typically referred to as an energy "penalty" not "cost" | Editorial. Yes, this is the type of inside jargon we would like to avoid. |
| 4260 | 7 | 60 | 5 | | | Whether or not CCS has adverse effects on human health will also depend on the degree to which it lowers particulate air pollution from fossil fuel combustion. Substantial lowering of fine particulates should more than compensate for any potential adverse effects from leakage of CO2 etc | Taken into account. Reduction of PM precursors due to requirement for gas cleaning in post combustion plants is included in the assessment. However, the comparison basis here are SOTA |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17940 | 7 | 60 | 9 | | | The cross-reference to Section 7.9.1 appears to be wrong. In general, it would be a good idea to bring the different discussions of CCS impacts across chapters (5, 6, 7, and 11) together. | Action: look for CCS impacts in the other chapters! The reference must now |
| 9606 | 7 | 60 | | | | Please, import a sentense from line 37 to 41, page 29 in chapter 9 as follows; premature deaths from biomass smoke in households accounted for 1.5 million people in 2008, a number - above those from tuberculosis and malaria - that may change little until 2030 according to projections following the present trends. | What is the source of this information? |
| 11949 | 7 | 60 | | | | Ths section could be shortened substantially since it relies heavily on a recent IPCC report. Suggest just giving a half page summary with reference. | Rejected. We think the material warrants to be presented in the present, |
| 10961 | 7 | 60 | 25 | 62 | 24 | Confer: Torvanger, Grimstad, Lindeberg, Rive, Rypdal, Bieltvedt Skeie, Fuglestvedt, Tollefsen (2012), Quality of geological CO2 storage to avoid jeopardizing climate targets, Climatic Change, 114, 245-260; showing that leakage even under large-scale CCS-based CO2 storage is not likely to have significant effects on future global temperature. | Taken into account. We have chosen not to address CO2 leakage from reservoirs in this section due to space constraints. Thank you for the reference! |
| 4788 | 7 | 60 | 41 | 60 | 44 | I am surprise of this data that hydro has the highest death rate for all technologes. I can understand that a dam failure may be dangerous. I have in mind a study that compared death to electricity generated (death/TWh) and the highest rate if or coal (technology & death/TWh): coal (world) = 161 ; coal (China) = 278 ; Coal (USA) = 15 ; Oil = 38 ; Solar PV = 0.44 ; Wind = 0.15 ; Hydro = 0.1 ; Hydro (with Banqiao) = 1.4. Please check your figures for all technologies | Rejected. The data summarized here is referenced. No source was given by the reviewer. Not helpful. |
| 10055 | 7 | 60 | 44 | 61 | 2 | There are sveral hundred nuclear accidents reported with medium to high environmental impact, including those in fuel supply facilities such as the accident(s) in Majak - e.g. on 29 September 1957. Today the region around Majak / Tscheljabinsk is still amoun the most radioactiv contaminated regions world wide. More references must be added to make the complete the information about nuclear accidents of the past. | Rejected. The intention here is not to provide a complete account of the entire past. Given that we want to make informed decisions about future energy systems, it is important to avoid too |
| 9163 | 7 | 61 | | 62 | | Why developed countries only? Many labors are killed by accidents in coal mines in developing countries. | Rhetorical question. Please note that non-OECD countries are presented in |
| 9164 | 7 | 61 | | 62 | | Show full externatlities of the world, not the casulity in the developed countreis. Rare metal industires are damaging the local environment in developing countries. | Noted. Why are rare metal industries relevant here? Could you please point us |
| 5931 | 7 | 61 | | 62 | | It would be important to show the fatalities also in relation to the amount of electricity generated, not only in relation to nominal capacity, by using typical average full -load hours of each technology. | Rejected. The difference due to the load factor would not be apparent given the |
| 16131 | 7 | 61 | 15 | 61 | 28 | The cumulative operation of 14,500 reactor years should be compared with the initial doctrine of probability of events of one accident with loss of coolant every 100 000 reactor years and one large catastrophic accident for one million years. This means the present doctrine of redundancy and multiple protection is not adequate. This paragraph is strange because it argues on nuclear safety increasing in time, but is based on data (14 500 y.reactors;three catastrophic accidents) contradicting obviously that record. | Rejected. The 100 000 reactor year claim is not relevant here. |
| 9605 | 7 | 61 | 15 | 61 | 28 | Please, delete here due to redundant, or discuss with the reason why modern nuclear and OECD hydropower plants show the lowest fatality rates. | Taken into account. Please note the section has been shortened. |
| 4112 | 7 | 61 | 15 | 61 | 18 | As the causes of these three 'nuclear accidents' are indeed 'fundamentally different' it would be worth reviewing the wording here. | Noted. This review comment is unclear, but the wording has been reviewed. |
| 3801 | 7 | 61 | 15 | 61 | 28 | Too much discussion on nuclear energy compared with other energy sources. This reflects report unbalance. | Rejected. The focus on nuclear in this section is warranted due to the potential for large accident and the dread these |
| 17377 | 7 | 61 | 2 | | | Reliable fatality data… | Accepted. Section revised. |
| 9477 | 7 | 61 | 24 | 61 | 28 | This part should be left in this report, as it is correct description about efforts to enhance safety of nuclear power. | Taken into account |
| 9511 | 7 | 61 | 24 | 61 | 28 | Good text. It's very important safety policy of nuclear reactor. This text should be referred to executive summary too. | Taken into account. This is not likely to make it to the summary. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18096 | 7 | 61 | 24 | 61 | 28 | The distinction between the safety of the oparting plants and the designs that are on the drawing board should be made clearer. | Rejected. As we discuss new designs that are remarkable for their safety features, it should be clear that existing |
| 16850 | 7 | 61 | 29 | | 32 | How good are the statistics for small, highly decentralized systems? How many deaths from installation of rooftop solar and how do these compare with roof install or repair? Are there no health impacts from exposure to toxic materials for workers in factors that produce solar cells? What about exposure to toxic material (resins, bonding agents) for workers in factories that make large wind turbine blades? No reported deaths for workers on very tall wind turbines (I hope these are all minimal, but these systems are new and I wonder if we just haven't gotten around to checking). All the numbers discussed here would be more useful if also put into context of risks or deaths/1000 worker hours or something similar, or perhaps more helpful deaths per unit of energy produced. | Accepted. Please note that we do not make claims regarding smaller accidents. We would very much welcome data sources and studies addressing these issues. |
| 7744 | 7 | 61 | 30 | 61 | 32 | What renewable sources is the text referring to? Nuclear is not renewable... | Accepted. "those" has been deleted. |
| 18097 | 7 | 61 | 30 | 61 | 32 | The sentence leaves the impression that "other low carbon technologies" are only more safe because of their "decentralised nature". That leaves much to add, e.g. that they do not use dangerous or polluting elements (fuel, uranium, ...) or extreme temperatures for combustion (and, therefore, explosion hasards); less particles, mercury, water use, riwsk of polution etc. | Rejected. These issues are addressed in section 7.9.2 |
| 4823 | 7 | 61 | 5 | 61 | 5 | Explain maximum consequences index | Rejected - space constraints do not allow to go into the details here. |
| 10056 | 7 | 61 | 15 | 61 | 28 | see above | Rejected. We do not understand this |
| 4653 | 7 | 62 | | 62 | | Is this table necessary? Could it not be summarized in a short paragraph? In my opinion the whole section on technical risks could be condensed. | Editorial comment |
| 10566 | 7 | 62 | | | | Bullets on bottom right of figure should become a foonote in caption. Where they are placed now is not easy for the reader to link with the numbers in left hand column | Editorial comment |
| 13206 | 7 | 62 | 1 | | | This figure is misleading and should be checked. It does not reflect the fact that coal is by far the most harmful energy source | Reject. No reference provided to justify the assertion made. |
| 10085 | 7 | 62 | 14 | | 21 | There is no mentioning of gas exploration and production accidents like recently in the north sea. In additon there no remark about the possible contradictions between hydraulic fracturing for shale gas, natural gas or geothermal operations and the storage of CO2. | Reject. No reference provided. Gas accidents are taken into account in Fig. 7.17. We do not understand what the |
| 15293 | 7 | 62 | 19 | 63 | 14 | I am surprised to see that hydr fracturing (fracking) is only mentioned as a health & water issue. The 2011 Cornell (Howarth et al.) LCA suggests it is worse than coal, & presumably others have followed us with such analyses. I think such issues should be mentioned, unless the authors feel they don't exist. | Reject. The Howarth study refers to GHG not catastrophic risks and this issue is addressed in section 7.8.1 and |
| 2974 | 7 | 62 | 25 | | | The cited PSI data has several flaws. By considering only accidents with more than 5 deaths, technologies leading to many but not large accidence like coal mining are heavily underestimated (see: Lirong Wu and others, 'Major Accident Analysis and Prevention of Coal Mines in China from the Year of 1949 to 2009', Mining Science and Technology (China), 21 (2011), 693–699 <doi:10.1016/j.mstc.2011.03.006>.). For fossil fuels in addition an outlook on future risks from new exploration and depletion technologies such as fracking would be useful. | Noted. The reviewer has identified a major gap in the current analysis, i.e. accidents with less than 5 fatalities. No systematic, comparative information of the type presented here is currently available. Thank you for pointing out a |
| 11950 | 7 | 62 | 25 | 64 | 4 | Since this is discussed in other Chapters, a one sentence referral is warrented, not 2 whole pages. This is not on the main topic of Energy Systems | Rejected - we are following the outline dictated by the IPCC, but have reduced |
| 2843 | 7 | 62 | 25 | 64 | 2 | The discussion of public acceptability does not cover transmission lines, though these can raise significant acceptability issues. | Accepted - we note in a footnote that transmission is NOT covered here. While a relevant topic, we do not the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 9283 | 7 | 63 | | | | Footnote 18 states "Knowledge about the social acceptability of CCS is limited due to the early state of the technologies' deployment. Recent research has, in part, focused on the need to fully educate respondents about CCS if meaningful insights are to be gained about public acceptance issues".<br><br>The extent to which a local community has confidence in the regulatory frameworks that undeprin and govern any standard industrial activities (such as CCS, refer to WGIII FOD Chapter 2, page 43 lines 2 - 23 which states that CCS is no more riskier than other fossil fuel applications) often means that the community does not have be "fully" educated om a particular technology for it to have acceptance of its deployment.<br><br>The prevailing footnote statement seems to offer quite a subjective statement. I suggest delete it. | Accepted - We have shorten the footnote substantially to address the concern, but still retain it. |
| 3407 | 7 | 63 | 10 | 63 | 13 | IPCC SR on CCS already reports these basic ideas. Therefore no need for 7 new references ¡. Footnote 18 states the obvious and introduces again four references. Similar problems in lines 23-24. | Rejected - these references are from after the CCS special report, and a key purpose of AR5 is to update the literature from previous IPCC reports. While the concepts may not be |
| 16851 | 7 | 63 | 10 | | 12 | There are undoubtedly other costs associated with the use of fossil fuels -- however, the fact that CCS tech cost calculations don't include other social costs is not the point is it? The effort is to reduce CO2 emissions while still providing energy. Other social costs can be internalized via market pricing systems independent of climate policies, but if we try to make climate mitigation account for all social ills, do we risk asking it to solve too much. | Rejected - Though we agree with the comment in many respects, this section's purpose is simply to identify concerns related to public perception and acceptance for each of the core energy supply technologies. For all technologies, those concerns extend well beyond carbon, and indeed, some concerns may not even be technically "accurate" in some respects. We agree |
| 9282 | 7 | 63 | 11 | 63 | 12 | It is not clear what the following statement is actually referring to: "… CCS technologies do not avoid the non-GHG social and environmental impacts of fossil energy sources …"<br><br>The statement would benefit from further information to assist clarity of meaning. | Rejected - we feel that this language is clear. CCS avoids carbon; it does not avoid other social/environmental impacts associated with fossil energy plants. |
| 16859 | 7 | 64 | 15 | | | Where have "new market mechanisms" been defined? I don't know what these are. | Rejected - comment seems to be misplaced. Please clarify where you |
| 10086 | 7 | 64 | 18 | | 19 | This is not only an issue for renewables but large thermal power units as well | Taken into account - comment is obsolete as the underlying text has been |
| 11870 | 7 | 64 | 18 | 64 | 32 | The bulleted list provided here seem to be a strange subset of barriers - but the text implies that they are an exhaustive list - perhaps it can be made explicit that this is just a subset or list of examples? | Taken into account - comment is obsolete as the underlying text has been |
| 5957 | 7 | 64 | 20 | 24 | | The inference that the difference between average thermal plant efficiencies and best available is a barrier to mitigation lacks balance. It is an economic consequence of the large scale of the required capital investments and the length of the cost recovery periods. The situation is not a technical barrier. The same argument can be applied to network infratructure investments | See 7.10.1 |
| 16852 | 7 | 64 | 20 | | 22 | Does this really limit mitigation potential? I don't believe this point has been demonstrated -- the discussion of conversion efficiencies and energy penalty of CCS does not seem to understand or take into account how this works in a world with carbon prices. It is also inconsistent with results of most models that look at the energy system -- | Taken into account - comment is obsolete as the underlying text has been deleted due to space constraints. |
| 10568 | 7 | 64 | 20 | 64 | 22 | This is two bullet points | Taken into account - comment is obsolete as the underlying text has been |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9910 | 7 | 64 | 3 | 64 | 4 | An analysis of 104 empirical studies of innovation to change showed the following barriers, that could refine and structure the discussion of barriers:<br>Issues of resourcing (76%), for instance, “not enough resources” (Post and Altman 1994), “lack of adequate resources such as time and staff” (Adams and McNicholas 2007), limited or no budgeting (e.g. Harris 2000 and Anumba et al. 2006), access to capital and lack of time (Rohdin and Thollander 2006).<br>Issues of capabilities (75%), for instance, “low technology literacy” (Stewart, Mohamed and Marosszeky 2004), “ill-equipped in terms of training and expertise” (Whitaker 1987), “employees are not trained” (Tamimi and Sebastianelli 1998), “lack of understanding” (Waldron 2005), “lack of technical skills” (Rohdin and Thollander 2006), “lack of skill, knowledge and expertise” (Kirkland and Thompson 1999), etc.<br>Issues of communication (64%), for instance, “communication barriers” (Heide, Grønhaug and Johannessen 2002), “communication overload and distortion” (Allen 2002), “lack of communication within the team” (Attaran and Nguyen 1999), “lack of communication among those sharing responsibility for different aspects” (Kunda and Brooks 2000), “poor communication practices that damaged employee commitment to projects” (Jacobs et al. 2006), “tension among departments arising from the incompatibility of actual or desired responses” (Aggarwal 2003), etc.<br>Issues of organizational structure (62%), for instance, bureaucracy (e.g. Molinsky 1999; Borins 2000; Abdul-Hadi, Al-Sudairi and Alqahtani 2005), “salary structure” (Al-Qirim 2007), “complexity, centralization, and formalization”(e.g. Allen 2002), “rigid organizational boundaries” (Butler 2006), “departmental fortresses” (Cicmil 1999), and organizational structure (e.g. Scarbrough and Lannon 1988; McGaughey and Snyde 1994; Yauch and Steudel 2002).<br>Abdul-Hadi, N., Al-Sudairi, A. und Alqahtani, S. (2005): Prioritizing barriers to successful business process re-engineering (BPR) efforts in Saudi Arabian construction industry, In: Construction Management \& Economics, Vol. 23, Nr. 3, S. 305-315.<br>Adams, C.A. und McNicholas, P. (2007): Making a difference: Sustainability reporting, accountability and organisational change, In: Accounting, Auditing and Accountability Journal, Vol. 20, Nr. 3, S. 382-402.<br>Aggarwal, N. (2003): Organizational Barriers to Market Orientation, In: Journal of Management Research, Vol. 3, Nr. 2, S. 87-97.<br>Allen, R.Y.W. (2002): Assessing the impediments to organizational change: A view of community policing, In: Journal of Criminal Justic, Vol. 30, Nr. 6, S. 511-517.<br>Al-Qirim, N. (2007): The adoption and diffusion of E-commerce in developing countries: The case of an NGO in Jordan, In: Information Technology for Development, Vol. 13, Nr. 2, S. 107-131.<br>Anumba, C.E.H., et al. (2006): Understanding structural and cultural impediments to ICT system integration: A GIS-based case study, In: Engineering Construction & Architectural Management, Vol. 13, Nr. 6, S. 616-633.<br>Attaran, M. und Nguyen, T.T. (1999): Design and implementation of self-directed process teams, In: Management Decision, Vol. 37, Nr. 7, S. 553-561.<br>Borins, S. (2000): What Border? Public Management Innovation in the United States and Canada, In: Journal of Policy Analysis and Management, Vol. 19, Nr. 1, S. 46-74.<br>Butler, J.C. (2006): Ten Lessons Learned: Data Warehouse Development Project, California Department of Fish and Game, In: CrossTalk: The Journal of Defense Software Engineering, Vol. 19, Nr. 10, S. 16-20 | Rejected - although the information provided by the reviewer is correct, space constraints unfortunately do not allow to go into the details here. |
| 5958 | 7 | 64 | 33 | | | The analysis in Section 7.10.2 should be strengthened as it is a critical aspect of mitigation | Noted. |
| 2844 | 7 | 64 | 34 | 64 | 38 | Should point out that it is not so much the barriers in themselves, as the fact that renewables are thereby less attractive than fossil sources, which leads to a need for policy support. | Noted. The sentence has been deleted to focus more on investments barrier. |
| 18098 | 7 | 64 | 35 | 64 | 35 | Unclear what is meant by "limits of market capacity". Delete "(ii) Uncertainty of energy prices". The uncertainty of future fuel prices is one of the biggest drivers for zero fuel cost renewables - not a barrier (unless it is wrongly assumed that gas and CCS are low-carbon) | Noted. The sentence has been deleted. |
| 16853 | 7 | 64 | 37 | | | suggest insert after " … among stakeholders" the following: ", vii) absence of a price on CO2 emissions to change the relative competitiveness of low emitting energy systems." | Taken into account. CO2 price is mentioned with energy price. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2845 | 7 | 64 | 39 | 64 | 40 | Unbalanced – while some studies show lower overall costs, others show higher costs. Should point out that these results depend on assumptions, inter alia about future fossil fuel prices, whose accuracy is inherently unknowable. | Noted. The sentence has been deleted. |
| 6199 | 7 | 64 | 39 | 64 | 40 | "Various studies indicate that investing in low carbon energy technologies would end up costing less than continuing to invest in older technologies." This sentence, particularly in using the word "would", sounds much more conclusive than may be warranted. It does not say which low-carbon energy technologies would cost less, and thereby clumps together technologies that may be cost-effective with others that are not. It does not describe whether it is referring to overall social costs, or costs that a user would see. Additionally, it needs to tie into reasons why they are not being adopted, and what market failures and/or barriers are maintaining these inefficiencies. | Noted. The sentence has been deleted. |
| 16854 | 7 | 64 | 39 | | 40 | This statement is not supported by the literature UNLESS there is a CO2 price on emissions. | Noted. The sentence has been deleted |
| 16856 | 7 | 64 | 39 | 65 | 2 | This ignores fact that all economic modeling show this change has a cost relative to the no policy scenario. See chapt 6 and 13. | Noted. The sentence has been deleted |
| 9662 | 7 | 64 | 40 | | 41 | Be explicit that the new systems would reduce the demand for fossil fuels | Taken into account. This subsection has been revised focusing more on |
| 16855 | 7 | 64 | 40 | | 41 | 2nd sentence ignores the economic costs created by such a change -- it is not free. Nor does it "save money" -- this does not make it unaffordable, but we should not cross line and claim it is free either. | Noted. Rephrased. |
| 18099 | 7 | 64 | 41 | 65 | 2 | Important point but somewhat unclear sentence. Is it $7 bn savings in fuel costs; is it annually, capital expenditure compared to what ? | Taken into account. The paragraph has been revised. |
| 16857 | 7 | 64 | 6 | | | What is definition of "sustainable" energy? Suggest something more precise. | Rejected - comment seems to be misplaced. Please clarify where you |
| 10567 | 7 | 64 | 6 | 64 | 15 | Suggest delete - repetitive | Rejected - the reference to the objective serves as an introduction for the entire |
| 13207 | 7 | 64 | 8 | 64 | 8 | Delete any reference to a specific mitigation objective which is irrelevant in a chaper devoted to the technical constraints in implementing new energy sources | Rejected - the reference to the objective serves as an introduction for the entire |
| 16858 | 7 | 64 | 9 | | 11 | Institutions or private investors will not finance projects unless they are confident they can earn a sufficient risk adjusted return -- this includes risk not only from technology, but from particular project, country risks, energy market risks and so on. | Rejected - comment seems to be misplaced. Please clarify where you would like to see this being reflected. |
| 18546 | 7 | 64 | | | | The sub-sections in 7.10 vary in terms of their treatment of the different technologies (e.g. with some focusing heavily on RE and ignoring other options) and structure, and in some sections strays to topics covered in other sections (e.g. there is a long policy discussion in 7.10.2). Some kind of conformity would be useful - perhaps structuring sub-sections according to the options presented in 7.5, i.e. fuel switching, energy efficiency, ccs, RE and nuclear. | Rejected 7.10 is on barriers and adopting structure along technologies won't work. The focus on RE is justified because the barriers are high for RE. |
| 3159 | 7 | 64 | 1 | | | Section 7.10 deals with barriers issues that are already discussed, for example, in chapter 3. TSU needs to advise on where barriers should be addressed. Here I repeat a comment I made in chapter 6: "BECCS plays a huge role in the IAMs that can meet goals like 2 degrees. Given that, why not use BECCS as a case study/box in chapter 3 since that would help tie together the issues discussed there with the large role that is assumed for BECCS in some scenarios." | Noted. |
| 11951 | 7 | 64 | 3 | | | Where is economic? And using etc. is very sloppy - makes it seem as is the authors are looking for filler material, when they are already over the limit given by a great deal. And why is physical here in the title since it does not have a section of its own? | Taken into account - economic aspects are discussed in an own chapter (7.8). The things that are mentioned in the title do not necessarily require an own |
| 4461 | 7 | 64 | | 65 | | This section repeats a number of barriers already discussed, including capital cost investment and uncertainty | Noted. This subsection has been revised focusing more on investments. |
| 3456 | 7 | 64 | 33 | 64 | 38 | Among the barriers should be mentioned the existance of regulatory barriers to allow consumers to introduce and sell electricity into the elecitrcity grids | Accepted. Rephrased. This subsection has been revised focusing more on |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15492 | 7 | 64 | 33 | 65 | 32 | Financial barriers and investment barriers and opportunities - Quote (even if this point will probably be treated elsewhere, financial solution combining "mix of technologies with special bank condition" (for example the French Zero per cent loan) | Noted. |
| 15493 | 7 | 64 | 33 | 65 | 32 | Financial barriers and investment barriers and opportunities - Introduce citizen's initiative (such as energy cooperative) to support local investment in RES – wind for example) | Taken into account. Because of space limitation, the suggestion is not explicitly |
| 17945 | 7 | 64 | 39 | 65 | 8 | It is of crucial importance to specify which concepts of cost underlies the claims in this paragraph. Instead of referencing UNFCCC and ADB, the SRREN would provide a much more natural reference with slightly different key messages on the cost side. The numbers of investment in renewable energy are also more recent than the year 2007. | Noted. The sentence has been deleted |
| 2588 | 7 | 65 | 12 | 65 | 17 | Personally, I strongly believe that the introduction of Feed In tariffs "mechanisms" is a participatory approach for developing renewable energy? Such mechanisms would also increase environment awarness among population | Noted. The paragraph has been deleted. |
| 2846 | 7 | 65 | 12 | 65 | 17 | This offers only an incomplete checklist. More detailed analysis is needed of the problem of mobilising investment, drawing attention to the scale of the problem, the capital intensiveness and consequent riskiness of low carbon sources, and the uncertainty facing investors and showing how these can be overcome. | Very important comments, but because of the space limitation, a detailed explanation cannot be done. |
| 10002 | 7 | 65 | 12 | 65 | 17 | This part should be revised to explain that "voluntary target scheme" can be more effective for development of low carbon energy, compared to other mitigation policies such as carbon tax, emission trading, and FIT. There are successful examples of "voluntary target scheme" in the world. Each industry in Japan has voluntary target and the voluntary target scheme has played a big role, as described in (Yamaguchi, 2012, page35 and 154), (Manuel, 2010, page 6 and 13), and (Yamaguchi, 2010, abstract). In addition, there is also a successful example of "voluntary target scheme" in Netherlands, as shown in (Martijin, 2002, page162). These literatures are listed in the No63 line of this table.<br>On the other hand, market-based mechanism such as emission trading has several problems. Volatility of emission permit prices affects volatility of product prices as evidenced by fluctuating price developments in the EU-ETS. Therefore, the market-based policy tools of cap-and-trade cannot provide credible incentives for the technological change, as described in (Montgomery, 2005, abstract) and (Baldursson, 2009, page29). These literatures are listed in the No62 line of this table.<br>In addition, CO2 leakage caused by the implementation of the ETS happened actually through international transfer of industry , as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No50 line of this table. | See 15.5.5 for voluntary scheme. |
| 9374 | 7 | 65 | 12 | 65 | 17 | Voluntary action policy also plays an important role in implementing low carbon energy system therefore should be added as one of the options. | Taken into account. Added. |
| 18101 | 7 | 65 | 15 | 65 | 15 | replace "feed-in tariffs" with "support mechanisms" (feed-in tariffs are one of several types, as stated elsewhere). | Noted. The paragraph has been deleted. |
| 16132 | 7 | 65 | 18 | 65 | 22 | The example of the CDM should be taken with more distance, because too large a share of the mechanism has been allocated to futile or fraudulent cases (i.e. production-destruction of specialty chemicals with N2O "abatement") with a limited share in actual technology transfer with local benefits. A more sober introduction is in order, for example "[The best examples in] the CDM show that such mechanism can work effectively... | Taken into consideration. The paragraph on CDM is deleted. CDM issues are covered in other sections, e.g. Section 4.3.8, Section 7.12 and Section 14.3 |
| 15356 | 7 | 65 | 18 | 65 | 32 | The passage gives the impression of effectiveness of CDM across developing countries however looking at the countries that have benefited from CDM, the statement cannot be made cross cuttingly as e.g. Africa has a very low CDM success rate due to issues related to methodologies, grid emission factors and high transactional costs. These are issues worth highlighting as on line 28 reference to the need for further efforts to alleviate poverty while addressing climate change would better be phrased/captured by indicating need for further "effort and support" | Taken into consideration. The paragraph on CDM is deleted. CDM issues are covered in other sections, e.g. Section 4.3.8, Section 7.12 and Section 14.3 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 11773 | 7 | 65 | 18 | 65 | 22 | CDM doesn't necessarily work well. Rosendahl et al. shows that overall leakage typically will be positive and sizeable, thus leading to an overall increase in global GHG emissions when CDM projects are undertaken. These sentense should be deleted.<br>1. Rosendahl et al.:[Carbon Leakage from the Clean Development Mechanism. Energy Journal], send attachment by another e-mail. | Taken into consideration. The paragraph on CDM is deleted. CDM issues are covered in other sections, e.g. Section 4.3.8, Section 7.12 and Section 14.3 |
| 15494 | 7 | 65 | 18 | 65 | 22 | Delete this part and refer to the forthcoming chapter 7.11.2 GHG pricing policies OR Give figures about geographical repartition and technological repartition. Suggest comparison China with African countries (cross comparison – Geographic-technology). Many reports on this issue (RISOE, UNEP…). Otherwise quote that this part will be completed with a specific chapter later | Taken into account. The part was deleted. |
| 9375 | 7 | 65 | 18 | 65 | 22 | It should also mention the challenges that CDM mechanism faces such as overconcentration of project types and project host countries. There is also an analysis that overall increase in global GHG emissions with CDM projects undertaking.(Rosendahl,K.E, J.Strand, 2011). | Taken into account. This paragraph is deleted. CDM issues are covered in other sections, e.g. Section 7.12 and |
| 5959 | 7 | 65 | 28 | 32 | | It has previsouly been identified that most RE technologies involve high capital cost. This makes them unnatractive to least developed countries. Lack of energy capital stock can only provide an opportunity for low carbon investments if extensive external support mechnaisms are put in place | Noted. |
| 16860 | 7 | 65 | 35 | | | Climate policy does not mean the energy system must be or should be renewable energy sources only -- rather, economic modeling suggest that that the lowest costs approach is focused on low emitting energy technologies. Renewables only is possible, but incurs much higher costs than a system that is open to other technologies. See chapter 6. | Taken into consideration. We are saying large penetration of RE and NOT ONLY RES. We included low emitting energy technologies after checking with |
| 10087 | 7 | 65 | 7 | | 8 | 2011 Figures are $ 263 billion . A regular update is encouraged. (source: BNEF) | Accepted. Updated. |
| 18100 | 7 | 65 | 9 | 65 | 11 | Delete paragraph. Onshore wind cannot be considered "high risk". Offshore wind perhaps, as well as coal or gas with CCS, nuclear, ocean energy, solar thermal. | Noted. The paragraph has been deleted. |
| 10057 | 7 | 65 | 1 | 65 | 11 | outdated sources, newer publications are available such as Global Renewable Status Report 2012 /REN 21 | Noted. The paragraph has been deleted. |
| 17946 | 7 | 65 | 11 | | | It is not clear what 'early stages' is supposed to mean here. If this is targetted at the stage of innovation, the reference would need to be more rencent than 2009, since wind energy technology is rapidly maturing. | Taken into account. The sentence is deleted. |
| 17947 | 7 | 65 | 12 | 65 | 17 | The policy recommendations provided here rather belong to the policy section and do not consitute a comprehensive assessment of various policy options. | Deleted. |
| 15066 | 7 | 65 | 18 | 65 | 22 | Many literatures have found that substantial share of the CDM projects actually do not have "additionality". See, for example, L.Schneider (2009), "Assessing the additionality of CDM projects: practical experiences and lessons learned", Climate Policy, 9(3) pp.242–254; S. Ferrey (2011), "Can the CDM catalyze renewable energy?" in Mehling et al. (eds), Improving the Clean Developing Mechanism: Options and Challenges Post-2012, Lexxion, Berlin; M. Bogner and L. Schneider (2011), "Is the CDM changing investment trends in developing countries or crediting Business-as-Usual?: A case study on the power sector in China, in Mehling et al. (eds), Improving the Clean Developing Mechanism: Options and Challenges Post-2012, Lexxion, Berlin; J. Zhang and C. Wang(2012). "Co-benefits and additionality of the clean development mechanism: An empirical analysis", Journal of Environmental Economics and Management, Vol.62, pp.140–154. Therefore, in my view, it is not appropriate to conclude immediately that CDM has worked effectively to deploy low carbon energy technologies in the developing countries as stated in the present text. It is really no matter how many tons of CO2 have been issued as CERs, since they are likely to be just "Business-as-usual" of GHG reductions if they are non-additional projects found by the above literatures. | Taken into consideration. The paragraph on CDM is deleted. CDM issues are covered in other sections, e.g. Section 4.3.8, Section 7.12 and Section 14.3 |
| 17948 | 7 | 65 | 28 | 65 | 29 | This sentence should provide a cross-reference to Chapter 4 that is supposed to frame all SD discussions in WGIII AR5. | Taken into account. The sentence has been deleted. |
| 6552 | 7 | 65 | 7 | | 8 | Firstly, "148.4 billion" instead of "184.4 billion" is correct. Secondly, add a conditional clause to "more investments are required to stabilize climate change", as the Stern Review, cited by UNEP (2008a), only gives the cost for stabilizing at 550 ppm CO2-eq. | Taken into consideration. Rephrased. Data is updated. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3457 | 7 | 65 | 34 | 66 | 37 | Among the barriers mentioned, it should be included those regarding behavioural change on rational use of energy in developing countries as well as it should be mentioned the need to change high energy consumption style of life in countries like USA | Accepted. Behavioural aspects in high consumption countries is included |
| 15495 | 7 | 66 | 10 | 66 | 11 | Delete « not because they are a poor alternative to fossil fuels » as this is simply not true. | Taken into account. The focus of the perception is the lack of understanding why the technologies may be needed |
| 15496 | 7 | 66 | 15 | | | Not sure to get the good understanding of “free access” explanation - Rewording may be necessary? | Accepted. Rewording is done: "For instance cooking fuels particularly firewood is widely used in rural areas because it is a suitable fuel for these communities in addition to its access |
| 16862 | 7 | 66 | 18 | | 24 | Suggest delete. The policy in question is concerned with climate and CO2 emissions. Sustainability is not well defined or broadly understood. | Accepted. suggest to delete line 18 to avoid further text on definition of |
| 17378 | 7 | 66 | 22 | | | and implementation of energy policies | Noted |
| 16861 | 7 | 66 | 8 | | 12 | This sounds like a stereotype and patronizing. It may also be they simply want reliable energy and may not be convinced of the reliability or durability of these new systems. It may also be that they think these systems are more costly, or that it is easier to find technicians or parts when systems fail if they have older, more conventional technology. | Accepted. These considerations were included. |
| 10003 | 7 | 66 | 8 | 66 | 12 | This part should explain that wind power and photovoltaic are not suitable for alternating fossil fuel firing power plants in terms of supply stability and electricity quantity, as described in (DeCarolis, 2006, page 395 and 403). This literature is listed in the No26 line of this table. | Taken into consideration. The whole paragraph need to be reconsidered. Need to find better argument |
| 17949 | 7 | 66 | 1 | 66 | 7 | These claims would need to be substantiated by references; I recommend to cross-reference to the discussions in the SRREN where these issues were assessed at length in chapters 8 and 9 and the assessed references therin. | Accepted. Chapter 8 and 9 are considered |
| 17950 | 7 | 66 | 13 | 66 | 24 | Again, these results would need to be substantiated by references, e.g. SRREN chapters 9 and 11 and the assessed references therin. | Accepted. |
| 10058 | 7 | 66 | 38 | 67 | 26 | outdated sources, newer publications are available such as Global Renewable Status Report 2012 /REN 21 and Energy [R]evolution June 2012 | Rejected. Sources are not outdated. However lines 18-24 are modified after |
| 9478 | 7 | 67 | 10 | 67 | 14 | When employment effects of renewable energy is considered, not only direct effects of the renewable investment, but also broad and long effects on the economy should be counted.<br>Hillebrand et al. published a study about the renewable energies' expansion beginning in 2004 and employment effects in Germany [1] . They note that they distinguish two effects: (1) an expansive effect resulting from additional investments and (2) a contractive effect resulting from an increase in the production cost of power. The first effect will dominate during the first years and lead to an increase in employment of approximately 33,000 new jobs. However, the contractive effect will offset these gains and lead to a slightly negative employment balance by 2010.<br>[1] B. Hillebrand et al. (2006) The expansion of renewable energies and employment effects in Germany, Energy Policy 34,<br>[1] page 3484, Abstract lines 5-8. | Taken into consideration. Most of the comments to this section are focused around the issue of the net employment benefits of investment in RES systems. I agree that there are both positive (direct) and negative (indirect) employment effects. Although, in absolute terms, the number of jobs created by RES may not be that high, the direct employment effects associated to renewable energy deployment is the most significant contribution to local sustainability and the need for human capacity |
| 10089 | 7 | 67 | 10 | | | Employment in 2011 in the RE sector was estimated at 5 million jobs (REN21 2012)<br>A sentence like: "Employment more than doubled from 2.3 million in 2006 to 5 million in 2011"could be added. | Accepted. Good suggestion as it would be helpful to show the trend |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10004 | 7 | 67 | 10 | 67 | 14 | This part should include the employment effect of nuclear power. There are many job opportunities relating to nuclear power in the world and those will increase potentially in future, as described in (M. Wei, 2010, page922, Table2).<br><br><Reference><br>[1] M. Wei et al. (2010). Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US? Energy Policy 38. | Taken into consideration. Most of the comments to this section are focused around the issue of the net employment benefits of investment in RES systems. I agree that there are both positive (direct) and negative (indirect) employment effects. Although, in absolute terms, the number of jobs created by RES may not be that high, the direct employment effects associated to renewable energy deployment is the most significant contribution to local sustainability and the need for human capacity |
| 9608 | 7 | 67 | 12 | 67 | 14 | Please, discuss here from a positive and a negative side by using following information;.many of the claims regarding the positive employment effects of renewable energy introduction only count the direct effects of the renewable investment, without taking into account the broader effects on the economy as a whole. Several studies have indicated that the creation of “green jobs” leads to destruction of jobs in other sectors of the economy. For example, in a peer-reviewed study on the economic impacts of renewable expansion beginning in 2004 in Germany (Europe’s largest economy) Hillebrand et al. found that [1] there are two effects: (1) an expansive effect resulting from additional investments and (2) a contractive effect resulting from an increase in the production cost of power. The first effect will dominate during the first years and lead to an increase in employment of approximately 33,000 new jobs. However, the contractive effect will offset these gains and lead to a slightly negative employment balance by 2010.<br>[1] B. Hillebrand et al. (2006) The expansion of renewable energies and employment effects in Germany, Energy Policy 34,<br>See downloaded file “Hillebrand Buttermann 2006.pdf” | Taken into consideration. Most of the comments to this section are focused around the issue of the net employment benefits of investment in RES systems. I agree that there are both positive (direct) and negative (indirect) employment effects. Although, in absolute terms, the number of jobs created by RES may not be that high, the direct employment effects associated to renewable energy deployment is the most significant contribution to local sustainability and the need for human capacity development is there, which is the |
| 16864 | 7 | 67 | 21 | | 26 | The issue of lack of human capital or skilled labor is true for non-climate policies as well. This problem is not unique to climate mitigation -- highlighting it in the context of this document makes the climate task seem even harder. I believe it is not helpful to policymakers. Those who will deploy the tech will deal with this problem at the proper time. | Taken into consideration. I agree that this issue is not unique to climate mitigation and that a well functioning market should help correct any imbalance over time. In the US there is a TV program on the "Weather Channel" that is about how the wind industry is growing so fast that people from other industries are being trained to construct |
| 10090 | 7 | 67 | 28 | | 35 | To stop in 2009 is missleading because the rapid development of RES power generating capacitis over the last years is neglected. Power market share of renewables from 2000 to 2010 including Hydro was 26% [Greenpeace, Energy [r]evolution, 4th edition 2012 world energy scenario]. In 2010 and 2011 almost 50% and 40% respectively of new power capacities were renewable, increasing the renwable capacities to 1,360 GW (390 GW without Hydro) at the end of 2011 [Ren21 2012]. In addition, the figures for retired high carbon power plant capacities should be given as well.<br>The conclusion could be that despite the fact that there is still massive investments in high carbon stock, the situation is changing gradually and there is a huge potential for low carbon tachnologies replaing the 1,266 GW of fossil caapcity which is scheduled to retire in the next 25 yaers [IEA 2011a]. | Taken into account - the latest year available (2010) for recent investments has been updated and discussed. However it is extremely problematic to get data on retired power plant, which is further complicated given many old plant are mothballed for possible restart. |
| 5960 | 7 | 67 | 29 | | | Clarity: there is greater certainty regarding effective carbon lock-in than is stated | Taken into Account - the effectiveness of lock-in due to energy investments has |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18222 | 7 | 67 | 30 | | | Of the 1327GW investments (from 2000-2009) in the global electricity sector (SJ Davis et al., 2010), 416GW (31.4%) were coal, 449GW(33.9%) were natural gas and 47GW (3.6%) were oil. Construction of renewable source power plants together accounted for 231GW (17.4%), with nuclear at only 29GW (2.2%). Therefore high carbon energy capital stock is currently being heavily invested in and will be still in place for decades to come. Comment: From 2000 to 2009 it invested more in coal plants by developed countries, which contradicts the obligations and commitments. It is suggested to be penalized by moratoriums conventional coal plants in order to be controlled.<br>Alternative paragraph:<br>Of the 1327GW investments (from 2000-2009) in the global electricity sector (SJ Davis et al., 2010), 416GW (31.4%) were coal, 449GW(33.9%) were natural gas and 47GW (3.6%) were oil. Construction of renewable source power plants together accounted for 231GW (17.4%), with nuclear at only 29GW (2.2%). Therefore high carbon energy capital stock is currently being heavily invested in and will be still in place for decades to come. | Noted - Supports the above approach on making the developed vs. developing country energy mix and investments more explicit, and on updating data to 2010 |
| 7745 | 7 | 67 | 32 | 67 | 33 | Please, correct the sentence in order to avoid a misunderstanding. Currently, it gives the false impression that nuclear is renewable. | Taken into account - the language has been edited to avoid this potential |
| 3803 | 7 | 67 | 33 | 67 | 33 | Too much polarization on nuclear energy. | Rejected - no specific recommendation, and the text is simply listing the actual |
| 3011 | 7 | 67 | 33 | | | The sentence “Construction of renewable source power plants together accounted for 231GW (17.4%), with nuclear at only 29GW (2.2%)” gives the wrong idea that nuclear is a renewable source. | Taken into Account - the text has been checked to avoid any potential misunderstanding between categories of |
| 16865 | 7 | 67 | 41 | | 43 | When discussing building stock and urban infrastructure, the lock in is less true of the underlying energy system employs technologies that emit little CO2. For example, if a road is built and vehicles use electricity from non-emitting technologies, then the road has no lock in problem. | Accepted - text has been revised to make clear the importance of the underlying energy technology mix (including the developed vs. developing |
| 11774 | 7 | 67 | 6 | 67 | 14 | To avoid too much expectation to the renewable energy, number of jobs to be lost instead should be also added. If there aren't appropriate paper, this sentence should be deleted.<br>It is easy to guess that PV field only produces temporary jobs for construction because it is basically maintainance free once installed. Furthermore, Hillebrand et al. shows the creation of “green jobs” leads to destruction of jobs in other sectors of the economy in German case study.<br>1.B. Hillebrand et al.:[The expansion of renewable energies and employment effects in Germany, Energy Policy 34], send attachment by another e-mail. | Accepted. There are also more recent peer reviewed literature than that of Hillerbrand that show net positive employment effects as well. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9663 | 7 | 67 | 6 | | 14 | No mention is made of the capacity building, employment etc in the fossil fuel industries. A comparison between the industries should be given. How many jobs etc would be lost with the downscalng of the fossil fuel industry in relation to the opportunities provided by the RE industry? | Taken into consideration. A balanced treatment of employment in fossil fuel industries and RE industries is attempted. The new paragraph says: "Renewable energy has a high potential for direct employment generation, including R&D, engineering, consultancy, auditing, quality control, and installation and maintenance. Although there are some reports indicating that large scale renewable energy deployment could have offsetting effects on the conventional energy sector and the overall economy, resulting in net job losses (Hillebrand et al., 2006; Frondel et al., 2010), several studies report net positive employment effects (Lehra et al., 2008; del Rio and Burguillo, 2009). In developing |
| 10088 | 7 | 67 | 6 | | | insert "local" in front of employment | Noted |
| 2847 | 7 | 67 | 6 | | | Should also mention that the employment benefits have been disputed – eg Hillebrand et al Energy Policy Vol 34 issue 18 p 3484-94 for Germany; http://www.juandemariana.org/pdf/090327-employment-public-aid-renewable.pdf for Spain. Again the authors may not agree with these studies but balance requires that they acknowledge them. | Accepted, in similar vein to line 105, 107-109 |
| 16863 | 7 | 67 | 6 | | 20 | If you replace renewable section with "low CO2 emitting technologies" you would be able to shorten this section. | Noted |
| 10663 | 7 | 67 | 6 | 67 | 14 | It should be shown to what type of energy renewable energy potential for employment is better. There is the case a number of jobs lost because of the too much subsidies. See " Study of the effects on employment of public aid to renewable energy sources" by Calzada et al. | Taken into consideration. Most of the comments to this section are focused around the issue of the net employment benefits of investment in RES systems. I agree that there are both positive (direct) and negative (indirect) employment effects. Although, in absolute terms, the number of jobs created by RES may not be that high, the direct employment effects associated to renewable energy deployment is the most significant contribution to local sustainability and the need for human capacity |
| 4654 | 7 | 67 | 6 | 67 | 11 | “RE has a high potential for employment generation ---“. Line 10/11 “Globally, it is estimated that in 2006 more than 2.3 million people were employed in the RE sector; about half of which in biomass ---“. Not only does RE have a high potential for employment generation it already does. The employment in existing fuelwood, charcoal and residue trading has been completely ignored. From my work in various countries, especially Malawi, I estimated that about 30 million people are employed (full time equivalent and many more part-time) in growing, production, transport and trade of biomass energy, of which about 77% are rurally based. (Openshaw, K. 2010a). If poverty alleviation is a goal, then this should be encouraged. | Accepted. Will be included to the additional references that will be cited as mentioned in line 105. |
| 3802 | 7 | 67 | 7 | 67 | 7 | Replace "auditoring" by "auditing". | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3458 | 7 | 67 | 15 | 67 | 26 | It should be included some lines regarding the need of capacity building in energy planning and mitigation assessment | Accepted. The suggestion is useful |
| 15132 | 7 | 67 | 6 | 67 | 6 | The findings indicate that energy access through renewable energy technologies can generate significant employment:<br>reaching the objective of sustainable energy for all could create almost 4 million direct jobs by 2030 in the off-grid electricity sector alone. Small-scale renewable energy technologies are well adapted to the rural context as the bulk of<br>the skills and training required for their deployment can be developed locally. Importantly, this limits the need for developing countries to rely on foreign know-how and expertise. However, the case studies show that, in addition to formal<br>or full-time employment, entrepreneurs in remote rural areas often take on labourers in highly informal arrangements in<br>order to retain the flexibility needed for what are often fluctuating and uncertain business circumstances. IRENA, Renewable Energy<br>Jobs & Access, 2012 | Taken into consideration. However, the IRENA 'Jobs & Access' document is not peer-reviewed |
| 17952 | 7 | 67 | 41 | | | The following paper might be interesting in this context: Steven J. Davis, Ken Caldeira, and H. Damon Matthews (2010) Future CO2 Emissions and Climate Change from Existing Energy Infrastructure. Science 329: 1330-1333- | Taken into Account - this is a fair comment as the lock-in is to a class of technology or infrastructure or pattern of behaviour, rather than to a very specific |
| 12330 | 7 | 67 | 27 | | | This is an important issue (lock-in) . It should also be covered in the Executive Summary of Chapter 7 and be considered for the SPM. | Rejected - the ES is reserved for central statements. The inertia is important, but |
| 4655 | 7 | 68 | | 68 | | Many (rural) houses in developing countries have lifetimes much less than 50 years. | Taken into account - the table with this data has been removed for reasons of space and the text discussion does not |
| 9166 | 7 | 68 | | 72 | | this section has to be shortened, focus on what are specific to this sector, and refer to ch13-16. | Taken into account - the description of the instruments and their economic justification is left to the policy chapter |
| 4825 | 7 | 68 | 13 | 68 | 13 | The author of the paper cited here is DECC (Department of Energy and Climate Change) not Ofgem | Accepted - text revised. |
| 9664 | 7 | 68 | 19 | | 25 | this text is unnecessary | Taken into account - There is a duplication with respect to page 68 (lines 13 - 18) and page 68 (lines 19 - 27). As the comment 1767 suggests the |
| 18102 | 7 | 68 | 23 | 68 | 23 | Replace "(e.g. Feed-in tariffs or renewable energy quotas)" with "(e.g. price or quantity based mechanisms)" in order to capture, for example premium systems. | Accepted - The text is revised, and the reference is updated. |
| 3804 | 7 | 68 | 32 | 68 | 34 | This sentence is in conflict with the target of reaching peak GHG emissions by 2020. I understand that RN Scheck et al is referring to new/or improved technologies beyond the ones that are already available. Otherwise, we are conflicting with earlier IPCC reports where technology is mentioned as not being the main barrier to curb GHG emissions, but lack and enforcement of energy policies are. | Taken into account - the text of the paragraph has been deleted as a result of suggestions to restructure the entire section. |
| 4462 | 7 | 68 | | 72 | | This section offers a lengthy discussion of policies and challenges. The section could be shortened by offering a description of the policies which have worked (broadly) and those which have not, with a discussion of the conditions for success and failure, respectively. The goal of this section is to offer the reader guidance on policy design and considerations, with insights into what policies have worked and how to avoid those which have not. | Taken into account - the entire section has been rewritten in order to facilitate an assessment of the different energy policies. However, due to space restriction, some of the issues |
| 18547 | 7 | 68 | | | | Please make sure that this section follows the categorization for policies outlined in Chapter 3. | The order of the section now follows the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18548 | 7 | 68 | | | | This section has a very clear description of policy mechanisms and how they relate to and address market failures. However, a lot of this is already covered in the policy chapters. As such, the section could be shortened to focus more strictly on energy - ideally linking more directly to the energy options outlined in the AR4 and in Section 7.12 of this chapter on p. 85, fuel switching, ee, RE and CCS. | Taken into account - the description of the instruments and their economic justification is left to the policy chapter (13- 15). |
| 3160 | 7 | 68 | 10 | | | section 7.11 deals with policy choice, but those issues are addressed in many places in the WG3. I suggest TSU advise on how to consolidate. | Taken into account - the description of the instruments and their economic justification is left to the policy chapter |
| 11952 | 7 | 68 | 14 | | | "nature of instruments" is very vague. What is actually discussed in 7.11.1 is RD&D investments. In truth the following paragraph is a better description. Suggest dropping this paragraph. | Taken into account - text revised. |
| 13219 | 7 | 68 | 28 | 69 | 24 | The discussion that is not specific for the power sector could perhaps be integrated in chapter 15.6, and the focus of this section be dedicated on the aspects RD&D policies specific to the power sector. In particular (i) public and private actors have similar level of information and similar priorities about the overall needs for technology thus facilitating a public policy (ii) more homogeneous nature of product limits the ability to price discriminate and charge premium for new technologies (see e.g. 44. Neuhoff, K., 2005, Large-scale deployment of renewables for electricity generation, Oxford Review of Economic Policy, 21 (1), p. 88-110). | Taken into account - the description of the instruments and their economic justification is left to the policy chapter (13- 15). |
| 6553 | 7 | 68 | 31 | | 32 | Give a reference paper for the description "carbon emissions to ultimately peak and decline toward zero for any stabilization concentration". | Taken into account - the text of the paragraph has been deleted as a result of suggestions to restructure the entire |
| 14546 | 7 | 69 | 1 | 69 | 7 | This is a very insightful paragraph. We have an opportunity to use the Green Climate Fund for the public good. A significant portion should be devoted to R&D to transform RE technologies that are not yet economicaly viable into viable one, instead of being divided up among many countries for small projects. | Taken into account - the text of the paragraph has been deleted as a result of suggestions to restructure the entire |
| 9609 | 7 | 69 | 11 | 69 | 15 | Please, check figure 1.1 as the reference of Tracking Claen Energy Progress as the trend of graph starts to increase from 1999, not the release of AR4. Of importance is global public energy sector RD&D spending remains a small share of total RD&D budgets and spending levels have seen a recent decrease from peak spending in 2009. (IEA, 2012b p.13) | Accepted - text revised. |
| 10091 | 7 | 69 | 16 | | 18 | The Battele Institute publishes annualy the Global R&D Funding Forecast (2012: http://www.battelle.org/aboutus/rd/2012.pdf). There the figures from the pat and current forecasts are given: Industrial R&D in the energy sector comprises a broad portfolio of technologies, including fossil, nuclear, and renewable generation; smart grid or other transmission and distribution; and energy-efficiency technologies. Worldwide spending on energy R&D is forecasted to increase by roughly 10% from $ 15 billion in 2010 to $ 17.9 billion in 2012. | Noted - the comment confirms the assessment that private R&D expenditures are a large share of the overall R&D spending. |
| 18103 | 7 | 69 | 21 | 69 | 24 | Delete paragraph. This holds for all technologies that have reached commercialisation. Alternatively add "nuclear, coal and gas" which have received (and still does) far higher government R&D funding than PV and wind or other renewables. | Accepted - text revised. |
| 5937 | 7 | 69 | 25 | | | It is peculiar not to mention the practical drawbacks of tax policies to price GHG emissions, while discussing EP extensively. To name one obvious drawback, taxes are often set in annual budgets, which introduces a very clear political risk. | Taken into account - The comment is obsolete as the underlying text has been deleted. |
| 9610 | 7 | 69 | 26 | 70 | 8 | Please, move here to somewhere in chapter 13 to 15 as this part consists of general idea of pricing policy. | Taken into account. The first paragraph has been removed as suggested. The second paragraph is related to the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6200 | 7 | 69 | 30 | 69 | 34 | "Tax regimes fix the tax rate and allow markets to determine emissions, while EP regimes fix emissions and allow markets to determine the EP price. In a world with certainty it is a matter of indifference which approach is taken as both can be implemented so as to deliver the same distribution of economic activates in the economy. However, the two policy instruments differ importantly in their implications for income distribution." the first two sentences are important points, highlighting the concept that the two approaches can be designed to achieve the same effect in a world of certainty. However, the third sentence discusses differences, suggesting that these differences are inherent. Both cannot be true at the same time. the differences in income distribution need not be inherent, but arise from choices in implementation, specifically whether and how permits are freely distributed. | Taken into account. The comment is obsolete as the underlying text has been deleted. |
| 15545 | 7 | 69 | 41 | | | As well as Weitzman, Pizer has written key articles on this issue e.g. Pizer, WA (2002). 'Combining price and quantity controls to mitigate global climate change,' Journal of Public Economics, Vol 85, pages 409–434; Pizer, WA (1997). 'Prices vs. Quantities Revisited: The Case of Climate Change' Discussion Paper 98-02, Resources for the Future, Washington DC. W. Nordhaus and G. Metcalf have also written extensively on the advantages of taxes over cap and trade. A different view is reflected in the Stern Review (2007). | Taken into account. The comment is obsolete as the underlying text has been deleted. |
| 15480 | 7 | 69 | 41 | 69 | 42 | The citation to Weitzman is too absolute - the 1974 paper showed that the balance of advantage depends on the relative slope of the marginal damage and the marginal cost of abatement - subsequent papers summarised in Hepburn (2009) in Eds Helm and Hepburn "The Economics and Politics of Climate Change" OUP show that this will normally imply taxes are the best choice for carbon, but Hepburn points out that this is NOT inevitable. Weitzman 2007 is irrelevant here. | Taken into account. The comment is obsolete as the underlying text has been deleted. |
| 15544 | 7 | 69 | 25 | | | Should this discussion be here or in Ch 15, on Policy Instruments? Is there a danger of repetition? | Taken into account. The text has been deleted as it refers to general aspects of policies which are discussed in Chapter |
| 13220 | 7 | 69 | 25 | 72 | 11 | A closer coordination with chapter 15 section 5.4 could help to reduce overall length of report. (Have not been involved in discussions, so not clear what arguments for discussion of CDM in chapter 7 rather than 15.). | Taken into account -overlaps between this section and chapter 15 - 17 has been removed as far as possible and |
| 15497 | 7 | 69 | 25 | 72 | 8 | GHG pricing policies – Too long – Recommend to create at least 3 sub chapters – (1) General items & (2) ETS and others trading schemes & (3) Flexible mechanisms and NMM New Markets Mechanisms | Taken into account - The text has been reduced and structured as suggested |
| 15498 | 7 | 69 | 25 | 72 | 8 | Add a special item somewhere on NAMA, NMM and MRV requirements | Rejected- space restrictions do not allow for these extensions. The related instruments are discussed in chapter 15. |
| 2848 | 7 | 69 | 26 | 72 | 8 | This section is longer and more theoretical than needed and it overstates the impact of carbon trading – see below. | Taken into account - The section has been shortened. The impact of carbon |
| 10955 | 7 | 69 | 41 | 69 | 42 | Imprecise; depends on type of uncertainty. Weitzman (1974) shows that tax is best choice if mitigation cost uncertainty is more important than uncertainty w.r.t. impacts of human-induced climate change. | Taken into account. The comment is obsolete as the underlying text has been |
| 4777 | 7 | 7 | 1 | 7 | 8 | I support this statement. On request I can provide a box explaining the hydropower sustainable assessment protocol, published by IHA, and developed with NGOs, Governments, Banks, utilities, etc. | Noted - unfortunately space constraints do not allow for a detailed discussion of |
| 2940 | 7 | 7 | 11 | 7 | 16 | It is good to see these key conclusions so strongly expressed. I agree strongly that the evidence is strong that "Transition to low GHG concentrations will NOT be achieved by current energy investments nor simple evolution of business-as-usual..." and that "Strong policy support of low carbon energy supply options will be necessary to achieve this goal , [which requires] energy-related GHG emissions to peak by 2020". | Noted. |
| 13035 | 7 | 7 | 12 | 7 | 12 | suggest adding the word "levels" after the phrase "current energy investments" so that the sentence reads: "Transition to low GHG concentrations will not be achieved by current energy investment levels nor simple evolution of business-as-usual of energy supply systems." Without this, the sentence implies that current investments in specific projects will have no impact. | Taken into account - comment is obsolete as the underlying text has been deleted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17204 | 7 | 7 | 13 | | | The lock-in of emissions is ignoring the possiblity of early retirement of existing capital stocks. This is an economically meaningful option that is realized if CO2 prices increase the variable costs so that the continuation of the operation of the plant makes losses. So far, there are no publications on the issue, but they are in the making. | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 15541 | 7 | 7 | 13 | | 14 | This depends on scrapping and depreciation rates, which are not purely technologically determined. | Taken into account - comment is obsolete as the underlying text has been |
| 6794 | 7 | 7 | 13 | 7 | 15 | "Existing energy-related capital stock has already locked in 80% of the permissible 2035 CO2 emissions under a 450ppm CO2eq stabilization scenarios [7.12, high agreement; robust evidence]." I have two concerns with this. First, capital stock should not be considered "locked in." The cost of replacing this stock is less than the cost of addressing the climate change damage resulting from it. When we finally enact carbon pricing, the cost of coal electricity will go up. US utilities have already idled coal plants to operate cheaper natural gas plants. We can't afford to "lock in" climate change damage. Second, there is little scientific evidence that stabilization at 450 ppm will prevent unacceptable consequences. It is more likely that we will need to eventually reduce atmospheric CO2 to lower levels. (James Hansen's 350 target is more scientifically defensible, in my opinion.) The IPCC goals should be re-evaluated in light of the latest scientific results based on measurements, model results, and paleoclimate studies.The goals should be based on science and not based on what is (or was) believed to be politically and socially achievable. I realize this is a Working Group I decision, but I think it is entirely appropriate for members of Working Group III to advocate for a more scientifically-based goal, because that goal has an enormous impact on the solution strategy, both in terms of its content and the required speed of implementation. | Taken into account - the first comment is obsolete as the underlying text has been deleted. The second comment on the rationale behind the 450 ppm stabilization level is outside of the scope of WGIII. It is to be inferred by considerations that have to come from IPCC WG I and IPCC WG II. WG III does not advocate for any stabilization level. It simply investigates the implication of some of these levels. As statements of the IPCC have to be policy relevant (but not prescriptive), the 450 ppm level which is broadly consistent with the Cancun Agreement |
| 6223 | 7 | 7 | 13 | 7 | 15 | This does not take into account the possibility of retrofitting CCS | Taken into account - comment is obsolete as the underlying text has been |
| 18180 | 7 | 7 | 15 | | 20 | Comment: Strong policy support of low-carbon energy supply options will be necessary to achieve this goal requiring energy related GHG emissions to peak already by 2020 [7.12, high agreement; robust evidence]. Energy policies consistent with ambitious long-term greenhouse gas concentration levels, such as are described in Chapter 6, are not observed in most of the world at present, though governments have pledged to reduce emissions in line with the Copenhagen Accord [7.3. and 7.12, high agreement; robust evidence]. Comment: Again the Copenhagen accord is referenced as if it were a formal and official document of the UNFCCC, and the Bolivarian Republic of Venezuela expressed herein public rejection. COP-15 took notes of this document. | Taken into account - Copenhagen Accord is replaced by Cancun Agreement. |
| 18181 | 7 | 7 | 15 | | 20 | Alternative paragraph: Strong policy support of low-carbon energy supply options will be necessary to achieve this goal requiring energy related GHG emissions to peak already by 2020 [7.12, high agreement; robust evidence]. Energy policies consistent with ambitious long-term greenhouse gas concentration levels, such as are described in Chapter 6. | Taken into account - Copenhagen Accord is replaced by Cancun Agreement. |
| 6545 | 7 | 7 | 15 | | 16 | Replace "will be necessary to achieve this goal requiring" with e.g. "will be necessary if this goal is to be achieved, which requires", as "this goal" has not been agreed on globally. | Taken into account - although the Cancun Agreement is legally binding the statement has been rephrased in order |
| 7725 | 7 | 7 | 17 | 7 | 20 | Suggest replace "Copenhagen Accord" by "Kyoto Protocol". | Rejected - what is meant is the 2°C goal. The Copenhagen Accord is |
| 7851 | 7 | 7 | 19 | 7 | 20 | The statement that governments have pledged to reduce emissions in line with the Copenhagen Accord is ambigous and lacks clarity because the pledges do not match with the 2 degrees goal agreed in Copenhagen. A more appropriate langauge would be to say: .., though governments have pledged to reduce emissions as part of the Copenhagen Accord. It is suggested to add: However, those pledges fall short to meet the 2 degrees goal and might result in a temperature increase above 3 degrees C. | Taken into account - text has been deleted. Comment is obsolete. |
| 15759 | 7 | 7 | 2 | | | what are "benefit sharing mechanisms"? | Noted - benefit sharing provides money to those who are affected by additional |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5941 | 7 | 7 | 20 | | | The Summary should note, as per Chapter 7.12 and otyher studies (EURELECTRIC (2009), Power Choices: Pathways to a Carbon Neutral Electricty in Europe by 2050. Avaialble at www.eurelectric.org ) the decarbonsiation of electricity and eletrification of the transport and heating and cooling sectors, presents a cost optimised means of reducing emissions. | Taken into consideration - electrification now is discussed in detail in 7.11 (formerly 7.129. Space constraints however do not allow for a detailed |
| 2968 | 7 | 7 | 21 | | | In the introduction the system boundary of the energy system should be drawn. I suggest to focus on the power sector. | Accepted - a diagram now shows the system boundaries. |
| 6414 | 7 | 7 | 22 | 7 | 32 | I know that this is talking about big global issues, but this may be a place to introduce how the rapid expansion of hydraulic fracturing in the United States has also lead to large revisions or changes in the energy system. | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 6165 | 7 | 7 | 22 | | | No parenthetical remarks in subject headings. | Accepted - text revised. |
| 18182 | 7 | 7 | 23 | | 32 | Add to paragraph: After relatively stable development in 2000-2005 (the period covered by the WG3 IPCC AR4) the global economic and energy systems entered times of high turbulence and uncertainty. Deep global economic recession of 2008-2009; extremely volatile energy prices; Arab Spring of 2011 with concerns on stability of oil supply from the Middle East and North Africa; devastating earthquake and tsunami in Japan, which remembered that a stable made the nuclear power future more uncertain; slow and uneven pace of global economy recovery impacted by the debt crisis in Europe and the USA, and finally breaking the tradition on consensus proposals for failure to reach binding agreement of GHG emission control in Copenhagen, and at following UNFCCC COPs meetings - all those events significantly altered both recent trends in energy systems developments and energy related GHG emissions, as well as assumptions for the projections and visions of the near and long-term future. | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 18183 | 7 | 7 | 23 | | 32 | Alternative paragraph:<br>After a relatively stable development in 2000-2005 (the period covered by the WG3 IPCC AR4) the global economic and energy systems entered times of high turbulence and uncertainty. Deep global economic recession of 2008-2009; extremely volatile energy prices; Arab Spring of 2011 with concerns on stability of oil supply from the Middle East and North Africa; devastating earthquake and tsunami in Japan, which remembered that a stable nuclear power future more uncertain; slow and uneven pace of global economy recovery impacted by the debt crisis in Europe and the USA, and finally breaking the tradition on consensus proposals for GHG emission control in Copenhagen, and at following UNFCCC COPs meetings - all those events significantly altered both recent trends in energy systems developments and energy related GHG emissions, as well as assumptions for the projections and visions of the near and long-term future. | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 10276 | 7 | 7 | 24 | 7 | 32 | The description of "finally failure to reach binding agreement of GHG emission control in Copenhagen" should be revised. The word "failure" should not be used. | Taken into account - comment is obsolete as the underlying text has been |
| 7726 | 7 | 7 | 28 | 7 | 29 | Hasn`t the certainty of the continuity of the Kyoto Protocol and the establishment of the commence of the second commitment period been taken into account? | Taken into account - comment is obsolete as the underlying text has been |
| 12030 | 7 | 7 | 30 | 7 | 31 | Not clear what this sentence wants to say. What are actually alterned significantly? Please present evidences. | Taken into account - comment is obsolete as the underlying text has been |
| 17202 | 7 | 7 | 33 | | | The authors cite CO2 emissions from IEA and Enerdata. This is an important issue in the international context because IEA and Enerdata do not collect these numbers from all countries, but derive them from the energy statistics by applying IPCC methods. The problem is simply that national CO2 statics lack in several countries. China is preparing national CO2 emission statistics, but has not yet published the figures by a governmental agency. International climate policies with binding targets at the national level require national statistics. The LCAs are recommended to discuss this issue and consider a special paragraph or a box on the topic. The same is obviously the case for non-CO2 GHG emissions. | Noted - the suggestion made by the reviewer is unclear. What are the suggestions? Not to use numbers? We use data available from different sources (see section 7.2). We do agree that data quality need improvement. Additional comments on these issues are made in |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18184 | 7 | 7 | 33 | | 45 | Add to paragraph: The global energy related CO2 emissions growth accelerated from 1,1% per year in 1990-2000 to 2,6% in 2001-2010, and 3% in 2011 (IEA, 2011a; Enerdata, 2012). This acceleration was mostly driven by emissions from non-Annex I countries, which in 2008 for the first time surpassed those of the Annex I countries, who managed to keep emissions since 2008 below 1990 levels (IEA, 2011a). The gap in per capita energy related CO2 emissions between Annex I and non-Annex I countries is still large, but shrunk from 6:1 to 3.7:1 in 2000-2009. Annex I countries are not any more at the top of CO2 emitting countries list. In 2007 China took the leading position in this list and in 2010 it emitted already 40% more than the second largest emitter – the USA. In 2009 it took over the USA the position of leading energy consuming nation, and in 2011 – position of the largest global electricity consumer (Enerdata, 2012). In 2010 India overcame the Russian Federation to become the third largest CO2 emitter position (IEA, 2011a). With such acceleration the global community is approaching the estimated no-return point for 450 ppmv like scenarios leaving little additional room for maneuver and scaling up the need to introduce zero- and low-carbon technologies (IEA, 2011a). | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 18185 | 7 | 7 | 33 | | 45 | Alternative paragraph: The global energy related CO2 emissions growth accelerated from 1,1% per year in 1990-2000 to 2,6% in 2001-2010, and 3% in 2011 (IEA, 2011a; Enerdata, 2012). This acceleration was mostly driven by emissions from non-Annex I countries, which in 2008 for the first time surpassed those of the Annex I countries, who managed to keep emissions since 2008 below 1990 levels (IEA, 2011a). The gap in per capita energy related CO2 emissions between Annex I and non-Annex I countries is still large, but shrunk from 6:1 to 3.7:1 in 2000-2009. Annex I countries are not any more at the top of CO2 emitting countries list. In 2007 China took the leading position in this list and in 2010 it emitted already 40% more than the second largest emitter – the USA. In 2009 it took over the USA the position of leading energy consuming nation, and in 2011 – position of the largest global electricity consumer (Enerdata, 2012). In 2010 India overcame the Russian Federation to become the third largest CO2 emitter position (IEA, 2011a). With such acceleration the global community is approaching the estimated no-return point for 450 ppmv like scenarios leaving little additional room for maneuver and scaling up the need to introduce zero- and low-carbon technologies (IEA, 2011a). | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 4805 | 7 | 7 | 33 | 7 | 35 | What are the Annex I countries? | Taken into account - comment is obsolete as the underlying text has been |
| 15286 | 7 | 7 | 33 | 7 | 34 | “1,1%" and "2,6%" to be "1.1%" and "2.6%" | Accepted. Commas were replaced. |
| 4099 | 7 | 7 | 36 | 7 | 42 | This section is a nonsense, due to its complete overlooking of 'embedded emissions'. The transfer of manufacturing capacity from a number of industrialised nations since 1990, and their import of manufactured goods from countries such as China and India, have completely falsified emissions accounting on any intellectually honest basis. The USA, Germany, France, and the UK are clear examples. Thus instead of the UK claiming to have reduced its carbon emissions by over 20% since 1990, it has in fact increased them by over 20% once 'embedded emissions' are taken into account. | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 2821 | 7 | 7 | 36 | 7 | 38 | This comment should perhaps point out (as on p 16) that the average is driven by the low emissions of ldcs. There is already a significant degree of overlap between Annex 1 and non-Annex 1 countries. For instance, in 2009 (IEA 2011c) per capita emissions in China, at 5.14t, were not that different from OECD Europe (6.85t). It is likely that China’s per capita emissions today are above, not just those of France (as noted on p 21 – it could have added Sweden and others) but above the OECD Europe average. | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 9780 | 7 | 7 | 39 | 7 | 40 | suggest to delete"In 2007 China took the leading position in this list and in 2010 it emitted 40 already 40% more than the second largest emitter – the USA.",because there is no china emission data from 2007 to 2010 of GHG Data - UNFCCC, the china emission from IEA data is not The inventory data . | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 17357 | 7 | 7 | 40 | 7 | 41 | it took over the position of leading energy from the USA, and in 2011 the position… | Taken into account - comment is obsolete as the underlying text has been |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9627 | 7 | 7 | 41 | 7 | 44 | would be useful to express this on a per capita basis as well | Taken into account - comment is obsolete as the underlying text has been |
| 13286 | 7 | 7 | 42 | 7 | 43 | The word 'overcame' should be replaced with 'overtook'; the word 'position' is unnecessary in this context and should be deleted | Taken into account - comment is obsolete as the underlying text has been |
| 16775 | 7 | 7 | 44 | | 45 | re point "leaving little additional room to maneuver and scaling up …" This may need further elaboration -- there is plant of room to implement and deploy a great amount o flow emitting energy technology, however there is little time left if we hope to hit a 450 ppm concentration target -- we could yet plausibly hit a 500, 550 or even 600 ppm target, but we would incur a lot more risk in doing so | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 18038 | 7 | 7 | 45 | 7 | 45 | Define "zero- and low carbon technologies" | Taken into account - comment is obsolete as the underlying text has been |
| 6445 | 7 | 7 | 45 | 7 | 45 | Spelling error? manoeuver (not 'maneuver') | Taken into account - comment is obsolete as the underlying text has been |
| 18186 | 7 | 7 | 46 | | 48 | Add to paragraph: Chapter 7 is dealing with energy systems, which dominated global GHG emissions and includes activities on energy sourcing, conversion, storage, transmission and distribution to supply energy to downstream energy consumers. Technical complexity of energy systems is scaling up and involves more and more conversion and delivery stages, with increasing automation and "smart" control. They are designed to produce primary energy, to convert it into secondary energy carriers, store them and deliver to final users to provide energy services in forms allowing improving both the quality of life and overall economic productivity. | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 18187 | 7 | 7 | 46 | | 48 | Alternative paragraph: Chapter 7 is dealing with energy systems, which dominated global GHG emissions and includes activities on energy sourcing, conversion, storage, transmission and distribution to supply energy to downstream energy consumers. Technical complexity of energy systems is scaling up and involves more and more conversion and delivery stages, with increasing automation and "smart" control. They are designed to produce primary energy, to convert it into secondary energy carriers, store them and deliver to final users to provide energy services in forms allowing improving both the quality of life and overall economic productivity. | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 6166 | 7 | 7 | 46 | 7 | 46 | "Chapter 7 is dealing with energy systems". "Is dealing with" is poorly worded; "addressing" or "concerns" is better. | Accepted - text revised. |
| 6167 | 7 | 7 | 46 | 8 | 3 | The purpose of this paragraph is unclear. The first sentence seems like an introduction, and the final two are both vague and obvious. Cut. | Accepted - text revised. |
| 2939 | 7 | 7 | 46 | 8 | 3 | The inadequate discussion of this para (and of the first para of the chapter summary) suggests that "energy systems" in line 46 to the authors means "energy SUPPLY systems ", whereas the full energy SYSTEM to me is more like "well to wheels", i.e it includes how energy is used as well as how it is supplied. And in the phrase "energy [supply] systems includes [list of examples]" is this list meant to be comprehensive? Are there other aspects also included? In short this section is fails to clearly define the "boundaries of this chapter", and consequently of its relation to the other chapters on transport, buildings, industry , etc. | The scope of the chapter corresponds to definition of energy industries in the IPCC inventory Guidelines. It was made clearer. The boundaries of the system considered in chapter 7 now is explained by using a diagram. |
| 10493 | 7 | 7 | 47 | | | Throughout the chapter there is confusion over the definition of "energy sector" and what it includes. For example page 15 line 14 says energy sector is only electricity and heat - yet earlier in 7.1.1 it implies it includes some transport - up to distribution . The whole chapter needs to be checked for consistency in terminology. Suggest a small side-meeting at LAM3 | Accepted - a diagram now shows the system boundaries. |
| 16776 | 7 | 7 | 48 | | | Suggest delete sentence beginning with "Technical complexity of energy systems …" and replace with "The transformation of the energy system also provides the lowest costs opportunities for reducing CO2 emissions (chapter 6). | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 4778 | 7 | 7 | 9 | 7 | 20 | Power system is a very long term business, which requires important amount of money. It is therefore important to have a long term vision, that is shared between all stakeholders, in order to provide confidence to investors and for theme to choose the best solution (climate/energy issue). | Noted. |
| 15938 | 7 | 7 | 9 | 7 | 9 | please explain 'path dependent' or use another phrase | Accepted - text revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9221 | 7 | 7 | 22 | 7 | 32 | You can to eliminate the detail, from end line 24, because always can be forget some item. The parragraph we be: " Deep globaleconomic recession of 2008-2009 and slow recovery by the debt crisis in Europe and the USA, volatility of energy price, geopolitical tension, desvastating earhquake and sunnami, and failure to reach binding agrreement of GHG emission control all those events significantly...." | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 13452 | 7 | 7 | 13 | 7 | 14 | Text: "Existing energy-related capital stock has already locked in 80% of the 14 permissible 2035 CO2 emissions under a 450ppm CO2eq stabilization scenarios" Whilst it is true that current energy-related infrastructure could lock in high future emissions, it is also true that if decarbonisation in the energy sector begins to be treated seriously, not all the current plant will remain in use, or in constant use. One scenario could be that renewable electricity generation becomes of vital importance within major economies, perhaps because of strong volatility in fossil fuel prices and availability, leading to fossil fuel plant being used only as back up for load balancing. | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 13453 | 7 | 7 | 38 | 7 | 39 | Text: "Annex I countries are not any more at the top of CO2 emitting countries list." Alternative wording suggests itself to avoid confusion, such as "Annex I countries are in the top CO2 emitting countries list, but a non-Annex I country now holds the very top position." | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 7017 | 7 | 7 of 135 | 15 | 7 of 135 | 15 | Add "zero and", after the word "of", and before the word "low", around the middle part of the line. | Rejected - low carbon technologies comprise zero carbon technologies as a |
| 7018 | 7 | 7 of 135 | 19 | 7 of 135 | 20 | The same as 12th Comment. | Taken into account - Copenhagen Accord is replaced by Cancun |
| 11775 | 7 | 70 | | | | This figure shows wind power cost is extremely low, which means that it includes the some kind of policy support. Such remark should be added to avoid misunderstanding. | Taken into account - The comment is obsolete as the underlying figure has |
| 9612 | 7 | 70 | | | | Please, add in line 'a)' some condition such as if demand curve is perfectly inelastic or if supply is perfectly elastic. | Taken into account - The comment is obsolete as the underlying figure has |
| 10664 | 7 | 70 | | | | This figure assumes that wind energy enjoys prioritized dispatching because of the EU directive and does not reflect its real economy. Delete or provide a proper explanation. | Taken into account - The comment is obsolete as the underlying figure has |
| 10570 | 7 | 70 | | | | Expand caption as insufficient to interpret the figures | Taken into account - The comment is obsolete as the underlying figure has |
| 11546 | 7 | 70 | | | | This page is a mix of journal article-type text and quotations from the IEA. Please harmonize style, and make sure you understand what you want to say and why. Fig 7.19 is not well-explained and could be dropped as it is not essential. Better: drop figure, move caption to main text and provide appropriate references. This is what an assessment should do. | Taken into account - text revised. Figure 7.19 is deleted. |
| 10569 | 7 | 70 | 1 | 70 | 8 | Needs updating with references added | Taken into account. |
| 2849 | 7 | 70 | 14 | 70 | 18 | This is unbalanced. The studies cited do not justify the conclusion that GHG prices were effective in changing investment decisions. A more neutral summary of Ellerman et al 2010 said that it concludes that “the EU ETS did deliver operational changes, resulting in CO2 emission reductions of 3–5% during the pilot phase relative to a counter-factual without the ETS. The authors argue that it is too early to assess the additional impact on investment choices.” (Karsten Neuhoff: Reflections on implementing EU ETS, Climate Policy, 11:1). In any event the Ellerman studies relate to the pilot phase of the ETS (2005-2007) and events since then would cast doubt on whether the current scheme has even the minor impacts suggested for the pilot. | Taken into account - The text now distinguishes between operational choices and the impact on investments. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18223 | 7 | 70 | 19 | | 23 | Delete: A higher market clearing price implies that consumers have to pay more for electricity. “This can result in consumer payments for electricity increasing by substantially more than the actual cost of emissions allowances (Cowart, 2010)” (IEA, 2011j, p. 44). In markets that exhibit some price elasticity (e.g., due to demand response measures (IEA, 2003b)) this might result in a lower demand and consequently in lower emissions as well.<br>Comment: As true as stated, can be seen that a lower energy demand is a desirable scenario, but this little mentioned in the chapter, and on the other hand, has much resonance with regard to improving the efficiency of energy supply technologies, or low carbon emissions, to meet a growing demand that is projected.<br>Alternative paragraph:<br>A higher market clearing price implies that consumers have to pay more for electricity. “This can result in consumer payments for electricity increasing by substantially more than the actual cost of emissions allowances (Cowart, 2010)” (IEA, 2011j, p. 44). | Taken into account -text revised. |
| 12331 | 7 | 70 | 2 | | | California ETS should be mentioned. | Accepted - text revised. |
| 15546 | 7 | 70 | 21 | | 23 | The text seems to suggest that the only source of price elasticity is explicit demand-side policy measures. But consumers do respond to price changes if the changes are perceived to be permanent. Changing consumers' spending patterns by bringing about changes in relative prices should be a key part of climate change mitigation. | Taken into account. The reference to demand side policies has been deleted. |
| 18225 | 7 | 70 | 21 | | 25 | Comment:<br>In markets that exhibit some price elasticity (e.g., due to demand response measures (IEA, 2003b)) this might result in a lower demand and consequently in lower emissions as well. In contrast, a higher market clearing price implies higher infra-marginal rents for the electricity producers at least as long as the price effect is not overcompensated by additional EP expenditures (Keppler and Cruciani, 2010). The related transfer of money from consumers to producers is exaggerated, if certificates are allocated for free. Comment: As true as stated, can be seen that a lower energy demand is a desirable scenario, but this little mentioned in the chapter, and on the other hand, has much resonance with regard to improving the efficiency of energy supply technologies, or low carbon emissions, to meet a growing demand that is projected.<br>Alternative paragraph:<br>In markets that exhibit some price elasticity (e.g., due to demand response measures (IEA, 2003b)) this might result in a lower demand and consequently in lower emissions as well. In contrast, a higher market clearing price implies higher infra-marginal rents for the electricity producers at least as long as the price effect is not overcompensated by additional EP expenditures (Keppler and Cruciani, 2010). The related transfer of money from consumers to producers is exaggerated, if certificates are allocated for free. | Taken into account - There seems to be no difference of the proposed alternative. |
| 5961 | 7 | 70 | 21 | 23 | | Reducing demand for electricity (because of higher prices) does not impact overall carbon emissions (which are set by the cap). The principal effect is to reduce the price of permits. | Taken into account - the text that is referring to the emissions has been |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16866 | 7 | 70 | 27 | | 32 | There are oversimplifications here -- a free allocation above the operator's lost value in a CO2 market can create windfalls -- so if a generating station has lost $5 of margin with at $10 CO2 price an allocation of 1/2 allowance based on historic emissions will help cover their losses, but will not result in a windfall. A 100% allocation to the emitter (as occurred in the EU) will result in some windfall though. Also, in regard to the free allocation removing the incentive to move to low carbon generation is inaccurate -- operators respond to opportunity cost too -- it may take some time for all of them to figure this out, but they do in fairly short order - those who don't eventually go out of business because they don't understand their own economics. In fact, operators, if allowed to, can sell their future allocations on the market and use the resulting funds to finance part of the investment in the new, low emitting technology. Insofar as allocations may very well be needed to make a cap and trade program politically acceptable, it is not helpful to mischaracterize some of these points and make it more difficult to enact policies. Please see some of the literature produced by Stavins on this topic. http://www.hks.harvard.edu/fs/rstavins/Papers/Stavins'_Article_on_US_Cap-and-Trade_for_Oxford_Review.pdf and http://www.hks.harvard.edu/fs/rstavins/Papers/Policy%20Instruments%20for%20Climate%20Change.pdf and http://www.hks.harvard.edu/fs/rstavins/Selected_Articles/Three-Part_Architecture_Paper_for_Yale_by_Stavins_Revsied.pdf and http://globalchange.mit.edu/files/document/MITJPSPGC_Rpt170.pdf | Taken into account - The comment is obsolete as the underlying text has been deleted. |
| 9611 | 7 | 70 | 28 | 70 | 29 | Please, explain more politely as it is unclear why in regulated systems it can also remove the incentive to move to low-carbon generation and it may be wrong. (IEA, economics of transition of the power sector) | Taken into account - The comment is obsolete as the underlying text has been |
| 10005 | 7 | 70 | 34 | | | This figure should explain that renewable energy does not always reduce the electricity price. The situation depends strongly on countries or areas. A higher reserve margin will result in more costly structure as a whole power system. This is because it is necessary to install additional equipments for power grid stabilization if variable power sources such as wind power or photovoltaic were installed into power grid, as described in (DeCarolis, 2006, page 395 and 403). This literature is listed in the No26 line of this table. | Taken into account - The comment is obsolete as the underlying figure has been deleted. |
| 5932 | 7 | 70 | 9 | | 32 | At the Nordic electricity market, so-called windfall profits for generators caused by ETS are very substantial, 2 billion (10^9) €/yr at the Nordic market at the CO2 price of 10 €/tonne. 50% of electricity at the market is hydropower and 20% is nuclear (both have low variable costs), and most of the time the marginal generation is coal-condensing. Removing free allocation would not remove this large transfer of money from consumers to the owners of hydro and nuclear. All of this hydro and nuclear has been built far before the EU ETS. Reference: M. Kara, S. Syri, A. Lehtilä, S. Helynen, V. Kekkonen, M. Ruska, J. Forsström, En Econ 30 (2008) 193 – 211. | Taken into account - a paragraph on the profits made by energy suppliers who run a portfolio of power plants is added. Space constraints, however, do not allow to go into the details. |
| 12550 | 7 | 71 | 14 | | | While some observers may still believe the Clean Development Mechanism is “fairly credible,” the UN's own special panel concludes that the CDM is “imperilled” for numerous reasons, and makes dozens of recommendations to rebuild programme integrity. Climate Change, Carbon Markets and the CDM: A Call to Action, Report of the High-Level Panel on the CDM Policy Dialogue, http://www.cdmpolicydialogue.org/report/rpt110912.pdf | Taken into account - The comment is obsolete as the underlying text has been deleted. |
| 5963 | 7 | 71 | 17 | | | The disucssion of CDM projects and distributions has limited relevance in this section | Taken into account - text revised. The energy related aspects are now |
| 16867 | 7 | 71 | 2 | | | Suggest inserting something like this after sentence ending with "new investments." This might be helpful: "However, investors must have confidence the market will be durable and will provide a growing CO2 price for the incentive to change investor technology choices." | Taken into account - the importance of long-term targets now is emphasized (see 7.12). |

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| 18224 | 7 | 71 | 21 | | 25 | Comment:<br>Comment: The problem / scandal arising from the situations referred to the abatement of HFC-23 is very shallow in this part of the text, and the scientific community must be clearly and accurately warned about the perverse incentive that was identified in the Facility Clean Development Mechanism (CDM), in part, as to the abatement of gases with high global warming potential (as HFC-23) and their very low cost of destruction, compared to the high profits that meant selling certificates (Gillenwater and Seres, reduced emissions (CERs) that were awarded to those CDM projects.<br>Alternative paragraph:<br>One reason is that "early in the CDM program, a significant fraction of the emission reduction have come from a few large projects that reduced GHG emissions at low cost, for example industrial HGC and N2O abatement projects, but which delivered limited sustainable development benefits other than reduced GHGs" and low carbon energy supply (Gillenwater and Seres, 2011, p.25 30). | Taken into account - the discussion of HFC gases has been deleted, because it is not part of the energy system. The industry chapter has to take care of the HFC issue. |
| 18226 | 7 | 71 | 35 | | 37 | Comment:<br>Comment: The approach is incomplete. Should be included in the text, at least, a simple mention of what those reasons why "developing countries have not reached their potential to capture the benefits of the CDM", and not just leave it to a reference.<br>Alternative paragraph:<br>The reasons that explain why some developing countries don’t reach their full potential to capture the benefits from CDM are discussed in (Lokey, 2009). | Rejected - space constraints do not allow a deeper discussion of these reasons. |
| 15367 | 7 | 71 | 36 | | | Most of the LDCs and SIDs have not benefitted from the CDM at all until now.It could be mentioned that new simpler rules regarding 'additinality' of micro size (<5MW) projects and the Prgrammatic CDM might hel smaller countries make use of this facility in near future. | Rejected- space restrictions do not allow for this extensions. The issue must be addressed in chapter 13 - 15. |
| 15359 | 7 | 71 | 36 | 71 | 37 | Reference missing ( Lokey, 2009) | Taken into account - reference is added. |
| 12332 | 7 | 71 | 9 | | | Emission trading systems are not necessarily limited to Annex 1 countries. By 2015, China might have both an ETS system and a CDM mechanism. | Taken into account - The comment is obsolete as the underlying text has been |
| 9613 | 7 | 71 | 9 | 72 | 8 | Please, move here to somewhere in chapter 13 to 15. | Rejected (in part) - Those parts that are not directly related with energy aspects have been deleted. The other parts stay in accordance to the text that is |
| 5962 | 7 | 71 | 9 | | | As noted in previous text, ETS systems are also nder delveopment in non-Annex 1 countries. | Taken into account - The comment is obsolete as the underlying text has been |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13696 | 7 | 71 | 9 | 72 | 8 | Focus text on energy-related aspect of CDM and delete figures (general aspects of CDM as well as of its contribution to technology transfer are covered in Ch. 13 and 14). Use energy-specific CDM references such as Michaelowa, A., Hayashi, D., Marr, M. (2009): Challenges for energy efficiency improvement under the CDM—the case of energy-efficient lighting, in: Energy Efficiency, 2, p. 353-367; Lokey, E. (2009): Renewable energy project development under the Clean Development Mechanism: A guide for Latin America, Earthscan, London; Michaelowa, A.; Krey, M.; Butzengeiger, S. (2006): Clean Development Mechanism and Joint Implementation: New Instruments for Financing Renewable Energy Technologies, in: Assmann, D.; Laumanns, U.; Uh, D. (eds.): Renewable energy, Earthscan, London, p. 196-216. The CDM is a significant incentive for expansion of renewable energy (see e.g. Purohit and Michaelowa (2007) and Restuti and Michaelowa (2007) for the potential of bagasse cogeneration under the CDM in India and Indonesia.)" References: Purohit, P.; Michaelowa, A. (2007): CDM potential of bagasse cogeneration in India, in: Energy Policy, 35, p. 4779-4798; Restuti, D.; Michaelowa, A. (2007): The economic potential of bagasse cogeneration as CDM projects in Indonesia, in: Energy Policy, 35, p. 3952-3966. Update CDM data when finalizing AR5 as per the latest edition of UNEP Riso Centre: CDM pipeline, download at www.cdmpipeline.org. In case of interest, I'd be happy to draft a para of the role of the CDM in the energy sector as a contributing author. | Taken into account - text revised. |
| 15067 | 7 | 71 | 10 | 71 | 13 | This sentence is simply a re-written of what Art.12 of the Kyoto Protocol stated without any additional elements. Therefore, the references (Boyd et al., 2009; van der Gaast et al., 2009) in the present text are not needed here. | Taken into account - text has been deleted. |
| 3459 | 7 | 71 | 17 | 71 | 37 | I suggest to include some figure and comments regarding the contribution of CER in GHG reduction | Taken into account - the energy related aspects are now emphasized. |
| 15068 | 7 | 71 | 23 | 71 | 25 | The text says "but which delivered limited sustainable development benefits other than reduced GHGs". However, this seems to be an individual view which is expressed by a single paper (Gillenwater and Seres, 2011) without any formal discussions about what sustainable development benefits are. Under the current CDM process, each developing country hosting the CDM project can determine what is meant by "sustainable development". In this context, it is not so easy to conclude that HFC and N2O projects deliver limited SD benefits since such value judgment has to be done by the developing countries hosting these projects. Gillenwater and Seres (2011) does not provide any evidence to prove this. | Taken into account - the CDM text has been rewritten. Gillenwater and Seres are not cited anymore. |
| 15369 | 7 | 72 | 1 | | | UNFCCC CDM Technology Transfer report (2010): http://ynccf.net/pdf/CDM/CDM_and_Technology_Transfer.pdf | Taken into account - the general aspects of technology transfer are discussed in |
| 10571 | 7 | 72 | 16 | | | Add ref REN21, 2012 after "recent years' | Editorial - added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9479 | 7 | 72 | 18 | 72 | 20 | It should be added that FIT system can impact civil life and economic activities by rise in the price of electricity and policies of FIT need to be decided in full consideration of such impacts.<br>In a study on FIT in Germany, Manuel Frondel et al. [1] point out the following points; a)Currently, the feed-in tariff for PV is more than eight times higher than the electricity price at the power exchange... Given the net cost of 41.82Cents/kWh for modules installed in 2008, and assuming that PV displaces conventional electricity generated from a mixture of gas and hard coal with an emissions factor of 0.584 kg carbon dioxide (CO2) per kWh, then dividing the two figures yields abatement costs that are as high as 716€ per tonne. ....abatement cost estimates are dramatically larger than the current prices of CO2 emission certificates. b) numerous empirical studies have consistently shown the net employment balance to be zero or even negative in the long run, a consequence of the high opportunity cost of supporting renewable energy technologies. c) rather than promoting energy security, the need for backup power from fossil fuels means that renewables increase Germany's dependence on gas imports, most of which come from Russia. d)… the system of feed-in tariffs stifles competition among renewable energy producers and creates perverse incentives to lock into existing technologies.<br>[1]Manuel Frondel, Christoph M. Schmidt, Nolan Ritter and Colin Vance (2010)<br>Economic Impacts from the Promotion of Renewable Energy Technologies: The German Experience. Ruhr Economic Paper #156 (Energy Policy 38 : 4048-4056)<br>a) page 6 lines 4-6, page 13 lines 20-25<br>b) – d) page 19 lines 31- page 20 line 3 | Rejected - a) the support for innovative technologies like PV is carried out via additional support schemes, because their abatements costs are higher than those observed in the carbon markets. If this would not be the case, any additional support would be not necessary. Complementary policies in addition to carbon pricing can be justified if other goals beyond climate protection (abatement of local air pollution, increased energy access, etc.) are pursued and/or technological learning is to be enhanced. Details on the issues that arise if policy instruments are applied simultaneously are discussed in detail in the policy chapter of the IPCC SRRREN. b) Space constraints do not allow the discussion of co-benefits of policy instruments. These are discussed in the subchapter on 7.9.1. c) Renewable energies displace fossil fuels. Taken together, |
| 9512 | 7 | 72 | 18 | 72 | 25 | add the bad influence for TIF in addition to the good influence<br>(Economic impacts from the promotion of renewable energies: The German experience/page 6 lines 3-6)(attached on email) | Rejected - the cited sentences summarize the outcome of a comprehensive assessment that has been made for the IPCC SRREN. Space constraints do not allow to go into the details here. The paragraph therefore is silent about specific implications of the |
| 9614 | 7 | 72 | 22 | 72 | 30 | Please, move here to line 32 in page 70. | Taken into account - comment is obsolete. Underlying text has been |
| 5965 | 7 | 72 | 24 | 30 | | Relocate to Page 69 after line 24 for better balance | Taken into account - comment is obsolete. Underlying text has been |
| 16133 | 7 | 72 | 25 | 72 | 29 | The paragraph rightly describe that merit order effects may lead to future unbalance in electric systems with increasing share of RE, and will induce other mechanisms (such as capacity credits or auctions). But it fails to say that presently it shakes existing baseload plants and even more projects, and have an accelerating impact on restructuration, by undermining amortization of these baseload plants. In the most obvious case, Germany, it illustrates the fact that independant renewable sources bring competion and shakes the sector. Thus "merit order effects" are independant from the context of subsidies, but more a competition issue. The paragraph should be more balanced in that direction. | Taken into account - comment is obsolete. Underlying text has been deleted. |
| 16869 | 7 | 72 | 25 | | | Re the point about renewables lowering the wholesale energy price -- this in fact creates a problem insofar as the lower price causes growth in consumption of electricity which is counterproductive when also trying to incentivize energy efficiency investment. | Rejected - this is only true for consumers that don't have to pay for the support itself (e.g. the payments compensating the feed-in tariff). At the |
| 5964 | 7 | 72 | 27 | 30 | | Objectivity: Strong support for "energy only" markets is also expressed with a view that the necessary back-up and other services can be provided in a competitive manner | Taken into account - The comment is obsolete as the underlying text has been |

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| 4826 | 7 | 72 | 31 | 72 | 31 | One point missing in this section is the impact of economic crisis in the implementation of enabling policies. There is usuallly a trade-off between affordability and green targets and the affordability aspect gains importance during economic crisis. | Rejected - this implies to general aspects of mitigation policies. It therefore must be discussed in chapter 13 - 15. |
| 10572 | 7 | 72 | 31 | | | Cross reference to chapters 12-16 where appropriate | Taken into account - text revised with references to Chapter 15 and others as |
| 5966 | 7 | 72 | 34 | 35 | | Lack of policy instrument coherence is a critical point and needs further emphasis | Rejected - the coherence of policies must be judged from a general point of view. This is to be done by chapter 13-15 and chapter 3. A reference to the |
| 14896 | 7 | 72 | 42 | 73 | 8 | overlap to chpter15 | Taken into account - overlap has been |
| 17379 | 7 | 72 | 44 | | | network constraints… | Editorial |
| 11997 | 7 | 72 | 6 | 72 | 8 | I question the scientific rigour of that study because of the very evidence that over 50% of the CERs issued to date come from industrial gas projects, the technology of which has been developed in Canada, Norway and Germany. Also, the studies base their conclusions of the technology transfer description in the CDM Project Design Documentation, which is also wrong because that description is voluntary and non-scientific i.e. non-comparable. And finally, technology transfer needs to be looked at in time: As an example, the installed wind capacity in China was less than 100MW before the CDM was used to top up Chinese tax money to heavily subsidize renewable energy from 2002 onwards. The first CDM projects all used predominantly Danish, Spanish and German technology. Today, in less than a decade, there is no more technology transfer in that very sense, because the country has caught up with the development. Besides the hardship that might pose in terms of intellectual property rights etc., the bottom line is: there has been massive amount of technology transfer under the CDM and it is beneficial to mitigate GHG emissions.<br>Also, I suggest to look at the UNFCCC Secretariat's assessment of technology transfer, you can find their study here: cdm.unfccc.int/about/dev_ben/index.html | Taken into account - the reference Das (2011) has been deleted. |
| 2850 | 7 | 72 | 9 | 72 | | This section needs to be expanded, in particular the reference to wholesale market design. Market reforms are currently under way in many countries and deserve discussion. (See for example, Newbery Reforming Competitive Electricity Markets to Meet Environmental Targets in Economic of Energy and Environmental Policy vol 1 issue 1.) | Rejected - elements of a new market design are already discussed in 7.12.3 (previously 7.11.4) enabling policies. Space constraints do not allow an |
| 16868 | 7 | 72 | | | | This section is important -- should include discussion regarding how policies focused on deploying renewables (rather than reducing CO2 emissions) may be very effective at deploying renewables, but are less effective at reducing CO2 emissions. Emissions reductions they do cause cost much more in terms of the money invested than other lower costs options that would otherwise be pursued as part of the market based program. This will drive down the CO2 price in a parallel cap and trade system, but this means that reductions that would otherwise have occurred as a slightly higher CO2 price are overlooked/not done. Forcing deployment of nascent technologies still being developed can be part of an RD&D program (and dramatically lowers costs of future techs) but if they only push techs that are already fairly mature, this is an expensive diversion of resources. Suggest looking at lit by Ellerman and others. | Rejected - space constraints do not a allow for an elaborated discussion of the co-benefits and drawbacks of combining various instruments. The question of coherence is discussed in detail in the policy chapter of the IPCC SRREN. Additional information on that issue should be provided by the policy chapters 13 - 15 and chapter 3. A |
| 13222 | 7 | 72 | 10 | 72 | 14 | It might be helpful to start with the more general point that no significant deployment of grid connected renewables has been observed to date in the absence of support mechanisms. This puts then the question on efficiency/effectiveness of support mechanisms into perspective. | Taken into account - The text has been revised to be clear on which support mechanisms packages have been |
| 11002 | 7 | 72 | 18 | 72 | 22 | Not only advantages but also drawbacks as to feed-in tariff should be stated. There are several problems which should be solved in feed-in tariff system, such as increase in electricity bills or development of infrastructure by introducing renewable energies rapidly. | Rejected - space constraints do not allow to go into the details here. The sentences cited summarize the outcome of a comprehensive assessment that has been made for the IPCC SRREN. Specific merits and drawbacks of |

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| 13221 | 7 | 72 | 22 | 72 | 30 | The renewable support mechanisms are not responsible for the merrit order effect. Whenever a cheaper technology comes to the market it will replace more expensive generation assets (in hours or in overall system).Thus the merrit order effect is neither an argument against support mechanisms nor against the viabiltiy of an energy market including large shares of reneawbles. | Taken into account - comment is obsolete. Underlying text has been deleted. |
| 13208 | 7 | 72 | 9 | | | Nuclear energy contribution to GHG emissions reduction should be discussed, e.g. for China | Rejected. Section 7.11.2 describes technology policies to complement carbon pricing. "Nuclear energy contribution to GHG emissions |
| 10956 | 7 | 72 | 9 | 72 | 30 | Confer: Fischer, Torvanger, Shrivastava, Sterner, Stigson (2012), How should support for climate-friendly technologies be designed?, Ambio, 41(Suppl. 1), 33-45. | Noted. The suggested literature picks up several important policies. However, any discussion of the design of policies now |
| 10092 | 7 | 72 | | 73 | | If enabling policies are described, the opposite should also be mentioned, which are plenty. | Rejected - barriers are discussed in |
| 18104 | 7 | 73 | 3 | 73 | 3 | ... nodal pricing schemes, ancillary services markets and capacity markets. | Accepted - text revised. |
| 9615 | 7 | 73 | 37 | 74 | 75 | Please, delete here due to duplication in chapter 6. | Rejected. The figure and text is essential to provide the context for the required |
| 7746 | 7 | 73 | 40 | 74 | 2 | There is no reason to refer to na accord,which is not unanimitily adopted by the UNFCCC. Please,refer tothe Kyoto Protocol. | Taken into account - the Copenhagen Accord has been replaced by the |
| 6461 | 7 | 73 | 40 | 74 | 2 | Copenhagen Accord does not set the objective of limitation of global average temperature change to below 2 degrees, but just “recognizing the scientific view”.<br>Therefore, the sentence should be changed to, for example;<br>“which is broadly compatible with scientific view recongnized in the Copenhagen Accord to limit global average temperature increase to below 2°C”. | Taken into account - the Copenhagen Accord has been replaced by the Cancun Agreement. |
| 12596 | 7 | 73 | 6 | | | There is an ethical issue over smart grid technologies. Do we go down the route of somewhat invasive systems, which give energy providers control over the devices in domestic homes, or, alternatively, do we go down a more decentralized type system, using systems which monitor the local grid frequency? | Rejected - although the question is interesting, space constraints do not allow for a deeper discussion based on |
| 3460 | 7 | 73 | 1 | 73 | 30 | It should be mentioned that there is a lack of regulation among countries, on order to take advantages of some energy and environmental solutions that could be implemented among countries | Rejected - the discussion of general policy aspects is to be done by chapter |
| 2851 | 7 | 73 | 31 | 86 | 8 | As mentioned in the general section the scenarios section could be shortened. There are one or two significant findings, such as the importance of demand and electricity and the need for immediate action. However, apart from those (familiar) points, no clear or useful message emerges, given the huge range of outcomes quoted from different models, and the cursory checklist of policies. | Accepted. We made an attempt to shorten the text wherever possible |
| 9069 | 7 | 73 | 31 | 86 | 8 | 7.12 Sectoral implication of transformation pathways and sustainable development can be deleted due to limitations on the nos of pages and it's been covered in chapter 6 | Rejected. We disagree that the pages are covered in chapter 6. |
| 3161 | 7 | 73 | 31 | | | Section 7.12 covers SD, but that is addressed in detail in a whole chapter (#4, I think). | Noted - we are bound by the heading to |
| 18549 | 7 | 74 | | 75 | | Why do energy and industry appear together in this figure? The AR5 has a separate chapter for each of these sectors, and one would therefore expect this figure (and section) to therefore focus strictly on energy. | Noted. This is so since some scenarios report industrial process emissions as part of the energy related emissions. we can not exclude these emissions. Note also that energy-related emissions refer to the full energy system including emissions of all demand-side sectors. In addition, non-energy emissions from industrial processes are included, since these emissions are not provided as a separate category in the AR5 scenario |
| 14547 | 7 | 74 | 18 | 74 | 18 | Express targets also in more familiar concept of CO2 concentration (ppm) | Accepted |

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| 9480 | 7 | 74 | 22 | 74 | 23 | Suitable sites for renewable energy or CCS are eccentrically-located and installation of them requires great cost. It should be added that there are difficulties to make world's average emission factor of electricity to zero. | Rejected. Costs are discussed elsewhere in the chapter. Whether or not they are "great" is a matter of personal |
| 6554 | 7 | 74 | 1 | | | "2.5-3.0" instead of "2.7" is correct (see Table 6.2). The same in P.74 line18, and P.83 line5. | Taken into account - the definition of the categories has been updated. |
| 6555 | 7 | 74 | 1 | | 2 | Correct the description "stated objective of the Copenhagen Accord to limit global average temperature change to below 2 degrees C.", as the heads of state, etc. have agreed on the Copenhagen Accord only "recognizing the scientific view that the increase in global temperature should be below 2 degrees Celsius" but not on "objective to limit temperature below 2 degrees C". | Taken into account - the Copenhagen Accord has been replaced by the Cancun Agreement. |
| 6556 | 7 | 74 | 2 | | 5 | Make numbers consistent with those in Chapter 6. | Taken into account - results in chapter 6 and chapter 7 now are consistent. |
| 6558 | 7 | 74 | 16 | | 17 | Replace "The stabilization of GHG" with e.g. "the lower stabilization levels of GHG", as there seems to be scenarios suggesting CO2 emissions to peak-out and then decline even in the baselines of Figure.21. | Accepted. The section has been changed to indicate that the increase is |
| 6559 | 7 | 74 | 21 | | 22 | Delete the sentence "As discussed [...] concentrations." or replace "CO2 emissions must eventually decline to zero" with e.g. "CO2 emissions must peak and then gradually approach zero over more than 1000 years" according to Kheshigi et. al (2005) cited in 7.12.4 to make it clear, as the other discussion here is only dealing with issues in this century. | Accepted. changed to read, "in the long term decline toward zero" |
| 6557 | 7 | 74 | 7 | | 8 | Modify the description "energy-related CO2 emission are expected to continue to increase", as the lower boundary of baselines on Figure 7.21 suggests that there are scenarios that indicate CO2 emissions to peak-out and then decline even in the baselines. | Accepted. The section has been changed to indicate that the increase is relative to present levels. |
| 12333 | 7 | 74 | 6 | | | This chapter should also deal with emission of SF6 from electric transmission systems. | Accepted - Unfortunately the AR5 scenario database does not include sufficient detail to break out information about SF6 emissions from electrical transmission systems. But we acknowledge that this omission should |
| 4656 | 7 | 75 | | 75 | | I think the categories should be specified in the figure. | Taken into account - the categories now are explained in the introduction to |
| 10573 | 7 | 75 | 2 | | | Does "the energy and industry sector" include transport and buildings? Seems a strange combination. Why is industry included in this chapter? Another example of where chapter boundaries are hazy | Noted. This is so since some scenarios report industrial process emissions as part of the energy related emissions. we can not exclude these emissions. Note also that energy-related emissions refer to the full energy system including emissions of all demand-side sectors. In addition, non-energy emissions from industrial processes are included, since these emissions are not provided as a separate category in the AR5 scenario |
| 16870 | 7 | 75 | 21 | | 24 | Replacing the fossil fuel share of energy is not precise enough -- should be replacing the high emitting fossil fuel technologies with low emitting fossil fuel technologies. See chapt 6 re the importance of CCS on fossil fuels as part of low costs mitigation scenarios. | Accepted. We clarified that we mean the fossil fuel share without CCS. |
| 16871 | 7 | 75 | 25 | | 29 | Very good that you mention that the scenarios show that energy efficiency is a large contributor of emissions reductions in the first decades of a CO2 reduction program that is driven by a CO2 price -- might also be helpful to note why this is so (EE is relatively inexpensive, other larger new technologies are not quite ready or require a higher CO2 price expected in future decades, etc.). | Rejected: in the IAMs every technology is deployed up to the point at which the last ton of emissions mitigation costs the same. So, nothing is any cheaper than |

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| 2852 | 7 | 75 | 27 | | | The suggestion that 40-90% of reductions can be achieved via demand reduction deserves more extensive analysis – for instance, how realistic this is, how it might be achieved, and what are the implications for the various systems issues listed in the general comments above. The suggestion is far reaching in its implications, but it does not seem to be reflected anywhere in the earlier sections. | Rejected: Demand reductions are discussed extensively in the chapters on industry, buildings and transport |
| 18550 | 7 | 75 | 9 | 77 | | Please clarify why these three scenarios were chosen for focus. | Accepted - Because they represent broader GHG mitigation strategies with varying emphasis on demand vs. supply-focus of the transformation. We clarified |
| 11953 | 7 | 75 | 2 | | | Why are we repeating what is also in Chapter 6? Simply refer to it, with p. # | Noted: This section elaborates on the energy supply and transformation implications of the scenario literature as achieved in the Chapter 6 data base. It may not be possible to discuss every scenario in the literature explicitly. If scenarios include important NEW information that lies outside of the larger |
| 6201 | 7 | 75 | | 78 | | Here, there doesn't seem to be enough text to explain the charts. Pointing out the key features of the various models being presented would help a reader follow what's being shown by all the colored blocks. | Rejected due to space limitations. Key features of models would need to be discussed in the transformation |
| 17279 | 7 | 75 | 4 | 79 | 8 | In this section also attention should be paid to low energy pathways that are not part of an integrated assessment model, like the one developed by DLR for Greenpeace (Energy [R]evolution) and by Ecofys for WWF (The Energy Report). These scenario studies often provide more detail in terms of the deployment of renewable energy. | Rejected - the IPCC scenario database is an open one. Please submit the respective scenarios so that they can be included. |
| 10059 | 7 | 75 | 8 | 78 | 11 | More scenarios should be added - especially those with different technology pathways (excluding e.g. CCS) | Accepted: We consider scenarios that exclude many technologies including, CCS and nuclear, and those which limit availability and performance of bioenergy |
| 16872 | 7 | 76 | | | | Are you not going to discuss or mention possible overshoot scenarios? Chapt 6 discusses them. If the world is slow in arriving at an agreement (really, emissions trading) among major emitting countries, overshoot strategies are the only way we ultimately can arrive at a 450 or 500 ppm world. | Rejected - implications of overshoot scenarios are discussed in chapter 6. |
| 4657 | 7 | 76 | | 76 | | I had difficulty following this figure. In two of the baseline scenarios, the biomass numbers decline to 2050 and then only start to increase to reach a maximum of 200 EJ by 2100. There is nothing shown for CCS. But surely, new tree planting entail CCS? Also the existing yields from wood, agricultural residues and dung are of the order of 500-515 EJ. This is well in excess of the 200 EJ shown in the table. The tables on the left which include CCS underground, have a maximum figure of less than 400EJ, which is again less than the current accessible annual yield! | Noted. We are trying to make our message clearer and the figures easier to follow. |
| 10278 | 7 | 77 | | 77 | | The role of nuclear power for the 450 ppm stabilization scenario is slightly smaller than that for the baseline scenario in MESSAGE and ReMIND models in Figure 7.22. The results will come from the assumptions of the models which have the exogenous scenario or limitation of nuclear power capacity or generations considering the public acceptability. However, such assumptions lack a scientific basis and are determined by modelers on an ad-hoc basis. There is a concern that readers will misunderstand the role of nuclear power inadequately without understandings of such model assumptions. Therefore, the additional explanatory remarks of the figure discussed above should be added in the body text in order to avoid misunderstandings of readers. | Rejected. Reduced deployment of nuclear or solar or wind in mitigation scenarios as compared with the reference case occurs when the expanded share of nuclear in power generation is offset by reduced demands for electricity occurring because end-use sectors are conserving energy in general. |

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| 11776 | 7 | 77 | | | | In the MESSAGE and ReMIND on the right side, nuclear power ratio is declining. If this is results from the some kind of given conditions to the model, such remark should be added. | Rejected. Reduced deployment of nuclear or solar or wind in mitigation scenarios as compared with the reference case occurs when the expanded share of nuclear in power generation is offset by reduced demands |
| 9616 | 7 | 77 | | | | Please, describe reasons for reduction of nuclear capacity in the text with regard to two models results, MESSAGE and ReMIND after 2080's; it may mislead readers to conclude that nuclear generation is no longer regarded as one of critical options. However, IEA indicates nuclear is still a significant source in some cases in 2050 (IEA, table 3.1, ETP 2010) and its trend continues. | Rejected. We don't have the space to discuss individual technology contributions in specific scenarios. (Also, see previous response.) |
| 9617 | 7 | 77 | | | | Please, describe reasons why nuclear deployment becomes low relative to other sources in the text. IEA shows two cases of normal and high nuclear deployment in table 3.1, ETP 2010, which differs from those in Figure 7.23. | Rejected. We don't have the space to discuss individual technology contributions in specific scenarios. |
| 10093 | 7 | 77 | | | | axis legends are missiong<br>"savings" is missleading as nothing is on an account to be used in the future. "Efficiency increase" suits better. | Accepted: the effect includes also other demand-side changes than efficiency. Changed the legend to |
| 10006 | 7 | 77 | | | | In this figure, there should be an explanation about the reason why the ratios of nuclear power generation are same in the 550 ppm case and the 450 ppm case. It seems that the capacity and/or generation of the nuclear is intentionally limited and set as the same in both cases. Many assessment models assume the limitation of nuclear power capacity and/or generations considering the public acceptability. It seems that the results are based on this assumption. If so, the results underestimate the contribution of nuclear power in terms of mitigation costs. | Rejected. This would require too much specific scenario detail. The interested reader needs to go back to the original source. |
| 6702 | 7 | 77 | 2 | | | In this figure, the role of nuclear energy for the 450 ppm stabilization scenario is smaller than the baseline scenario in MESSAGE and ReMIND models. It is thought that this result come from the assumptions of the models which have the exogenous scenario or limitation of nuclear energy capacity or generations considering the public acceptability. Such assumptions lack a scientific basis and are determined by modelers on an ad-hoc basis. The additional explanatory remarks of this figure are needed in order not to make readers misunderstand the role of nuclear energy. | Rejected. We are able to discuss the general nature of scenarios but not the role of specific energy supply and transformation technologies. The role of nuclear technology is discussed along with other mitigation technologies. |
| 11777 | 7 | 78 | | | | Nuclear ratio is almost same. If this results come from the some kind of given conditions to the model, such remark should be added. | Rejected. We don't have the space to discuss individual technology contributions in specific scenarios. |
| 4658 | 7 | 78 | | 78 | | For biomass, it appears that the 'low' figure is higher that the 'medium' figure. Why? | Taken into account - comment is obsolete. Figure has been deleted. |
| 17756 | 7 | 79 | | | | consider dividing this important figure into four segments - at present it is fully readable | Taken into account - comment is obsolete. Figure has been deleted. |
| 9665 | 7 | 79 | | | | this figure is completely confusing - I am not sure that it adds value | Taken into account - comment is obsolete. Figure has been deleted. |
| 7305 | 7 | 79 | | 79 | | For better reading, please, change the colour of the filling and increase the size for the Figure 7.24. | Taken into account - comment is obsolete. Figure has been deleted. |
| 6250 | 7 | 79 | | 81 | | this seems as though it should be one of the central premises of the entire chapter. But that's not the case here; it's 4 paragraphs and a couple of charts spread out over 2 pages near the end of the chapter. It is actually shorter in text than the next subsection which summarizes literature on the difficulty of long-term stabilization planning. | Noted: This is one of several important points. The fact that it is a separate sub-section means that it is important. |
| 16873 | 7 | 79 | | | | I don't find this chart very helpful or informative -- can it be simplified and parts enlarged? | Taken into account - comment is obsolete. Figure has been deleted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16874 | 7 | 79 | 12 | | | It might be helpful to note at the end of the paragraph the following: "In short, the electricity sector provides the new energy refining infrastructure for the low emitting future." | Rejected: We emphasize the role of power generation in emissions mitigation strategies, but reject the specific wording |
| 10574 | 7 | 79 | 17 | 79 | 20 | Suggest delete these last two sentences as they relate more to transport than to electricity sector. But if they stay, then change "Bioenergy" to "Biofuels" | Accepted: We no longer discuss the transport sector, but refer readers to the |
| 18105 | 7 | 79 | 21 | 79 | 23 | Add efficiency and demand side measures. | Reject. That does not belong in a chapter on energy supply and |
| 9165 | 7 | 79 | 4 | 81 | 5 | role of electrification is discussed in (Sugiyama 2012) - please refer. (it is in ch6 bibliograph) | Noted - space constraints do not allow to go into the details here. |
| 16875 | 7 | 79 | | | | Very good. Please make sure this is highlighted in the executive summary. | Noted. |
| 10497 | 7 | 8 | | | | No mention of the Bioenergy section in Exec Summary. If it is to stay here needs a paragraph - but will maybe move to Chapter 11 I suspect. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 9628 | 7 | 8 | 1 | 8 | 1 | Who or What is being referred to when you say "they"? | Energy systems. |
| 15939 | 7 | 8 | 1 | 8 | 3 | Energy systems are not designed to produce primary energy; they are designed to deliver energy services to end users. Whether or not they 'produce' primary energy is irrelevant, as in the case of wind, solar, there is no 'primary energy' involved, unless you count the kinetic energy in the wind or the fusion reaction in the sun as 'primary' energy - and in any case, the energy system doesn't 'produce' it. | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 6415 | 7 | 8 | 13 | 8 | 13 | Should "intermittency" be "variability"? | Taken into account - comment is obsolete as the underlying text has been |
| 18042 | 7 | 8 | 13 | 8 | 13 | "Balancing" is a better word than "intermittency" here if it relates to the broader operation of electricity systems. | Taken into account - comment is obsolete as the underlying text has been |
| 15940 | 7 | 8 | 13 | 8 | 13 | replace 'intermittency' with 'variability', since this is what is being referred to here, I believe. Wind and solar are not intermittent - they are variable. Intermittent is a nuclear reactor which can go from 1000 MW to zero in a fraction of a second - and systems need to deal with that as well. So, add 'variability' to intermittency, or just switch intermittency to variability - the latter is I think the simplest. | Taken into account - comment is obsolete as the underlying text has been deleted. |
| 3774 | 7 | 8 | 14 | 8 | 16 | Review wording. | Accepted -text revised. |
| 5149 | 7 | 8 | 14 | | 16 | simpler sentence may clearify message | Accepted text revised. |
| 17359 | 7 | 8 | 15 | | | impacts or may impact… | Accepted - text revised. |
| 18188 | 7 | 8 | 30 | | 40 | Add to paragraph: This chapter concentrates on medium-term projections (to 2030-2035). Comparisons with stabilization pathways allow understanding the gap and challenge, including sustainable development implications of rapid transformations and disruptive changes. Local fuel supply infrastructure is the subject of Chapter 8. Building integrated power and heat generation as well as biomass use for cooking are addressed in chapter 9. Responsive load issues are dealt with by chapters 8 and 9. Chapter 7 considers mitigation options in fossil fuel energy extraction industries (oil, gas, coal, uranium etc.) while other extractive industries are addressed in Chapter 10. This chapter considers energy storage, and addresses the transformation of wood into charcoal, but not natural forest management This chapter addresses the transformation of wood into charcoal, but does not address natural forest management. This chapter also considers energy storage. Only energy sector related policies are reviewed considered in this chapter while broader and more detailed policy picture is presented in chapters 13-15. | Rejected - comment is unclear. Please clarify what you would like to change. |

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| 18189 | 7 | 8 | 30 | | 40 | Alternative paragraph: This chapter concentrates on medium-term projections (to 2030-2035). Comparisons with stabilization pathways allow understanding the gap and challenge, including sustainable development implications of rapid transformations and disruptive changes. Local fuel supply infrastructure is the subject of Chapter 8. Building integrated power and heat generation as well as biomass use for cooking are addressed in chapter 9. Responsive load issues are dealt with by chapters 8 and 9. Chapter 7 considers mitigation options in fossil fuel extraction industries (oil, gas, coal, uranium etc.) while other extractive industries are addressed in Chapter 10. This chapter considers energy storage, and addresses the transformation of wood into charcoal, but not natural forest management This chapter also considers energy storage. Only energy sector related policies are reviewed this chapter while broader and more detailed policy picture is presented in chapters 13-15. | Rejected - comment is unclear. Please clarify what you would like to change. |
| 10494 | 7 | 8 | 32 | | | Local "transport" fuel supply…. | Accepted - text revised. |
| 10495 | 7 | 8 | 35 | | | Not clear how "Responsive load issues" are dealt with in Chapter 8. Need to clarify or amend. | Noted - please read chapter 8. |
| 10496 | 7 | 8 | 38 | | | … management, "which is covered in Chapter 11." | Accepted - text revised. |
| 9629 | 7 | 8 | 4 | 8 | 25 | This is not necessary - one can read it in the table of contents | Rejected - a short description of the content is necessary in order to guide |
| 18041 | 7 | 8 | 4 | 8 | 10 | Needs reformulation | Accepted - text revised. |
| 6168 | 7 | 8 | 4 | 8 | 40 | Sentence structure like this is acceptable in the context of an introduction. However, the length of this paragraph and its repetition makes it ineffective. Consider splitting it up at the very least, preferably rewriting it entirely. | Accepted - text revised and shortened. |
| 17358 | 7 | 8 | 4 | | | what is new and different… | Accepted - text revised. |
| 3773 | 7 | 8 | 4 | 8 | 5 | Improve wording. | Accepted - text revised. |
| 5148 | 7 | 8 | 4 | | 4 | unclear sentence | Noted - please clarify what is wrong? |
| 11913 | 7 | 8 | 4 | | | should be …what "is" new… | Accepted - text revised. |
| 16032 | 7 | 8 | 4 | 8 | 40 | Not necessary | Rejected - a guidance for the reader is necessary. However, the text has been |
| 4806 | 7 | 8 | 41 | 8 | 50 | Use past tense for the summary of AR4 | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18190 | 7 | 8 | 42 | | 48 | Add to paragraph: 4AR concluded that the world is not yet on a course to achieve a sustainable energy future. Mitigation has therefore become even more challenging. Decisions taken today that support the deployment of long lasting carbon-emitting technologies could have profound effects on GHG emissions for the next several decades. Without the near-term introduction of supportive and effective policies taken by governments, the global energy supply will continue to be dominated by predatory extractive methods for energy production, increasing environmental degradation and social inequality. By fossil fuels for several decades and total greenhouse gas (GHG) emissions arising from the global energy supply sector continue to increase. Comment: Government policies should not only refer to the support and promotion of low-carbon technologies for energy supply, but policies to reduce energy demand in itself is an urgent need, especially in terms of per capita consumption. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18191 | 7 | 8 | 42 | | 48 | Alternative paragraph: 4AR concluded that the world is not yet on a course to achieve a sustainable energy future. Mitigation has therefore become even more challenging. Decisions taken today that support the deployment of long lasting carbon-emitting technologies could have profound effects on GHG emissions for the next several decades. Without effective policies by governments, the global energy supply will continue to be dominated by fossil fuels for several decades and total greenhouse gas (GHG) emissions arising from the global energy supply sector continue to increase. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 2257 | 7 | 8 | 42 | 8 | 42 | Sustaiainability is impossible. There are only two directions, forward and backward. You seem to choose backward | Taken into account - comment is obsolete. Overview of AR4 was deleted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6169 | 7 | 8 | 42 | 9 | 25 | It is unclear how this section is a summary of AR4. Claims like “no single policy instrument will ensure the desired transition to a future secure and decarbonized world” are uncontroversial and read like meaningless platitudes. Suggest that this entire section be cut, and bring up AR4 when current conclusions are significantly different. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 3775 | 7 | 8 | 42 | 8 | 42 | Replace "4AR" by "AR4". | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 15287 | 7 | 8 | 42 | 8 | 42 | "4AR" to be "AR4" | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18192 | 7 | 8 | 49 | | 50 | Add to paragraph: The wide range of energy sources and carriers that provide energy services need to offer energy access for all, long-term energy security, be affordable and have minimal impact on climate and the environment. To reduce the resultant GHG emissions will require a transition to zero and low-carbon technologies. This transition has begun and there is large mitigation potential available for increased deployment at costs below 20 US$/tCO2. Environment as a whole, on the way to hybrid energy systems. This includes reduction of GHG emissions and the deployment of low-carbon technologies, considering that there is yet large mitigation potential available at costs below 20 US$/tCO2. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18193 | 7 | 8 | 49 | | 50 | Alternative paragraph: The wide range of energy sources and carriers that provide energy services need to offer energy access for all, long-term energy security, be affordable and have minimal impact on environment as a whole, on the way to hybrid energy systems. This includes reduction of GHG emissions and the deployment of low-carbon technologies, considering that there is yet large mitigation potential available at costs below 20 US$/tCO2. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 13287 | 7 | 8 | 5 | 8 | 5 | The words 'pre sets' here is a typo - presumably should be replaced with 'presents a' | Accepted - text revised. |
| 4100 | 7 | 8 | 50 | 8 | 50 | Not just 'long-term energy security'. The problems arising from intermittency, especially of wind power, should be specifically acknowledged. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 9590 | 7 | 8 | 41 | 9 | 25 | Please, delete here. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 11914 | 7 | 8 | 41 | | | Question the need for this entire section. Should best be covered in Chapter 1 along with general summary review of everything | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18499 | 7 | 8 | 41 | | | Please cite the AR4 directly including references to the particular AR4 chapters, and be very careful with paraphrasing (which has the potential to be politically problematic). | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18500 | 7 | 8 | 41 | | | The text in this section doesn't seem to focus on the findings of the AR4 energy chapter. A reader would expect a brief summary of the main AR4 energy chapter findings, as well as the differences in this AR5 chapter, and a guidance to the AR5 sections in which a discussion of those innovations/updated results can be found. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 6546 | 7 | 8 | 42 | | | Indicate which part of "4AR concluded that the world is not yet on a course to achieve a sustainable energy future." | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 10279 | 7 | 80 | | 80 | | Good figure. | Noted |
| 9482 | 7 | 80 | | | | Figure 7.25 should be left in this report, as it is a correct estimation that limiting CO2 emissions will increase share of electricity. | Accepted |
| 4463 | 7 | 80 | | 80 | | This figure is missing a legend for the bars. | Accepted: we added definitions of the categories in the introduction to section |
| 6762 | 7 | 80 | | | | Good figure. It's very important. | Noted |
| 3805 | 7 | 80 | | | | Add explanation about C4, C3, C2, and C1. | Noted |
| 10575 | 7 | 80 | | | | Define C1 to C5 as a caption footnote eg: "Categories CI to C5 are defined in Fig. 7.21." Consider whether graphs relating to electricity in transport fit in this chapter. My view is that they don't and should go to Chapter 8. But if stay, then at least give a cross reference to Ch 8. Can a breakdown be made of "other non-transport" into buildings and industry. Then these can go to Chapters 9 and 10. No rference given, or in text other than "Mitigation studies show....." Which studies? | Agreed. The figures for transport should be deleted, as similar analysis was added to Chapter 8 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10007 | 7 | 80 | | | | This figure should be kept in SOD. The result indicates that the rate of electrification becomes higher, as the CO2 concentration is constrained strictly. This means that it is important to make electrification rate higher for energy system in order to reduce CO2 emission. | Accepted: We agree that power generation plays a central role in cost-effective emissions mitigation. That is the point of this whole section. We have |
| 9513 | 7 | 80 | 11 | 80 | 17 | Good figure. Share of electricity is important factor in emission reduction. | Noted |
| 6703 | 7 | 80 | 13 | | | Good figure. | Noted |
| 11954 | 7 | 80 | 13 | | | Question - How much of this is new and not in Chapter 6? Make it clear. | Noted: We have coordinated with Chapter 6 to insure that we do not |
| 9481 | 7 | 80 | 6 | 80 | 9 | Suitable sites for renewable energy or CCS are eccentrically-located and installation of them requires great cost. It should be added that there are difficulties to make world's average emission factor of electricity to zero. | Rejected: Aggregate costs are discussed in Chapter 6. Specific technology costs are discussed elsewhere in the chapter. Whether or not costs are "great" or not is a judgement. IAMs deploy every technology up to the point at which its |
| 18106 | 7 | 81 | | 81 | | Clarify how "low-carbon" is defined in the table. Even more helpful would be of the bars were divided into the various low-carbon technologies, e.g. Nuclear and renewables | Accepted: Definition has been added. The split into low carbon options is provided in another figure in the same |
| 10576 | 7 | 81 | | | | No reference given for the figure 7.26 or in text other than "Mitigation studies indicate that...." | The figure summarises results from the AR5 database. Reference is added. |
| 9618 | 7 | 81 | 7 | 83 | 3 | Please, move here to chapter 6. | The chapter authors are coordinating |
| 6560 | 7 | 81 | 9 | | 10 | Replace "stable concentrations of CO2 ultimately require emissions to decline to zero" with e.g. "stable concentrations of CO2 require CO2 emissions to peak and then gradually approach zero over more than 1000 years" according to Kheshigi et. al (2005) to make it clear, as the other discussion here is only dealing with issues in this century. | Accepted: This text has been edited to be clearer. |
| 16876 | 7 | 83 | 16 | | 26 | Very important point here that if the policies are limited to only advance renewables to lower emissions the cost is much higher than if all technologies are used. This point is buried in the middle of the paragraph and should be moved to front as key point or to the end as a summary statement. In the middle it gets lost. The point is not widely understood and there are many stakeholders who push the alternative view that policy should be only renewables -- the misunderstanding will delay achievement of an agreement and, if we are in a renewables only world, it is possible the rising costs will cause the policy to unravel later. | Taken into account - this important aspect is part of the Chapter 6 discussions. |
| 11955 | 7 | 83 | 2 | | | Consider just showing the figure on the right. The one on the left really adds nothing to the discussion. | Taken into account - comment is obsolete. Figure was removed. |
| 15371 | 7 | 83 | 8 | | | Reference missing ( Luckow, 2012) | Accepted. |
| 10060 | 7 | 83 | 16 | 84 | 3 | Request to delete the entire section about the Luckow et al paper, as it is misleading and biased. Neither the assumption nor the methodology are transparent, therefore the results of this paper shown in figure 7.29 can not be reproduced. A large number of energy modells indicate, that renewable energy systems are cost efficiency by an order of magnitude as opposed to fossil fuel energy systems, especially put 2050. This section is must be seriously rewrited with more and balance informations. | Accepted - Luckow (2012) should be replaced with a citation to Edmonds, J., Luckow, P., Calvin, C., Wise, M., Dooley, J., Kyle, G., Kim, S., Patel, P., Clarke, L., 2012. Can Radiative Forcing Be Limited to 2.6 W/m2 at the end of |
| 4464 | 7 | 84 | | 84 | | This figure should be redrawn so that the two series in the top plot are joined to their counterparts in the bottom. That is, it should be explicit that both graphs share the same x-axis, even if the break in y-axis is emphasized to give resolution to the other series. | Taken into account - comment is obsolete. Figure was removed. |
| 14548 | 7 | 84 | | | | The figure needs more explanation. | Taken into account - comment is obsolete. Figure was removed. |
| 16878 | 7 | 84 | | | | Very good. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18645 | 7 | 84 | | | | Page 84: The discussion on investment needs due to stabilization/mitigation should be related to the needs to invest in the energy system due to other reasons to be meaningful. | Rejected. The discussion of investments focuses here on climate mitigation. Chapter 16 has additional and more |
| 16877 | 7 | 84 | 13 | | | Suggest addition of the following at end of paragraph: "This implies that pushing the system transition too rapidly via other policy instruments risks substantial short term costs increases which could undermine political support for the policy. This in turn increases the risks of policy reversal, making investors less confident in deploying technologies which require a longer timeframe to earn a return." | Rejected - we recognize that this point might be valid. But the answer is better placed in the policy and framing chapters. |
| 11956 | 7 | 84 | 2 | | | Is this figure from Luckow? If so, needs reference. | Accepted. Citation was updated |
| 6561 | 7 | 84 | 18 | | 19 | Firstly, give a reference paper for "The present investment [...] stabilization of GHG". Secondly, specify the level of "stabilization of GHGs" intended ( Category 1?). | Accepted. Reference added, and stabilization level clarified (cat 1) |
| 10094 | 7 | 85 | | | | annual investment for 2010 is not ine line with the info given on page 65. It is also unlikeley that for renewables and electricity transmission and storage there is the same number over all 41 scenarios. | Noted. The number is correct and had been taken from the source. We will |
| 18107 | 7 | 85 | | | | On renewables: "Regulation, Standards" are "essential", not "complement", according to the definition in the text. On the other hand, "Externality pricing" is "compliment" rather than "Essential" for renewables. For nuclear "carefully designed subsidies" are "essential" rather than "uncertain" to mobilise resources - no nuclear power plant in history has ever been built without subsidies. | noted. The policy information was removed from the table |
| 3806 | 7 | 85 | | | | I have serious concern with the investment cost shown at the Table for Nuclear compared with Renewables. The footnote explanation about what is included in the evaluation is not enough to provide clear information. The Table should be constructed in a way that the reader gets the full information immediately. Thus, what is quoted in footnotes must be part of the Table to avoid incorrect interpretation by readers. | rejected. Footnotes are there to provide details of definitions. The table is transparent as is. |
| 10577 | 7 | 85 | | | | Is Category 1 here the same as Category 1 in Fig. 7.21? Maybe this Table and text should be cross-reference to Fig 7.21 (or even placed in section 7.12.1 and merged to avoid confusion). However, having said that, this chapter does not have a section on policies as do other technical chapters. Should it have? This Table 7.6 does cover policies, but appears to be tacked on almost as an after thought. Should there be a section 7.12.7 on policies? | rejected. We can not change or add sections which have been subject to plenary approval at this stage. The policy discussion was removed, since there is an own chapter focusing on policies |
| 10061 | 7 | 85 | | | | This table has several factuaral errors: While it states GHG pricing is essential for the development of renewables, feed-in tariffs (FIT) are listed under "subsidies". The development of the renewables - especially wind and solar pv are entirely driven by FIT, while emissions trading (e.g. ETS) did not result in an RE market so far. Thus, there is no evidence so far, that GHG pricing will be essential for RE in the future. According to the judgment of the European Court of Justice in March 2001 to the German Renewable Energy law, a FIT is not a subsidy. These factural errors must be corrected in table 7.6. | Noted - the policy section of the table was removed. |
| 12334 | 7 | 85 | 20 | | | This is a useful table. Please consider also to put it at the end of the Executive Summary, as it summarises mitigation options, investments needed and policy mechanisms. | rejected. We removed the policy mechanisms as the issue is better |
| 2975 | 7 | 85 | 21 | | | This table is misleading. It states that for the promotion of renewables GHG pricing is key to rapid development, while feed-in tariff and tax credits for R&D or production can complement GHG pricing. However, in reality the opposite could be observed. Feed-in tariffs were key for the innovation and development of renewables. See: Tobias S. Schmidt and others, 'The Effects of Climate Policy on the Rate and Direction of Innovation: A Survey of the EU ETS and the Electricity Sector', Environmental Innovation and Societal Transitions, 2 (2012), 23–48 <doi:10.1016/j.eist.2011.12.002>.. | Noted - the policy section of the table has been removed. |
| 9666 | 7 | 86 | | | | The answer given does not really give a clear answer to the question. | Taken into account - the entire paragraph has been rewritten - together |
| 11957 | 7 | 86 | 19 | 86 | 21 | This sentence needs to reference what limited examples exist. | Rejected - the Gaps in knowledge summarizes the lack of information concerning the most important questions. It is a summary of the gaps identified during the writing process of |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11958 | 7 | 86 | 23 | 86 | 24 | What exactly is meant by "integrated decision making support"? Same for "integrated analysis tools". Key word that needs explanation is "integrated". Integrated in what sense? Across disciplines? Policies? Governments? Continents? Regions? | Rejected - Integrated assessments and their usage to support climate policy decision making is a well known concept introduced in chapter 6. It cannot be |
| 10280 | 7 | 86 | 30 | 86 | 45 | FAQ 7.1 will be better to be discussed in Chapter 6. | Taken - into account. The frequently asked question (FAQ) has been reformulated in order to address issues |
| 7747 | 7 | 86 | 30 | 86 | 31 | Please refer to the Kyoto Protocol | Rejected - the FAQ refers to emissions reduction potentials in the future. The AR5 will be published in 2014. The commitment period of the Kyoto Protocol ended in 2012, the Kyoto |
| 2236 | 7 | 86 | 30 | 86 | 30 | This question does not belong here, as it can only be answered by looking at all GHGs and non-GHG climate forcers, and not just one sector in isolation | Taken - into account. The frequently asked question (FAQ) has been reformulated in order to address issues |
| 6462 | 7 | 86 | 30 | 86 | 34 | Copenhagen Accord does not set the 2 degrees goal, but just “recognized the scientific view”. | Taken into account - the Copenhagen Accord has been replaced by the |
| 7748 | 7 | 86 | 32 | 86 | 34 | Please refer to the Kyoto Protocol and not the the Copenhagen Accord. | Taken into account - the FAQ refers to emissions reduction potentials in the future. The AR5 will be published in 2014. The commitment period of the Kyoto Protocol ended in 2012, the Kyoto Protocol therefore is not relevant anymore within the context of future |
| 4659 | 7 | 86 | 9 | 86 | 9 | Gaps in the knowledge. The availability of more accurate data cannot be over emphasized. Good inventory information by area is required if plans and investments are to be made for the development of RE, especially biomass. FAO undertook a survey in Ethiopia in 1996 and determined that there were considerable biomass shortages: large-scale planting programs were recommended. However, a detailed inventory was undertaken in 2003, which showed an overall surplus of annual yield compared to demand. It pinpointed areas of shortage and surplus and recommended exploiting surpluses and planting/improved management etc. in shortage areas. (Openshaw, K. 2010b). Without good data information, much investment could be misdirected. (Openshaw, K. 2012). | Noted. |
| 9619 | 7 | 86 | | | | Please, delete here due to general idea not directly related with chapter 7. | Rejected - comment seems to be misplaced. Please clarify to which part of the text your comment actually refers. |
| 10619 | 7 | 86 | 10 | | | One of the reasons behind gaps in data and information may be the fragmented international regime that deals with energy issues. For example, the International Energy Agency is one of the few international institutions dedicated to energy issues, and yet its membership excludes most of the major fossil fuel producers (e.g., Saudi Arabia) and most of the big emerging consumers (e.g., China, India). See [Colgan, J, T van de Graaf, and R. Keohane. 2012. Punctuated Equilibrium in the Energy Regime Complex. Review of International Organizations. 7(2): 117-143.] | Noted - the section is about gaps, not about the reasons behind them. |
| 18551 | 7 | 86 | 10 | | | Please note that the SRREN also has a comprehensive list of knowledge gaps related to RE (See Ch 1 page 179). These would be useful to incorporate here. | Taken into account - the knowledge gaps have been rewritten by taking into account the information contained in the |
| 6562 | 7 | 86 | 30 | | | Define the meaning of "technically feasible". | Taken into account - as the FAQ has been reformulated, the comment is |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6563 | 7 | 86 | 32 | | 34 | Explain how this sentence is correct or give a reference paper, as Chapter 6 and especially Figure 6.29 shows, depending on the technology availability that is complex and uncertain, considerable number of the models used were not able to achieve 450 ppm stabilization by 2100. | Taken into account - the paragraph has been rewritten in order to avoid any inconsistencies with chapter 6. |
| 6564 | 7 | 86 | 33 | | 34 | Correct the description "the 2 degrees goal of the Copenhagen Accord", as the heads of state, etc. have agreed on the Copenhagen Accord only "recognizing the scientific view that the increase in global temperature should be below 2 degrees Celsius" but not on "the 2 degrees goal". | Taken into account - the Copenhagen Accord has been replaced by the Cancun Agreement. |
| 6202 | 7 | 87 | 1 | 87 | 4 | FAQ 7.2 asks whether "Is there a single best solution to achieve deep emission reductions in the energy sector?" The answer addresses supply-side technologies only., and demand-reducing activities seem to be omitted. Suggest adding a new sentence into line 3: " There are also many activities that can imporove end-use energy efficiency and thereby reduce the demand for energy and the attendant emissions." | Taken - into account. The frequently asked question (FAQ) has been reformulated in order to address issues related to the energy supply sector only. |
| 6704 | 7 | 87 | 11 | 87 | 12 | It should be noticed that in order to reduce GHG emission voluntary approach is effective. Recent studies show that voluntary efforts to reduce SF6 emissions by electric power sector in Japan, which have been successfully carried out and will be a good example to show the effectiveness of gas-by-gas sectoral approaches.<br>Moreover, when introducing climate protection policies, it is necessary to consider energy prices so as not to damage family budget.<br><br>See: Nishimura et al (2008) Mitigation of Non-CO2 Greenhouse Gases., abstract lines 13-15<br>http://criepi.denken.or.jp/jp/kenkikaku/report/detail/Y07012.html | Taken into account- the original FAQ has been reformulated. The comment therefore is obsolete. It is now about barriers and not primarily about necessary policies. |
| 2237 | 7 | 87 | 11 | 87 | 12 | This answer is far too rigid and prescriptive. IPCC usually does not state in that style of "yes/no". Even if I agree that without strong decisive and long-term stable political framework conditions a low-carbon change in the energy sector will very very likely not happen, there may be other strong forces. If we look at the US for example where cheap gas reduces coal power generation at high speed, without policies, just by economics, similar changes could occur as well. So policy will not be the only driver of change as the current answer implies. | Taken into account- the original FAQ has been reformulated. The comment therefore is obsolete. The FAQ is now about barriers and not primarily about necessary policies. |
| 6203 | 7 | 87 | 11 | 87 | 12 | "Without intervention, energy systems way will not show a transition to low GHG concentrations. Specific climate protection policies will be necessary in order to achieve that goal." This is incorrect. In some instances, intervention may help in market transitions. In other case it may not be needed, or even hinder transitions. In the U.S., for example, the shale gas revolution is rapidly lowering the carbon intensity of the electric power sector, all without specific intent to produce a specific GHG profile. | Taken into account - the paragraph has been deleted as a consequence of a reformulation of the FAQ. |
| 13209 | 7 | 87 | 24 | 87 | 24 | Add after renewable "and nuclear" | Taken into account - the paragraph has been deleted as a consequence of a |
| 9483 | 7 | 87 | 9 | 87 | 12 | It should be described that GHG emission reduction in energy sector was implemented by voluntary efforts of companies without introducing polices.<br>It should be added that introducing policies can impact civil life and economic activities by rise in the price of energy, and policies need to be decided in full consideration of such impacts.<br>Nishimura et al [1]. introduces voluntary efforts to reduce SF6 emissions by electric power sector in Japan, which have been successfully carried out and will be a good example to show the effectiveness of gas-by-gas sectoral approaches.<br>[1] Mitigation of Non-CO2 Greenhouse Gases<br>http://criepi.denken.or.jp/jp/kenkikaku/report/detail/Y07012.html<br>[1]abstract lines 13-15 | Taken into account- the original FAQ has been reformulated. The comment therefore is obsolete. The FAQ is now about barriers and not primarily about necessary policies. |
| 5967 | 7 | 87 | 9 | | | The need for financial mechanisms to encourage developing economies implment high capitla cost, low-carbon technologies should also be referenced | Taken into account - text revised. |
| 6565 | 7 | 87 | 23 | | 24 | Firstly, add "and nuclear" after "renewables". Secondly, replace "a phase out of coal use" with e.g. "further emissions reductions from fossil fuel". Thirdly, explain "a smaller energy system" or give an example. | Taken into account - the paragraph has been deleted as a consequence of a |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3077 | 7 | 88 | | | | The paragraph makes strong (and good) statements where bioenergy has or will work and where it does not. I would be worthwhile backing these up by references. | The statements are quite general and are supported by the SRREN, which is |
| 18647 | 7 | 88 | | | | Bioenergy annex (page 88) – better to add to the chapter on land use? | A likely way forward. |
| 4660 | 7 | 88 | | 96 | | . Bioenergy annex. General comments.<br>In my opinion, this annex should start off with the existing potential and actual supply of biomass energy. The net primary production [NPP] of terrestrial plants is an estimated 53.2 Gt carbon, which is approximately 2000 EJ (Melillo et al 1993. Global climate change and terrestrial NPP. Nature, vol. 363 1993. Cited in Openshaw, K. 2011b). This is about half the total NPP of about 4000 EJ, the remaining NPP is from plants in oceans and other water bodies. Every year plants capture this atmospheric carbon and every year it is returned to the atmosphere through respiration, rot, burning and wildfires etc. (The carbon cycle). While a little can accumulate in woody biomass, roots of plants and in the soil, most is lost. Thus, the theoretical potential from terrestrial biomass is an estimated 2000 EJ, but using water-based algae to produce energy is now in the experimental stage; this expands the above estimate.<br>Woody biomass has accumulated over the years in closed and open formations and provides an annual yield, some of which is stored, but most of which is lost. I repeat the table that I gave in my review of chapter 11 AFOLU.<br><br>Table 1. Land use for the world 2006: units million hectares and 109 dry tonnes of woody biomass2.<br>World Forest Woodland Arable Grassland1 Desert Built up Arctic<br>14894 4021 1224 1638 4170 1787 298 1788 area<br>100 27 8 11 28 12 2 12 %<br>543.80 450.71 9.28 79.71 0 4.10 0 Growing stock<br>18.35 12.44 0.36 5.33 0 0.22 0 Annual yield<br>Note. 1. Grasslands include wetlands. 2. This is above ground biomass, total biomass is 20-33% more.<br>Annual yield is accessible yield. Total yield is 21.58 x 109 t. Carbon content is 50% of dry wood weight.<br>Net [low heat] energy value of dry wood, with a 1% ash content is taken as 18.7 GJ/tonne.<br>Source. FAO 2009 (State of the world's forests [adjusted]) and search of the WWW. Openshaw, K. 2011.<br><br>Thus, an estimated 18.35 Gt of accessible above-ground woody biomass (343 EJ) could be used every year without reducing the above-ground stock of wood (544 Gt containing more than 10,000 EJ). In contrast, the current consumption of fossil fuels is an estimated 412 EJ (IEA 2011), or 20% more than the annual yield from woody biomass. Of course, other forms of biomass are used for energy, namely crop residues, grass, animal dung, municipal waste, plant oils and grains/sugar to produce ethyl alcohol etc. Also wood and other forms of biomass are used for non-energy purposes. The following is my estimate of the biomass production and its current use.<br><br>Table 2. 2009: Estimated consumption of energy etc. and annual production of some biomass<br>Energy type Energy use EJ Total EJ Annual yield Accessible EJ Total EJ<br>Wood products 43.6 66.01 All woody biomass 343 6152<br>Residues/food 4.5 60.0<br>(food) Residues 89 -100 200 + 603<br>Dung 1.5 Grass/forage 67-70 1404 | See above. |
| 16047 | 7 | 88 | | 96 | | Why this extra anex. I would recommend to write an annex about the Power to Gas-Technology to use the surplus electricity as hydrogen or methan. My oppinion is that this will be much more important for the reduction of GHG emission in future. | Forward this comment to the TSU. |
| 16134 | 7 | 88 | 1 | 96 | 32 | The annex gives key information on potentials for mitigation. But is it not redondant with some parts of the agriculture-forestry chapter? | Moved to Chapter 11 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7483 | 7 | 88 | 1 | 96 | 32 | Bioenergy annex. – general comments.<br>In my opinion, this annex should start off with the existing potential and actual supply of biomass energy. The net primary production [NPP] of terrestrial plants is an estimated 53.2 Gt carbon, which is approximately 2000 EJ (Melillo et al 1993. Global climate change and terrestrial NPP. Nature, vol. 363 1993. Cited in Openshaw, K. 2011b). This is about half the total NPP of about 4000 EJ, the remaining NPP is from plants in oceans and other water bodies. Every year plants capture this atmospheric carbon and every year it is returned to the atmosphere through respiration, rot, burning and wildfires etc. (The carbon cycle). While a little can accumulate in woody biomass, roots of plants and in the soil, most is lost. Thus, the theoretical potential from terrestrial biomass is an estimated 2000 EJ, but using water-based algae to produce energy is now in the experimental stage; this expands the above estimate.<br>Woody biomass has accumulated over the years in closed and open formations and provides an annual yield, some of which is stored, but most of which is lost. I repeat the table that I gave in my review of chapter 11 AFOLU. | This is an interesting perspective, and highly valuable. However, I think it would be deeply misleading to start with these numbers. It suggests a perspective where we can start with the theoretical potential and then see how much works. But respiration, rot, burning, wildfires all have their biological and ecosystem function, including water management services for human settlements etc. Too much harm has already been done by single-mindedly focusing on a technology without its context. I think we are much better off starting with the context and that looking with sharp eyes |
| 7484 | 7 | 88 | 1 | 96 | 32 | Table 1. Land use for the world 2006: units million hectares and 109 dry tonnes of woody biomass2.<br>World Forest Woodland Arable Grassland1 Desert Built up Arctic<br>14894 4021 1224 1638 4170 1787 298 1788 area<br>100 27 8 11 28 12 2 12 %<br>543.80 450.71 9.28 79.71 0 4.10 0 Growing stock<br>18.35 12.44 0.36 5.33 0 0.22 0 Annual yield<br>Note. 1. Grasslands include wetlands. 2. This is above ground biomass, total biomass is 20-33% more.<br>Annual yield is accessible yield. Total yield is 21.58 x 109 t. Carbon content is 50% of dry wood weight.<br>Net [low heat] energy value of dry wood, with a 1% ash content is taken as 18.7 GJ/tonne.<br>Source. FAO 2009 (State of the world's forests [adjusted]) and search of the WWW. Openshaw, K. 2011. □ | see above. |
| 7485 | 7 | 88 | 1 | 96 | 32 | Thus, an estimated 18.35 Gt of accessible above-ground woody biomass (343 EJ) could be used every year without reducing the above-ground stock of wood (544 Gt containing more than 10,000 EJ). In contrast, the current consumption of fossil fuels is an estimated 412 EJ (IEA 2011), or 20% more than the annual yield from woody biomass. Of course, other forms of biomass are used for energy, namely crop residues, grass, animal dung, municipal waste, plant oils and grains/sugar to produce ethyl alcohol etc. Also wood and other forms of biomass are used for non-energy purposes. The following is my estimate of the biomass production and its current use. | See above. |
| 7486 | 7 | 88 | 1 | 96 | 32 | Table 2. 2009: Estimated consumption of energy etc. and annual production of some biomass<br>Energy type Energy use EJ Total EJ Annual yield Accessible EJ Total EJ<br>Wood products 43.6 66.01 All woody biomass 343 6152<br>Residues/food 4.5 60.0<br>(food) Residues 89 -100 200 + 603<br>Dung 1.5 Grass/forage 67-70 1404<br>Waste 0.4 Waste products 1-2 5<br>Total 50.0 126.0 500- 515 1020<br>Unaccounted for: 9805<br>Note 1. Includes an estimated 22.4 EJ for non-energy use in 2009. 2. This includes: inaccessible wood biomass; annual growth of roots; tree leaves; and annual plants on forest floor etc. 3. Not all residues are suitable for use. Food includes animal feed. 5. The annual terrestrial NPP is an estimated 2000 EJ. Therefore, 980 EJ has to be accounted for. It may cover all the 5 groups mentioned in the table. Thus, more NPP may be available for use. | See above. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7487 | 7 | 88 | 1 | 96 | 32 | The accessible annual NPP is an estimated 500-515 EJ, but these may be minimum figures because some of the unaccounted for NPP may be accessible and useable. This highlights the urgent need for good biomass inventories. However, it also highlights the fact that much more existing NPP could be used for renewable energy purposes, rather than assuming that all additional biomass initiatives have to come from 'new' biomass schemes: this is what the present chapter conveys. | I think here could be a strong point: we need to look sharper at the exisiting resources for bioenergy. |
| 11959 | 7 | 88 | 1 | | | This is a very interesting section. I would question whether it belongs here or in another Chapter. In this Chapter it appears to give added weight to renewable energy. There is already a preponderance discussion on renewables which raises the wuestion of balance. Decision for the TSU but at written, Chapter 7 could easily be interpreted as arguing for massive substitution of existing energy sources with renewables. CCS is given lip service. In reality the scenarios discussion, which is excellent, and Chapter 6, cover the possibilities rather well. Consider conbining and reducing text. | Likely to be moved to Chapter 11. |
| 3076 | 7 | 88 | 15 | | | Why especially starch crops? (This seems like a US perspective)<br>How about oil crops? The latter is very important in the EU (rapeseed), Asian (palm), and South American (Soya) context. | Agreed. For space reasons we don't refer to any specific crops anymore. |
| 12158 | 7 | 88 | 23 | 25 | | Its necessary to include also "policy incentives". So, my suggestion is to use..."But policy incentives, advanced technologies and management practices,...". | Is inserted as suggested. |
| 3075 | 7 | 88 | 8 | 88 | 14 | Focuses on the importance of land management (largely); this is linked to more factors, e.g. institutional framework and governance. I suggest to explicitly make this link. | Considered. One specific sentence on land use (on sugar cane) has been deleted. Instead the following sentence has been inserted: "Success and failure of bioenergy deployment crucially hinges |
| 5742 | 7 | 88 | | | | When dealing with bioenergy (this comment applies actually to the whole report) there is a lot of work done by the FAO that should be considered. For example, regarding bioenergy iLUC I would suggest to add references to the fact that it is possible tackling this issue through certification and the need for other policy mechanisms, e.g. refer to the RSB/WWF/Ecofys work on low indirect effects certification:<br>http://rsb.epfl.ch/files/content/sites/rsb2/files/Biofuels/Working%20Groups/II%20EG/Low%20Indirect%20Impact%20Biofuels%20Certification%20Module%20-%20Field%20testing%20version%20-%20July%202011.pdf<br>http://rsb.epfl.ch/files/content/sites/rsb2/files/Biofuels/Working%20Groups/II%20EG/RSB%20IIEG%20-%20Certification%20Module%20for%20Low%20Indirect%20Impact%20Biofuels_20110907.pdf<br><br>This builds on the earlier responsible cultivation approach work, which may also be useful info:<br>http://www.ecofys.com/files/files/ecofysrcamethodologyv1.0.pdf.<br><br>More generally on ILUC, the Ecofys report prepared for GBEP is relevant:<br>http://www.globalbioenergy.org/bioenergyinfo/bioenergy-and-sustainability/detail/en/news/81766/icode/<br><br>There is also good work from Winrock, including:<br>http://www.globalbioenergy.org/bioenergyinfo/bioenergy-and-sustainability/detail/en/news/82038/icode/<br><br>There are also many more, including on ILUC but also other sustainability issues of relevance to the EST report:<br>http://www.winrock.org/clean_energy/publications.asp?BU=9054#s600. | Refer to ILUC policies (certification) in a paragraph in the last section. Cite FAO, prefer peer-reviewed literature when possible. It's difficult for product-oriented certifications to address the macro effect of ILUC adequately . The only product-level certification that seems to address ILUC is the idea of "responsible cultivation areas" in which output of prior services is maintained, but this doesn't conflates the decision to intensify with the decision to produce biofuels. Once intensification is achieved, food could also be planted... |
| 4661 | 7 | 89 | | 89 | | Merge 'traditional' and 'modern' biomass under one heading 'unprocessed biomass'. Exclude charcoal from this heading. It is processed biomass as is biogas, producer gas/water gas (gengas) and liquid products. | Good suggestion. See my suggestion. I prefer linking to GBEP and to whether the biomass is renewable or not. If you leave the two together, you lose the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7085 | 7 | 89 | 17 | 89 | 29 | The discussion is missing an important overall point regarding the long-term benefits of biomass-based systems based on sustainable forest management principles. It is suggested that at this point in the text, the key finding from the Fourth Assessment Report be repeated - i.e. "In the long term, sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual yield of timber, fibre, or energy from the forest, will generate the largest sustained mitigation benefit". (Fourth Assessment Report, Report of WGIII, Executive Summary) | This section is on climate effects, not an integrated assessment statement that concludes. |
| 4662 | 7 | 89 | 17 | 89 | 17 | Stock dynamics. This whole paragraph is very misleading For example: “taking biomass out of forests, includes non-negligible stock dynamics ---“. While this may affect individual areas, for the tree population as a whole, it is neutral if only part or all of the NPP is removed. Also, there are many trees outside the forest, which are generally intensively managed and used. | This is a strong statement that we can only consider with supporting literature. RICH: if the ecosystem is approximately in equilibrium including the NPP, how does it remain so if a substantial fraction of NPP is removed? Ecosystems also accumulate C in deadwood, litter, and soil over time. Removing BAU NPP reduces the source for these pools. The only "free lunch" I see is to remove biomass that would otherwise decay quickly. Anders: Please note that the |
| 3079 | 7 | 89 | 17ff | | | Include Earles et al 2012, Nature Clim Change, to account also for C changes/fluxes of post use (forest C) | Sounds reasonable. Need to read that paper. RICH: Good point. The Earles paper is very good. Distinction between forest products use in developed vs |
| 3080 | 7 | 89 | 18 | 89 | 20 | Make clear that this is true for the outtake of any biomass, living or dead, not only for energy. Regular timber harvest creates carbon debts much "deeper" than bioenergy. This is why we need a correct baseline and a focus on residue material from such operations. | Good point. A comment has been inserted to reflect this. |
| 4663 | 7 | 89 | 18 | 89 | 20 | “The increased outtake for bioenergy purposes causes a period of increased CO2 emissions [and] carbon debt compared to leaving the forest standing and using fossil fuels ---“. This only occurs if the annual tree growth is exceeded or when there is a change of land use from forests to non-forests. Therefore, this statement should be modified. | I think the models of carbon stock dynamics take the annual tree growth into account. RICH: yes, see above. Anders: Also see above. Marginal vs average perspective. In Norway the annual sequestration of forest far exceed any bioenergy emission scenarios, but the marginal emission balance can be |
| 12914 | 7 | 89 | 24 | 89 | 24 | Could add reference (Zetterberg, L. Instruments for Reaching Climate Objectives – Focusing on the time aspects of Bioenergy and Allocation Rules in the European Union’s Emission Trading System. Ph.D. thesis, department of Earth Sciences, University of Gothenburg, 2011. SE-405 30 Gothenburg. Also available at http://gupea.ub.gu.se/handle/2077/26672. ISBN 978-91-628-8368-3) | What is the additional value of this? |
| 10754 | 7 | 89 | 31 | 89 | 31 | Change "… generally may be…" to "…is usually…." ? | Considered as suggested. |
| 2589 | 7 | 89 | 4 | 89 | 7 | Biomass production from aquatic algae is gaining interest from commercial and R&D institutions | Agreed, but that would be the wrong place to address this. Needs to go into |
| 3078 | 7 | 89 | 8 | 89 | 16 | This should be termed "carbon" neutrality (see e.g. Johnson 2009). Paragraph needs revision as the main message is blurry. E.g. the Creutzig et al. Assessment is value and appreciated but should be put in an extra sentence to avoid confusing the two phenomena that (1) biomass was considered carbon neutral in policy; and (2) in climate and economic models assessing policy choices. There are many more (recent) studies which address the full carbon aspect of bioenergy other than Hillier et al 2009; e.g. Mitchell et al 2012 and Hudiburg et al. 2011 | This paragraph focuses on climate and economic models not on policies. So I don't see any reason for confusion here. Also it should be climate neutrality, not carbon neutrality, because albedo effects are not related to carbon cycles. Citing good studies can be improved, yes. |

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| 6224 | 7 | 9 | 1 | 9 | 3 | This statement requires expansion and justification. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 16094 | 7 | 9 | 10 | | | Use of the word "recycling" to describe chemical reprocessing of nuclear waste is problematic. In France, the only country in the world to have the full cycle of reprocessing, actual use of waste materials amountis to only a few percentage points according to NGOs, and 12% according to the official Haut Comité à la Transparence et à l'Information sur la Sureté Nucléaire (http://hctsin.fr) in a 2010 report. It is a far cry from the 96% claimed by the French firm AREVA. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18196 | 7 | 9 | 11 | | 15 | Add to paragraph: Renewable energy sources provide currently small a growing contribution to global heat and electricity supply, and but are the most rapidly increasing. Costs, as well as social and environmental barriers, are restricting this growth. Smaller-scale, distributed energy plants using local energy resources and low or zero-carbon emitting technologies, can give added reliability, be built more quickly and be efficient by utilizing both heat and power outputs locally. defined by traditional energy accountability methods , as well as social and institutional barriers, are yet restricting the widespread use of renewable energies, which depends more on the internalization of “externalities” , than on other well known factors. Comments (accountabiity methods): The energy accounting was created to be used with conventional sources and adapted to their characteristics and not to the traits of renewable energies (RE), which require the consistent use of life cycle costs, the practical recognition of their potential continuous availability (which contrasts with the exhaustible fossil fuel reserves) and other specific methods. Comments (externalities): Meaning the specific value of RE from an environmental, land use and social standpoint, usually called “externalities” with respect to the energy process. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18197 | 7 | 9 | 11 | | 15 | Alternative paragraph: Renewable energy sources provide currently a growing contribution to global heat and electricity supply, and are the most rapidly increasing. Costs, defined by traditional energy accountability methods, as well as social and institutional barriers, are yet restricting the widespread use of renewable energies, which depends more on the internalization of “externalities”, than on other well known factors. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 9631 | 7 | 9 | 11 | 9 | 12 | Was RE the most rapidly increasing energy source when AR4 was written? | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18043 | 7 | 9 | 11 | 9 | 12 | The term "small" is misleading, not to say incorrect, and in contradiction with the findings in the following pages. According to table 7.1 page 12, renewables is 13.3% of primary energy consumption; nuclear is 2% and gas 21.5%.<br>In terms of electricity supply, renewables is 19.5%; gas is 13.5%; nuclear is around 14%. It would be difficult to argue that renewbles provide a "small" contribution, relative to other technologies. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 6172 | 7 | 9 | 11 | 9 | 12 | "Renewable energy sources … are the most rapidly increasing" is ambiguous. As presented here, it sounds as though the increase is referring to an increase in MW capacity. However, more likely it is referring to the percentage increase, where the capacity additions for renewables is applied to a much smaller base. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 17360 | 7 | 9 | 11 | | | currently a small contribution… | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 15941 | 7 | 9 | 11 | 9 | 11 | is 20% of global electricity supply (from renewables) 'small'? | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 2582 | 7 | 9 | 12 | 9 | 12 | Renewable energy cost effective compared to conventional (except energy from coal). In many countries electricity from wind energy is far below grid parity. Electricity from Photovoltaic reached in few countries the grid parity. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6795 | 7 | 9 | 13 | 9 | 15 | "Smaller-scale, distributed energy plants using local energy resources and low or zero-carbon emitting technologies, can give added reliability, be built more quickly and be efficient by utilizing both heat and power outputs locally." In reviewing the special report on renewable energy I cited what I felt was a bias towards distributed generation as opposed to central generation, and I fear there may be a similar bias here. We need both distributed and central generation from carbon-free sources to have any chance of significantly addressing the climate change problem. Each of these has advantages and disadvantages. As just one example, nuclear plants can provide baseload power and directly replace coal plants. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 16779 | 7 | 9 | 14 | | | suggest insert after "zero-carbon emitting technologies" the following "frequently are disadvantaged from economies of scale impacts." | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 16780 | 7 | 9 | 14 | | | suggest insert after "can give added reliability" the following: "when integrated with existing energy systems." This is the context w/in which I most frequently encounter this claim -- few claim that reliability is enhanced by being off grid nor are there studies that I know of that have proven this point. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18198 | 7 | 9 | 16 | | 25 | Add to paragraph: No single policy instrument will ensure the desired transition to a future secure and decarbonized safe, fair and balanced world. Policies will need to be regionally specific and both energy and non-energy co-benefits as well as social acceptance and technological risks should be taken into account based on sound science and economic analysis. Energy sector reform is critical to sustainable energy development and includes reviewing and reforming subsidies, establishing credible regulatory frameworks, developing policy environments through regulatory interventions, and creating market-based approaches such as emissions trading on the real value of natural resourses For developing countries, particularly oil importing countries, lack of security and higher world-energy prices constrain endeavors to accelerate access to modern energy services that would help to decrease poverty, improve health, increase productivity, enhance competition in the frame of human solidarity and integration and thus improve their economies. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18199 | 7 | 9 | 16 | | 25 | Alternative paragraph: No single policy instrument will ensure the desired transition safe, fair and balanced world. Policies will need to be regionally specific and both energy and non-energy co-benefits as well as social acceptance and technological risks should be taken into account based on sound science and economic analysis. Energy sector reform is critical to sustainable energy development and includes reviewing and reforming subsidies, establishing credible regulatory frameworks, developing policy environments through regulatory interventions, and creating market-based on approaches to the real value of natural resources for developing countries, particularly oil importing countries, lack of security and higher world-energy prices constrain endeavors to accelerate access to modern energy services that would help to decrease poverty, improve health, increase productivity, enhance competition in the frame of human solidarity and integration and thus improve their economies. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 5150 | 7 | 9 | 16 | | 17 | As long as the heavens are free for all to put ghg in we will have a "tragdy of the commons"-situation - setting a price on carbon or ghg emissions may be a "silverr bullit" - or so many insitutions of the world indicate - the sentence here seems to omit the main problem, that emissions is more or less "free" | Taken into account - comment is obsolete. Overview of AR4 was deleted. |

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| 6695 | 7 | 9 | 19 | 9 | 22 | It should be noticed that voluntary approaches are indispensable for energy sector reform rather than regulary inteventions and creating market based approaches.<br>Recent studies show that the Japanese steel industry responded to the Kyoto target by launching a voluntary action plan in 1996 a year prior to the adoption of the Kyoto Protocol with challenging quantitative target: 10% reduction of energy consumption in 2010 compared to 1990. Since then, the steel industry has made stead progress toward achieving these goals. As a result, the energy consumption in 2008 was 11.5% less in comparison to the 1990 level (equivalent to 12.1% reduction in CO2 emissions).<br><br>See: Teruo Okazaki, Mitsutsune Yamaguchi (2011)<br>Accelerating the transfer and diffusion of energy saving technologies steel sector experience—Lessons learned<br>Original Research Article<br>Energy Policy, Volume 39, Issue 3, March 2011, Pages 1296-1304<br>http://www.sciencedirect.com/science/article/pii/S0301421510008827 | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 9989 | 7 | 9 | 19 | 9 | 22 | Energy sector reform should include "voluntary target scheme" because there are successful examples of "voluntary target scheme" in the world. Each industry in Japan has voluntary target and the voluntary target scheme has played a big role, as described in (Yamaguchi, 2012, page35 and 154), (Manuel, 2010, page 6 and 13), and (Yamaguchi, 2010, abstract). In addition, there is also a successful example of "voluntary target scheme" in Netherlands, as shown in (Martijin, 2002, page162). These literatures are listed in the No63 line of this table.<br>On the other hand, market-based mechanism such as emission trading has several problems. Volatility of emission permit prices affects volatility of product prices as evidenced by fluctuating price developments in the EU-ETS. Therefore, the market-based policy tools of cap-and-trade cannot provide credible incentives for the technological change, as described in (Montgomery, 2005, abstract) and (Baldursson, 2009, page29). These literatures are listed in the No62 line of this table.<br>In addition, CO2 leakage caused by the implementation of the ETS happened actually through international transfer of industry , as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No50 line of this table. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 9367 | 7 | 9 | 19 | 9 | 22 | It should be deleted because regulatory interventions are not necessarily needed. In Japan the voluntary action policy does work successfully in the industry sector. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 16781 | 7 | 9 | 21 | | | This "creating market-based approaches such as emissions trading" appears almost as an afterthought. Insofar as this is a key point of negotiation for some, could more effort be made to discuss how this impacts or interacts with the energy system, how it is likely to respond? | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 15354 | 7 | 9 | 22 | | | Perhaps it would help to be clear that security being referred to is energy security as can be confused with other forms of security related to e.g. political unrest | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 2256 | 7 | 9 | 22 | 28 | 14 | By far the most useful section of the whole report | Noted. |
| 18044 | 7 | 9 | 22 | 9 | 22 | add "or carbon taxation". In economic terms, an instrument based on quantities (emissions trading) is no more "market-based" than one based on prices (taxation). | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 6173 | 7 | 9 | 28 | | | While the concerns of differing data gathering methodologies are valid, it's strange to bring it up here and not revisit it. Why point it out and then immediately start mixing and matching IEA and DOE sources? Issues like this are best addressed in a methodology section or chapter. | A reference to the Methodological Annex is made where the issue is dealt with. The point is raised here to make readers |
| 18501 | 7 | 9 | 28 | 9 | 28 | What is the IPCC's approach to deal with these different statistical sources? Have we selected one data set to use over the others? If so, why? | This is dealt with in the Methodological Annex. It is specified in the caption to |
| 17206 | 7 | 9 | 29 | | | The numbers are misleadding. Keep to the standard of energy accounting chosen for AR5. | We are assessing the literature. There are different numbers in different sources. And this disagreement |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17747 | 7 | 9 | 3 | | | give a reference for 20US$/ton CO2 | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 5942 | 7 | 9 | 3 | | | The value of $20/t at which a large mitigation potential of low carbon technologies is reported to exits should be qualified to specify whether it applies to variable RE technologies and if so whether it includes the cost of backup | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 2822 | 7 | 9 | 33 | 9 | 35 | Lumping together unconventional fuels with renewables, as in this sentence, is misleading – they do not have the same implications for diversity (or emissions). | The statement is correct. It does not sum them up. It just points on growing |
| 12588 | 7 | 9 | 4 | | | Should it be mentioned that we actually need petroleum products for the production of renewable energy systems? Plastics, rubber etc. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18194 | 7 | 9 | 4 | | 11 | Add to paragraph: Conventional oil reserves will eventually peak, but it is uncertain exactly when and what will be the nature of the transition to alternative liquid fuels. Conventional natural gas reserves are larger by scale, but less evenly un evenly distributed across regions. Unconventional oil and gas resources are abundant, with uncertain future for the scale of their economic development (IEA, 2012). More reliance on coal will demand viable CCS (Comment) technologies if GHG emissions from its use are to be limited. There are many barriers for nuclear energy to contribute more to GHG mitigation: long-term fuel resource constraints without recycling; economics; real costs (Comment) safety; waste management; security; proliferation, and adverse public opinion. Comments (CCS): Some research about Carbon Capture and Use-CCU, have already started. This could be a more practical solution than CCS. Comments (real costs): Including whole decommissioning, decontamination and alternative land-use costs, and also the updated costs of the latest technology and safety. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 18195 | 7 | 9 | 4 | | 11 | Alternative paragraph: Conventional oil reserves will eventually peak, but it is uncertain exactly when and what will be the nature of the transition to alternative fuels. Conventional natural gas reserves are larger by scale, but un evently distributed across regions. Unconventional oil and gas resources are abundant, with uncertain future for the scale of their economic development (IEA, 2012). More reliance on coal will demand viable CCS technologies if GHG emissions from its use are to be limited. There are many barriers for nuclear energy to contribute more to GHG mitigation: long-term fuel resource constraints without recycling; economics; real costs safety; waste management; security; proliferation, and adverse public opinion. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 9630 | 7 | 9 | 4 | 9 | 7 | If this is a summary of AR4, why is IEA, 2012 being referred to? I agree with the statement, but was it the same in AR4? | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 4101 | 7 | 9 | 4 | 9 | 4 | I assume "Recoverable conventional oil reserves … " is meant. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 6170 | 7 | 9 | 4 | 9 | 4 | "Conventional oil reserves will eventually peak …" is a misleading way to begin the paragraph. As much of the subsequent discussion makes clear, unconventional reserves are accounting for an increasingly larger share of total production, in some cases over half. See p. 40, line 30. In this context, talk about "peak production" for a portion of the total production makes no sense, suggesting looming market crises that may or may not emerge. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 16777 | 7 | 9 | 4 | | | Why say "Conventional oil reserves will eventually peak" knowing that many people believe this is true and a harbinger of either salvation (lower emissions) or disaster (run out of oil)? Within this chapter, in section 7.4, there is a discussion that at first seems to indicate we have a peak oil problem, but then completely refutes the point with a very sound discussion of resource economics and the fact there are huge supplies from more costly sources that become attractive to exploit as the lower cost supplies are exhausted and prices increase. Peak oil is only true if confined to discussing particular price ranges, as in "we are likely to run out of oil that is economic to exploit at market prices below $20/barrel". This chapter could be greatly improved if the debate held on the pages was clarified. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 16778 | 7 | 9 | 4 | | | Perhaps you can begin this discussion by simply noting the following: Nearly all energy sources involve constraints or have associated trade-offs. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11916 | 7 | 9 | 40 | | | "to 14%" from what? Say what it was. | Taken into account - comment is obsolete. Underlying text has been |
| 17208 | 7 | 9 | 44 | 10 | 2 | Gas flaring (CO2 and black carbon) and methane emissions, both, from the extraction sector should be noted. The corresponding emissions could be reduced and also produce valuable energy carriers. | This section does not discuss emissions yet. |
| 3776 | 7 | 9 | 6 | 9 | 6 | "but less evenly distributed across regions". Please, clarify the meaning of "less". You refer to "less" than conventional oil reserves? Is this true? | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 6171 | 7 | 9 | 7 | | | This section decribed as a summary of the last AR. How can a source from 2012 be referenced? | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 11761 | 7 | 9 | 8 | 9 | 11 | It seems that AR4 doesn't say such. Since this section is summary of AR4, what doesn't include in the AR4 shouldn't be added. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 9502 | 7 | 9 | 8 | 9 | 12 | Only the disadvantages of nuclear power were summarized from AR4, The text on AR4 chap7 executive summary "Nuclear energy, already at about 7% of total primary energy, could make an increasing contribution to carbon free electricity and heat in the future" should be written on this section. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 6761 | 7 | 9 | 8 | | | It should be described that nuclear energy contributes to economic competitiveness and CO2 emission reduction. Because I refered to IPCC Fourth Assesment Report, Working Group □ Chapter 4,page 269, colum 1, line 28 [ 1].<br><br>[1] http://www.ipcc-wg3.de/publications/assessment-reports/ar4/.files-ar4/Chapter04.pdf | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 11000 | 7 | 9 | 19 | 9 | 22 | It is stated that regulations or market-based approaches such as emission trading is important in energy sector reform, but it should be also noted that there are countries like Japan whose voluntary approaches function effectively. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 11915 | 7 | 9 | 28 | | | Neeed to be careful. Different sources count different things, e.g., lower vs higher heating values, and some don't include traditional biomass, so often these are not uncertainties, just different ways of counting, and even converting. | That is why reference is made to the Methodological Annex. |
| 7117 | 7 | 9 | 28 | | | The sentense lacks clarity | It just says the data from different sources are not strictly comparable. |
| 12319 | 7 | 9 | 26 | | | Please consider to include emission of SF6 from electric transmission systems in this section. The other parts of this section could be shorter. Maybe some of the details could be moved to an appendix or just shown in graphs/figures. | Rejected - This section is not on emissions, but on energy use. |
| 7019 | 7 | 9 of 135 | 12 | 9 of 135 | 12 | Add "without externalities" after the word "Costs", at the beginning of the final part of line12, because if externalities would be taken into account, the result would be very different. | Taken into account - comment is obsolete. Overview of AR4 was deleted. |
| 10755 | 7 | 90 | 1 | 90 | 8 | It could be mentioned what the response of burning biogenic CO2 is in terms of GTP (i.e. that cooling for a period is calculated). | Don't understand what it means. No problem. The GTP is a different metric than GWP. This is an important point. What he says is that the instant temperature change profile of biogenic CO2 emissions actually has a period of |
| 4665 | 7 | 90 | 18 | 90 | 19 | . “Other non-first-generation bioenergy crops such as --- Miscanthus sp. require minimal or zero N fertilization ---“. All non-nitrogen fixing species require N fertilization to maintain productivity, this applies to Miscanthus sp., switch grass, Jatropha sp., oil palm etc. For Miscanthus sp., 70-75 kg/ha of N fertilizer are required to maintain a yield of 14-15 dry tonnes of grass. | This is an important point, we need to look at in more detail. Opinions differ on how much N is required (which is different from how much will be applied if economic). Scown et al 2012, |
| 11376 | 7 | 90 | 23 | 90 | 35 | Natural aerosols from boreal forests should also be mentioned as a potentially important climate forcer (see e.g. Tunved et al. Science 14 April 2006: Vol. 312 no. 5771 pp. 261-263. DOI: 10.1126/science.1123052). The high uncertainties concerning all the geophysical impacts of forests could be emphasized. Besides, when considering the whole bioenergy chain, black carbon originated from biomass combustion must not be forgotten as a factor influencing the surface albedo especially in the arctic. | That is reasonable. We should add one sentence. But we should also note that Organic Carbon co-emitted with BC exerts negative forcing. Unclear how it balances out. Jacobson @ Stanford has |

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| 4666 | 7 | 90 | 33 | 90 | 33 | Line 33. Replace 'slow' by 'long'. | Slow is appropriate here. An alternative is "long rotation period" but that mean to |
| 11380 | 7 | 90 | 33 | 90 | 35 | The question of advantage/disadvantage of short/long rotations is in connection to bioenergy somewhat irrelevant, as industrial wood demand is usually the driver for harvesting. In energy wood harvest there is rather a choice whether in addition to industrial wood harvest to collect the residues (branches, crown, stumps) or not. Thus the relevant question is: what is difference in albedo and carbon balance between the cases of totally cleared harvest site vs. cleared site except that residues are left. | Not sure. What do others say? I read this as a particular case of estimating delta from BAU, which he assumes includes industrial wood harvesting. So the bioenergy case involves only the residues. With that baseline, I agree with him. It will be difficult to squeeze this in, though... It is well understood that industrial wood is the economic driving force for forestry activities today. In situations where no whole stem fractions are used for bioenergy |
| 5237 | 7 | 90 | 35 | | | More site specific information confirming this statement can be found in: LOHILA, A., MINKKINEN, K., LAINE, J., SAVOLAINEN, I., TUOVINEN, J.-P., KORHONEN, L., LAURILA, T., TIETÄVÄINEN, H., LAAKSONEN, A. 2010. Forestation of boreal peatlands – impacts of changing albedo and greenhouse gas fluxes on radiative forcing.. J. Geophys. Res., 115, G04011, doi:10.1029/2010JG001327. | Anders: We can add this reference. |
| 3081 | 7 | 90 | 37 | 90 | 39 | Depends on more than 2 factors: The type of biomass used (green tree vs. harvest residues vs.insect/disease affect trees) (Lamers et al 2012); Prior land use (Fargione et al. 2008; Lapola et al. 2010; Don et al. 2011); Sequestered carbon volume in the soil and plant stock prior to harvest (depending on biome, tree species, forest age structure) (Harmon et al. 1990; Bernier and Paré 2012), in combination with harvesting intensity i.e. outtake/harvest level (Mitchell et al. 2012); Plant (re-) growth rates (influenced by site-productivity and management practices) (Cherubini et al. 2011), and rotation cycles (Mitchell et al. 2012); Carbon dynamics on the site (longer payback for cold climate and coarse material) (Bernier and Paré 2012); Wood use: (1) efficiency of usage and (2) additional emissions for converting biomass into energy and non-energy products, (3) carbon emission rates and efficiency of the respective products replaced (Marland and Marland 1992; Schlamadinger and Marland 1999; Mitchell et al. 2012) | No disagreement, the 2 factors summarize the more detailed list of factors here. Also these detailed list is mostly covered in the previous section. RICH: Agreed. |
| 4667 | 7 | 90 | 38 | 90 | 39 | Most of the wood harvest systems, be they from natural forests, plantations or farm trees etc. will not cause a land use change. New planting may be in degraded areas and therefore, there should be an increase in sequestrated CO2. | Unclear how one can say "most" here. I'd say "some" is more appropriate. In any case what existed before the planation? What replaces the natural |
| 11378 | 7 | 90 | 39 | 90 | 39 | Add sentence to the end: The efficiency of the bioenergy system in displacing emissions compared to the fossil one can be characterized by the so-called displacement factor (Marland and Schlamadinger 1997). | Too technical. |
| 5236 | 7 | 90 | 4 | | | Please, for new information add the references: Pingoud, K., Ekholm, T., Savolainen, I. Global Warming Potential (GWP) factors and warming payback time as climate indicators of forest biomass use". Mitigation and Adaptation of Strategies for Global Change (3 November 2011), pp. 1-18. DOI 10.1007/s11027-011-9331-9 2. Helin, T., Sokka, L., Soimakallio, S., Pingoud, K., Pajula, T. 2012. Approaches for inclusion of forest carbon cycle in life cycle assessment – A review. GCB Bioenergy (in press). | Anders: They are mixing scenario analysis and characterization factor development. Their approach is not consistent with WGI definitins of metrics and their intended applications. |
| 11379 | 7 | 90 | 42 | 90 | 42 | Add sentence after "…markets.". As a consequence of the market or rebound effects the effective displacement factor is lower than the theoretical one. | We need a broader discussion on the rebound effect. Ask TSU where they see |
| 4668 | 7 | 90 | 43 | 90 | 43 | What is LCA? | Noted, consideration under discussion. |

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| 4664 | 7 | 90 | 5 | 90 | 6 | ---"a biogenic CO2 emission pulse generates radiative forcings in timescales equivalent to regrowth periods ---". This is only considering individual trees or individual areas. The dynamics of the whole population in the area have to be considered and therefore, the 'relative forcing' may be negligible or even negative! | This statements assumes that the removal of carbon stock at one place is compensated by increased uptake somewhere else. I cannot follow this logic. This is a classical landscape vs single stand discission. We have a new paper fortcomming bridging this. His take is that the net flux is zero if the |
| 11377 | 7 | 90 | 8 | 90 | 8 | Add sentences: Using GWP or other radiative forcing or temperature based metrics, emission factors for harvest-residue-based bioenergy can be estimated in proportion to the business as usual baseline where residues are left on site (Pingoud et al. 2012). In case the time interval of interest is fixed, the emission factor could basically integrate the climate impact of the dynamic carbon debt and all the non-ghg climate forcers into a single CO2 eq number. Reference: Pingoud, K.; Ekholm, T.; Savolainen, I. 2012. Global warming potential factors and warming payback time as climate indicators of forest biomass use. Mitigation and Adaptation Strategies for Global Change 17: 369–386. Springer. doi-link: 10.1007/s11027-011-9331-9 | That is interesting, can we get this into one single sentence?On the other hand, I am worried that we get too much into detail; we need to shorten rather than getting longer. They are mixing scenario analysis and characterization factor development. Their approach is not consistent with WGI definition of metrics |
| 12915 | 7 | 90 | 8 | 90 | 8 | The establishment of new forest or energy crops on fallow land may both build up new carbon stocks, thus having a negative radiative forcing, and provide bioenergy. | To be integrated, see also AF's comments. Crucial to not ignore informal land rights. depends on land use history. There may not be much soil C seq unless the land was recently cropped. Also, if in the baseline the land would return to production relatively soon, using it for energy crops could be |
| 6922 | 7 | 90 | 23 | 90 | 35 | Ensure consistency and avoid overlap with WGI AR5, Chapters 2/6/8 and the WGI assessment of the physical science basis of changes in land cover etc. on radiative forcing. | could shorten the text and refer to these chapters, but I haven't seen the WGI documents. Do not have latest version, but could not see overlap of concern in a previous version. (Please get hold of |
| 18648 | 7 | 91 | | | | Page 91: A rebound effect of bioenergy on the use of fossil fuels is discussed. The problem is in reality the same for other sorts of renewables, efficiency measures as well as fuel shifts so there is no reason to couple the challenge to biofuels. It just shows that a single policy or action will not handle the problem, that there is a need for policy packages. As indicated there are means to handle rebound effects. | Agreed. it's still not clear to me how taxing in the policy region affects macroeconomic rebound effects. Agree with the comment made. |
| 4669 | 7 | 91 | 1 | 91 | 3 | "Biospheric C losses --- can be in some cases more than 100 times larger than the annual GHG savings ---". These are extreme cases, generally, the GHG savings are much larger, and in most cases substantially larger than the C losses. This statement denigrates tree planting and management. | Literature needed here. |
| 13301 | 7 | 91 | 26 | 91 | 48 | I agree that this section should be moved to somewhere else, and should broaden the rebound effect discussion - in this context, it should also cover the downward pressure on coal prices that would result from mitigation scenarios, in addition to the equivalent situation for oil | If moved somewhere else, we should ensure that fuel market effects are covered, not just efficiency. Agree to move displacement effects out of this |
| 2853 | 7 | 91 | 26 | 91 | 48 | Although I believe the bioenergy annex could be shortened or relocated, the issue of rebounds does, as suggested here, deserve systematic discussion and this should of course include efficiency rebounds. More generally, the impact of all the various options at system level needs consideration. | Agreed about need for system discussion for all mitigation strategies. see above line. |
| 3082 | 7 | 91 | 26 | 91 | 38 | It is fair to point out this discussion, but we should still remain aware of the dimensions. So far modern bioenergy constitutes a marginal fraction as compared to fossil fuel; this is true to liquids compared to oil as well as solids compared to e.g. coal. The economic discussion is therefore largely theoretical. To my knowledge, it has not yet been proven empirically in any study that e.g. wood pellet consumption in the EU has lead to a change in (regional, EU, or even global?!) coal consumption or prices. | Exactly that is the point: If coal consumption etc. doesn't go downward, bioenergy is supplementary not complentary to fossil fuels. yes, see York, 2012 Nat. Clim. Change doi: 10.1038/nclimate1451: The problem is |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3646 | 7 | 91 | 26 | 92 | 4 | Move to Chapter 5.9.2. | Noted, consideration under discussion. |
| 3807 | 7 | 91 | 4 | 91 | 6 | Please, consider reading Pacca and Moreira, 2011 paper. - Pacca, S. and J. R. Moreira, 2011. A Biorefinery for Mobility? Environ Sci Technol. 2011 Nov 15;45(22):9498-505. | Noted, consideration under discussion. |
| 17380 | 7 | 91 | 48 | | | be avoided by cap… | Is related to the rebound thing. |
| 4670 | 7 | 92 | 10 | 92 | 10 | "Around 2.7 billon people relied on [traditional] biomass in 2008". This figure is an underestimate, even for household cooking. Wood and other forms of [traditional] biomass are used for heating, especially in northern latitudes. It is also used by the service sector and formal and informal industries for cooking, warming and to provide process heat, especially in developing countries. | Of no help, if no better literature is provided. |
| 4671 | 7 | 92 | 15 | 92 | 16 | '--- reducing both black carbon and CO2 emissions by 60% ---." The main causes of black carbon are: wild fires and emissions from vehicles. I agree that improved biomass devices should be a major push to improve the health of the users and reduce energy consumption for particular tasks. But, clearing the forest floor of debris and using it for energy may prevent many wild fires and provide a useful raw material. Also, black carbon and biochar help to improve the productivity of the land. Soot could be collected from chimneys and spread on the land and it may be cheaper than producing biochar. | Ok. Let's try to integrate this comment, very briefly. |
| 4672 | 7 | 92 | 15 | 92 | 16 | "Co-benefits accrue from improved indoor and local air quality and time savings for those collecting fuelwood, typically women and children ---". Fuelwood is not only collected for own use, but for sale. | Good point. |
| 3808 | 7 | 92 | 16 | 92 | 16 | Please, consider reading Pacca and Moreira, 2011 paper. - Pacca, S. and J. R. Moreira, 2011. A Biorefinery for Mobility? Environ Sci Technol. 2011 Nov 15;45(22):9498-505. | Sounds reasonable. Need to read that paper. |
| 7086 | 7 | 92 | 20 | 92 | 21 | As support for the statement "...the health and environmental gains from collection and proper management through combustion or anaerobic digestion can be significant you could cite Gaudreault ,et. al. (2012). Life cycle greenhouse gas and non-renewable energy benefits of kraft black liquor recovery. Biomass and Bioenergy, http://dx.doi.org/10.1016/j.biombioe.2012.06.027 . | Sounds reasonable. Need to read that paper. |
| 13302 | 7 | 92 | 22 | 92 | 39 | For the long-term (e.g. 2050), given high expected carbon prices and constrained biomass availability, it is useful to frame the argument around where bioenergy should be used in terms of the quantity of abatement derived from using a tonne of biomass in different applications. By doing this one can incorporate bioenergy with CCS into the same analytical framework as uses that simply displace fossil fuel consumption (and also with non-energy uses, such as using wood as a construction material). Using this framework, bio CCS provides greater abatement than most other uses, primarily due to the high carbon content of solid biomass relative to other fuels (e.g. natural gas) - see Chapter 4 of http://www.theccc.org.uk/reports/bioenergy-review for a grey literature version of such analysis | CCS is discussed somewhere else in Ch. 7. Need to refer to this. |
| 10757 | 7 | 92 | 26 | 92 | 26 | What is meant by "… lower GWP effects…" ? This should be reworded. | Specify better. Same as above. |
| 17381 | 7 | 92 | 36 | | | sugar stream goes… | Is corrected. |
| 3013 | 7 | 92 | 36 | | | It is written bioproducuts. Please fix it. | Thanks, Is corrected. |
| 17757 | 7 | 92 | 37 | | | delete the words "Carbon capture and storage (CCS) of" - these do not fit here | I disagree. I think we should add references, though, e.g., doi: Rhodes & |
| 4673 | 7 | 92 | 37 | 92 | 39 | CCS. Surely it may be much cheaper to pursue CCS directly in tree sequestration, rather than by capturing the CO2 emission from bioenergy plants and storing it underground? See my general comments above about CCS. | Reference? |
| 5745 | 7 | 92 | 45 | 92 | 46 | "Aquatic biomass, i.e. microalgae can 46 offer productivity levels above those of terrestrial plants" This statement is not correct according to Prof. Tredici and FAO report on algae-based biofuels 2010, because the photoefficiency seems to be comparable with C4 plants and well watered C4 plants don't produce less biomass than algae. | The suggestion forgets t hat the algae do not have all the vascular tissue for plant support that the C4 plants have. The reference of Ch 2 is sound for this. |

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| 10756 | 7 | 92 | 6 | 92 | 6 | What is meant by "… provide significant GWP benefits,…" ? This should be reworded. | True. The statement is only correct with additional conditionalities that e.g. avoid rebound effects. The thing here is terminology. Jan is a metric guru. GWP is a well defined climate metric. The use of this in some sentences in the |
| 5739 | 7 | 93 | 1 | 93 | 2 | A similar conclusion can be found in the FAO report on Algae-based biofuels - Applications and co-products (http://www.fao.org/docrep/012/i1704e/i1704e00.htm) | Add the reference |
| 4674 | 7 | 93 | 11 | 93 | 11 | "Biofuels include ethanol and biodiesel ---". Methanol should not be neglected, neither should liquid products from gengas. | Ok. |
| 4675 | 7 | 93 | 12 | 93 | 12 | Primary resource management. The most important primary resource management output has been neglected, namely improved tree management and increased use of NPP from existing woody growing stock. | Is covered in the forestry section. |
| 5740 | 7 | 93 | 22 | 93 | 22 | IRENA reports even larger variation from 8 to 400 EJ by 2050. | Noted, consideration under discussion. |
| 4676 | 7 | 93 | 22 | 93 | 22 | "--- with global estimates ranging from 25 to more than 200 EJ/yr in 2050 (Table 1 – Ch 11)". I think this is Table 11.3! However, this table is difficult to follow at present. | Not helpful. What are better references? |
| 17382 | 7 | 93 | 24 | 93 | 25 | (e.g., animal feeding) or if soil… | Is corrected. |
| 3083 | 7 | 93 | 29 | 93 | 37 | Please consider my comment No7: there are many options to create bioenergy benefits from forestry. It depends on the context, i.e. feedstock, alternative land and harvest use, etc. (see No7 for details). | Ok. Let's try to integrate this comment, very briefly. |
| 11381 | 7 | 93 | 29 | 93 | 37 | An extensive list of climate forcers associated with forests should be given. Relevant references needed. | Read his paper, and see. a reasonable point. I emailed Kim to ask for |
| 4677 | 7 | 93 | 31 | 93 | 33 | "Biomass potential estimates range from 0-100 EJ/yr in 2050. Realizing higher-end potentials --- implies increasing the forest output to several times the present global industrial roundwood production ---". Conventionally, roundwood production is divided between 'fuelwood' and 'industrial roundwood'. Fuelwood is the largest percentage. This phrase should be changed to 'global roundwood production'. However, in Table 2 above, the potential accessible wood energy is an estimate 343 EJ/yr, much larger than the maximum of 100 EJ quoted above. Therefore, in my opinion, the potential with increased plantings could be in the range of 250-300 EJ from wood alone. | the 343 EJ/yr estimate, to my best understanding, is a theoretical one, and doesn't respect ecosystem functioning, see above. |
| 5238 | 7 | 93 | 37 | | | Site specific information confirming this statement can be found also in: LOHILA, A., MINKKINEN, K., LAINE, J., SAVOLAINEN, I., TUOVINEN, J.-P., KORHONEN, L., LAURILA, T., TIETÄVÄINEN, H., LAAKSONEN, A. 2010. Forestation of boreal peatlands – impacts of changing albedo and greenhouse gas fluxes on radiative forcing.. J. Geophys. Res., 115, G04011, doi:10.1029/2010JG001327. | Sure, it's a slightly older source still post-AR4. |
| 2590 | 7 | 93 | 38 | 96 | 32 | The text does not consider the new generation of biofuels: its potential in contributing to climate changes adaptation and mitigation. Jatropha as example is promising plant, which can used for oil production, and as well as green barrier against desertification in the arid zone. Many field experiments are prominsing. | More focus on new biofuels, ok. But need references. |
| 17759 | 7 | 94 | | | | This is an extremely important chapter, lots of information in it; but the final end of it is somewhat abrupt | Noted, consideration under discussion. |
| 4678 | 7 | 94 | 14 | 94 | 14 | "---increased production of biofuels will have negative implications on biodiversity" ---. The word will should be changed to may, because biofuels can be made from existing NPP (e.g. wood and residues) by thermal distillation. | Accepted. |
| 4679 | 7 | 94 | 20 | 94 | 22 | This whole paragraph and in fact the whole section on sustainable development is very negative. How can residues be harvested at 'unsustainable levels'? | Residues have their own function in ecosystems. I (Esteve) agree with the reviewer's note. I will bring a more positive tone by highlighting benefits in |
| 17758 | 7 | 94 | 21 | | | change the words "land is converted" to "land is irreversibly converted" | It is not clear that conversion is irreversible. Hence, this adjective should |
| 3809 | 7 | 94 | 33 | 94 | 47 | Only negative impacts of bioenergy are discussed. The text has to be fair. | Very general comment. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7749 | 7 | 94 | 45 | 95 | 2 | I strongly recommend that Brazlian papers on this issue are investigated. Palm oil in Brazil is not produced by large farmers. This is an important production in isolated communities in the Amazon. It has absolutely nothing to do with soybean production. Please, access the issue adequately. | We cannot discuss individual countries. We should have a balanced statement, citing a review paper. |
| 5741 | 7 | 94 | 9 | 94 | 99 | The recently completed Bioenergy and Food Security Criteria and Indicators (BEFSCI) project of the FAO has identified a set of good practices and policy options on sustainable bioenergy production that foster rural development and food security (including agro-forestry practices). (http://www.fao.org/docrep/015/i2596e/i2596e00.pdf but also http://www.fao.org/bioenergy/foodsecurity/befsci/en/ in general) | Read this. |
| 15357 | 7 | 94 | 12 | | | Reference to definitions of food security and food security policies would add more value to this section as this plays a significant role in policy decisions to promote large scale biofuel production | Noted, consideration under discussion. |
| 3810 | 7 | 95 | 11 | 95 | 11 | Replace "desposition" by "participation". | Participation seems to be inappropriate |
| 4681 | 7 | 95 | 17 | 95 | 18 | Again the word 'Traditional' is used. Does this include wood used for heating purposes by households, the service sector and with district heating? Why make the distinction? | See suggestion. Agree with dropping charcoal (the charcoal there was the |
| 3811 | 7 | 95 | 25 | 95 | 25 | Define what "advanced biofuelsl" means. For the USA, first generation ethanol from sugar cane produced in Brazil is known as "advanced ethanol". | agreed that "advanced" needs definition or replacement with more specific terms. |
| 3812 | 7 | 95 | 26 | 95 | 26 | Check figures regarding growth between 2008 and 2012!!! | Noted, consideration under discussion. |
| 7750 | 7 | 95 | 3 | 95 | 7 | It is also not easy to establish a pattern that needs to be reproduced for biodieselproduction for all kinds of oil seeds in all parts of the world and this needs to be addressed. Implementing certification patterns from one country in another one may be extreamly dangerous an inadequate. | Reflect this. Esteve is willing to review the most up-to-date literature on the pros and cons of certification schemes, particularly the experience of soy and oil |
| 4682 | 7 | 95 | 36 | 95 | 37 | "In the absence of growth-enhancing measures, increased biomass extraction reduces forest C stocks". I have tried to demonstrate that the existing accessible NPP, especially from wood is more than the forecasted demand for biomass energy. Therefore, I strongly disagree with the statement that 'increased biomass extraction reduces forest C stock. This only occurs when there is a change of land use. In such circumstances, it is better to salvage this stock, rather than burn it in situ. | Noted, consideration under discussion. |
| 3813 | 7 | 95 | 41 | 95 | 42 | Remove sentence since it is a repetition from above. | The sentence above (the first |
| 3814 | 7 | 95 | 42 | 95 | 44 | Check if the statement is really applicable to degraded lands. Recovery of degraded land is considered as a remarkable achievement, which had not be successful when providing food and feed at competitive cost. | Need to present both sides. |
| 4680 | 7 | 95 | 9 | 95 | 10 | "Altogether, by 2050 global primary bioenergy could contribute 20 to 250 EJ --- and by 2100, 10 to 330 EJ ---". This does not fit with the facts. At present, bioenergy consumption is an estimated 50 EJ (see Table 2 above). Thus, you are predicting that with a 'minimum' bioenergy forecast its consumption could fall to 20 EJ by 2050 and further decline to 10 EJ by 2010. This is extraordinary! What will take its place? Electricity from hydro, solar and wind? What will happen to the NPP? If it is not used, there is a good chance that 'wild fires' will consume some of it and this could seriously affect the habitat for animals, especially humans. On the other hand, the 'maximum' bioenergy forecasts predict that consumption could rise to 250 EJ by 2050 and to 330 EJ by 2100. But these numbers are still less than the accessible NPP 500-515 EJ (Table 2 above). And this does not take into account new investment in biomass planting. The minimum figures do not agree with the figures in the next paragraph (l 16-18). I think the forecasts are neglecting existing net primary production, assuming that future biomass production will come from new biomass production initiatives. I think this section should be amended to take into consideration exiting biomass growth (NPP). | Noted, consideration under discussion. |
| 3815 | 7 | 96 | 16 | 96 | 18 | There are activities being carried out by a large actor in the sugar cane sector in Brazil - ETH Bioenergia involving the use of large degraded areas for sugar cane crop. Please, check the web through the company name plus sugar plus Brazil. | Unfortunately, we don't have the space to discuss specific activities (nor should we cite company websites) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3816 | 7 | 96 | 19 | 96 | 21 | See EPA, 2010 where it is shown that sugar cane plantation in Brazil, responsible for 1/3 of global ethanol production has excellent energy balance and saves more than 60% of the GHGs emissions due fossil fuel replacement. Thus, tour statement is not supported by credible publications. EPA, 2010 - EPA (Environmental Protection Agency). Renewable Fuel Standard Program (RFS2), Regulatory Impact Analysis. Assessment and Standards Division, Office of Transportation and Air Quality. EPA-420-R-10-006, February (2010). | The replacement effect is debatable. As pointed out, this is a more "sceptical" scenario. the EPA analysis is in a projected 2022 world that assume no more burning of sugarcane trash and other arguable assumptions about fossil fuel displacement, and yield growth, and |
| 4683 | 7 | 96 | 21 | 96 | 22 | “For example, unfavorable land-use changes associated with bioenergy development can lead to very high GHG emissions (possibly exceeding 500 Gt [C or CO2?]) Melillo et al 2009 ---“. Of course, if tropical high forests are cut down to grow soy bean or sugar cane for biofuels about 100 to 150 t of carbon will be lost per ha. Assuming that the GHG emissions are Gt C, this means that between 3,333 and 5,000 million ha of tropical high forest will be felled and converted to such crops. The land area of Brazil is 851.2 million ha. Therefore, a country 4 to 6 times the size of Brazil will be converted to biofuel crops if the C emissions are up to 500 Gt C! IF 500 Gt refers to CO2, then the area required would range from 910 to 1,364 million ha, still in excess of the land are of Brazil! It is surprising that Melillo was one of the authors of the above prediction, seeing he estimated that the NPP of land based plants is an estimated 53.2 Gt C, of which 43% is in the tropics (Openshaw, K. 2011b). Incidentally, a book on photosynthesis by Hall and Rao agree with Melillo estimate for NPP. (Hall D.O. & Rao K.K. 1994). Photosynthesis, fifth edition, Cambridge University Press. ISBN 0-521-43622-2). In my opinion, this annex does not take in to consideration existing net primary production. It assumes that existing biomass production is hardly sustainable and that increased bioenergy demand will have to come from additional investment. I have tried to demonstrate that there is a considerable surplus of existing NPP and with simple training, improved management and allowing local people access and control over forests and other lands, much more annual biomass growth could be used sustainable. This should assist in poverty alleviation. | Noted, consideration under discussion. |
| 3817 | 7 | 96 | 26 | 96 | 28 | Remove sentence since it is a repetition. | Noted, consideration under discussion. |
| 6236 | 7 | 97 | | 135 | | the references are almost excklusively friom academic souces with no significant iputs from industry, governments or think-tanks.Publications from the Energy sector MUST be included. | Peer-reviewed literature only in IPCC reports. Gray literature only when |
| 8893 | 8 | | | | | When the authors will develop further this table then they should cover all transport modes | Table will be revised for the Second- |
| 8897 | 8 | | | | | This entire section could be condensed and some more attention on other transport modes besides road is needed plus clearer links with 6.7 | This being worked upon with Ch 6 |
| 8895 | 8 | | | | | How consistent are these scenarios with the transport scenarios from Chapter 6, section 6.7? | This being worked upon with Ch 6 |
| 8896 | 8 | | | | | How consistent are these scenarios with the transport scenarios from Chapter 6, section 6.7? | This being worked upon with Ch 6 |
| 14296 | 8 | | | | | Row 3 - "BFs displacing ... jet fuel", column "long-term possibilities" - correct that aviation is likely to be the most significant transport user of biofuels (given lack of alternatives unlike surface transport). However, "significant adoption around 2020" is probably optimistic given need to develop options to scale. Analysis suggests that biofuels in aviation may become viable in early 2020s, with penetration ramping up through the 2020s and reaching more significant levels in the 2030s. See Committee on Climate Change (2011), "Bionergy Review", Chapter 4, p67 (http://downloads.theccc.org.uk.s3.amazonaws.com/Bioenergy/1463%20CCC_Bioenergy%20review_bookmarked_1.pdf). | Agreed. Changed to 2020 to 2030. Will amend. |
| 14297 | 8 | | | | | Row 10 - "MS by displacing plane trips through fast-rail alternatives", column "long-term possibilities" - only short-medium distance trips suitable is correct and this means that there is limited emissions reduction potential as majority of aviation emissions are from long-haul flights. Reference is Committee on Climate Change (2009), "Meeting the UK aviation target - options for reducing emissions to 2050", Chapter 3 (http://downloads.theccc.org.uk/Aviation%20Report%2009/21667B%20CCC%20Aviation%20AW%20COMP%20v8.pdf) | Disagree. Any savings worth doing. Alternative assesssments in Satler et al. |

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| 14271 | 8 | | | | | For the legend, 'Other' should be renamed as 'International aviation and shipping', and 'Aviation' and 'Navigation' should be renamed as 'Domestic aviation' and 'Domestic shipping' respectively. | Will amend |
| 14272 | 8 | | | | | I think this chart should come before 8.1.1.a and 8.1.1.b. It gives the context of what has been happening to total transport emissions before getting into the regional breakdown. For the legend, 'Other' should be renamed as 'International aviation and shipping', and 'Aviation' and 'Navigation' should be renamed as 'Domestic aviation' and 'Domestic shipping' respectively. | Moved. |
| 11606 | 8 | | | | | Reference? What's MAF? What GHGs are actually included? Before presenting this why not present your decomposition approach first, and then the individual elements? Anyhow I suggest to replace this figure with Ragnhild Bieltvedt Skeie, Jan Fuglestvedt, Terje Berntsen, Marianne Tronstad Lund, Gunnar Myhre, Kristin Rypdal, Global temperature change from the transport sectors: Historical development and future scenarios, Atmospheric Environment, Volume 43, Issue 39, December 2009, Pages 6260-6270, ISSN 1352-2310, 10.1016/j.atmosenv.2009.05.025.<br>This paper is on impacts from transportation, hence much better than just CO2 emissions. | Will be explained. |
| 11610 | 8 | | | | | Replace "structure" by the more usual term "mode" or "modal share" | Mode only a part of structure |
| 11612 | 8 | | | | | Good references for global consumption shares:<br>Jens Borken, Heike Steller, Tamás Merétei, Filip Vanhove: Global and Country Inventory of Road Passenger and Freight Transportation: Fuel Consumption and Emissions of Air Pollutants in Year 2000. Transportation Research Record: Journal of the Transportation Research Board. Volume 2011, 1, 127-136. DOI - 10.3141/2011-14. http://trb.metapress.com/content/X2223425H545K651<br><br>Jens Borken-Kleefeld, Terje Berntsen, and Jan Fuglestvedt: Specific Climate Impact of Passenger and Freight Transport. Environmental Science & Technology 2010 44 (15), 5700-5706 | First is too out-dated. Will check other. Most of this additional literature is relevant and could help us elaborate . Alan: Agreed. The figure for rail freight does look rather low. We will review the available data and amend accordingly |
| 11617 | 8 | | | | | When rail runs on 100% electricity it can go down to 0 g CO2/tkm - ask Swiss and Swedish rail for instance. As this figure does not included SLCF I would replace with references above | ADEME figures for French rail freight, assuming nuclear-powered electrified services, also gives carbon intensity factors close to zero. Whole issue of carbon intensity values for freight |
| 11651 | 8 | | | | | what about freight? | Would like to increase the freight / logistics content. Agree that freight |
| 4341 | 8 | | | | | this table does not include R &D expenditure nor behaviour change for low carbon transport (See Banister, anderton, Bonilla, givoni,Schwanen ( 2011) (Annual Review of Envirionment and Resources, Vol 36, 247-270 | To be amended |
| 6494 | 8 | | | | | Table is not clear in the print quality | Accept - only a draft |
| 9911 | 8 | | | | | For the ecological evaluation of transportation processes see: Edeltraud Guenther, Vera Greschner Farkavcová, (2010) "Decision making for transportation systems as a support for sustainable stewardship: Freight transport process evaluation using the ETIENNE-Tool", Management Research Review, Vol. 33 Iss: 4, pp.317 - 339 | We were not aware of this reference. If it offers important new insights we will consider referring to it. |
| 15345 | 8 | | | | | Overall: I'm afraid I'm not a big fan of the 2nd half of section 8.1.1 since it is generic content, and hard to read. The other sections offer some great details, thoughout, however, and they are valuable. To save space, please strike the 2nd half of 8.1.1 (starting from top of p 10). | Accept - being re-drafted |
| 14772 | 8 | | | | | Sorry, I only had the time to read the chpater until page 25 | Thanks |
| 2780 | 8 | | | | | Replace biofuels by renewable fuels. | Accept |
| 2781 | 8 | | | | | Add renewable fuels in other transport modes (than "heavy trucks/aviation"). E.g. renewable methane and renewable hydrogen are suitable in all transport forms and modes. They do not need to be based on bioenergy (therefore renewable fuels instead of biofuels). | Accept |
| 2763 | 8 | | | | | Potential indicative Technical potential: add RM: 100 % global demand | Numbers will be revised for the Second- |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2764 | 8 | | | | | Potential indicative Technical potential EL: up to 100 % is not possible => change to 30 % (because only rail and urban light vehicles are well suitable, urban buses to some degree and some applications exist in other transport modes, but most of transport energy demand can not be met by electricity) | Numbers will be revised for the Second-order Draft. |
| 2765 | 8 | | | | | Potential illustrative add methane: Pakistan: over 80 % road transport energy use methane (currently natural gas, but RM possible) | Numbers will be revised for the Second-order Draft. |
| 2766 | 8 | | | | | Cost-effectiveness best examples add carbon efficiency RM negative and energy efficiency RM negative | Text will be modified for the Second- |
| 2773 | 8 | | | | | 2. replace CNG and LNG => renewable methane (incl. CBG and LBG) | Agreed. Changed. |
| 4076 | 8 | | | | | Summary of Sustainable Transport Measures… Even at 150% zoom of the page, the table is difficult to read. Delete this table or make this better to read. There is also duplication of this with material from pages 59-61. | Accept - is only a draft |
| 4051 | 8 | | | | | Table 8.6.2 Summary of costs and potentials for the transport sector. Range of potentials are portrayed optimistically as "… up to x% efficiency or emission reduction improvement." | Table will be revised for the Second-order Draft. |
| 4067 | 8 | | | | | Item 6. Modal Shift by cycling and Walking. "Rapid short term growth already happening in many cities." "Some growth [walking]." This may be true in some cities in Europe or North America, but the urban form of many cities and the distances for commuting does not enable this. | Disagree. Always short trips even in dispersed cities. Not just commuting which is 30% of transport task. |
| 4052 | 8 | | | | | Figure 8.2.1. If this figure does not provide realistic projections for current and future emissions, then why include this? There is a significant potential for this to be mis-quoted or used by mistake by future researchers. Perhaps a qualitative comparison, ratios, or a pie-chart adapting the data would be better (Unger et al 2010). | Will check |
| 5329 | 8 | | | | | No discussion of hydrogen fuel cell HDVs. This is the only way to reduce HDV emissions to zero and could be very cost-effective given greater efficiency of fuel cells and high mileage of HDVs. This is a major omission, even if the authors take the view that technical or economic barriers are prohibitive this technology should be discussed. | Well covered in 8.3.2.2 and elsewhere. I agree….especially given cost reductions for fuel cells |
| 17889 | 8 | | | | | 5. In large cities in the WHO European Region, air pollution causes 100 000 premature deaths in adults annually[i]. Of these, several thousand are attributable to transport-related air pollution, particularly in urban areas. Exposure to air pollution leads to an increased risk of cardiopulmonary disease and a reduction in life expectancy of 9 months or more for people living in European cities[ii],[iii]. | Noted. This issue is now covered in more detail in Section 8.7, particularly the table. Further, this is summarized in Table 6.5 in Chapter 6. |
| 17890 | 8 | | | | | 5. The health effects of hazardous noise exposure are considered to be an increasingly important public health problem. About 40% of the population in the EU-15 countries are exposed to road traffic noise with an equivalent sound pressure level exceeding 55 dB(A), and 20% are exposed to levels exceeding 65 dB(A) [iv]. Long-term exposure to noise has been associated with a wide range of adverse effects on human health and well-being. | Noted. This issue is now covered in more detail in Section 8.7, particularly the table. Further, this is summarized in Table 6.5 in Chapter 6. |
| 17891 | 8 | | | | | 5. In the WHO European Region, road traffic deaths and injuries have a heavy public health burden with about 118 000 deaths and about 2.4 million injuries per year. The cost of road traffic injuries to society is estimated to range from 0.4% to 3.1% of a country's gross domestic product.[v],[vi],[vii] | Accept |
| 17892 | 8 | | | | | 5. The increasing dependence on motorized road transport has also indirect effects, notably by reducing the possibilities for active travel. On the other handHowever, there is great potential for active travel in European urban transport systemscities, 50% of trips by car being shorter than 6 km and 30% shorter than 3 km: in European cities, more than 50% of trips by car are shorter than 6 km and 30% shorter than 3 km, distances conveniently covered by cycling or walking, often at comparable speeds[viii]. | Accept |
| 17893 | 8 | | | | | 5. Promoting active travel for everyday transport has been demonstrated to lead to substantial public health gains:. Studies showed that regular commuters who walk or cycle register a reduction of 20-30% of coronary heart and cardiovascular diseases of 20-30%, of 30% of colon cancer of 30% and of almost one third in mortality[ix],[x]. | Accept |
| 17894 | 8 | | | | | 5. A shift to active transport (walking and cycling) and rapid transit/public transport, combined with improved land use, can yield much greater immediate health "co-benefits" compared withthan improving fuel and vehicle efficiency. | Relate to 8.7.1.2. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17895 | 8 | | | | | 5. The key to a successful sustainable transport system lies in combining policies that maximize co-benefits for health through a combination of technical and non-technical measures. Action need to be calibrated at the different levels of application, efficacy and scale that can be local, urban, regional, national and international. For air pollution and climate change, all scales are involved. | Relate to 8.7.1.2. |
| 17896 | 8 | | | | | [i]. The world health report 2002 – Reducing risks, promoting healthy life (2002). World Health Organization, Geneva. http://www.who.int/whr/2002/en (accessed 29 September 2011) | Relate to 8.7.1.2. |
| 17897 | 8 | | | | | [ii]. World Health Organization Regional Office for Europe (2003). Health aspects of air pollution with particulate matter, ozone and nitrogen dioxide: report of a WHO working group, Bonn, Germany, 13–15 January 2003. WHO Regional Office for Europe, Copenhagen. | Relate to 8.7.1.2. |
| 17898 | 8 | | | | | http://www.euro.who.int/__data/assets/pdf_file/0005/112199/E79097.pdf | Relate to 8.7.1.2. |
| 17899 | 8 | | | | | (accessed 29 September 2011) | Relate to 8.7.1.2. |
| 17900 | 8 | | | | | [iii]. World Health Organization Regional Office for Europe / Convention Task Force on the Health Aspects of Air Pollution (2006). Health risks of particulate matter from long-range transboundary air pollution. WHO Regional Office for Europe, Copenhagen. http://www.euro.who.int/document/E88189.pdf (accessed 29 September 2011) | Relate to 8.7.1.2. |
| 17901 | 8 | | | | | [iv]. Berglund B, Lindvall T, Schwela DH, eds. (2000). Guidelines for community noise., World Health Organization, Geneva. | Relate to 8.7.1.2. |
| 17902 | 8 | | | | | http://www.who.int/docstore/peh/noise/guidelines2.html (accessed 29 September 2011) | Relate to 8.7.1.2. |
| 17903 | 8 | | | | | [v]. World Health Organization Regional Office for Europe (2009). European status report on road safety: towards safer roads and healthier transport choices. WHO Regional Office for Europe. Copenhagen. | Relate to 8.7.1.2. |
| 17904 | 8 | | | | | [vi]. Racioppi F et al. (2004). Preventing road traffic injuries: a public health perspective for Europe. WHO Regional Office for Europe, Copenhagen. | Relate to 8.7.1.2. |
| 17905 | 8 | | | | | http://www.euro.who.int/__data/assets/pdf_file/0003/87564/E82659.pdf | Relate to 8.7.1.2. |
| 17906 | 8 | | | | | (accessed 29 September 2011) | Relate to 8.7.1.2. |
| 17907 | 8 | | | | | [vii]. Peden M et al., eds. (2004). World report on road traffic injury prevention. World Health Organization, Geneva. | Relate to 8.7.1.2. |
| 17908 | 8 | | | | | http://www.who.int/violence_injury_prevention/publications/road_traffic/world_report/en/index.html (accessed 29 September 2011) | Relate to 8.7.1.2. |
| 17909 | 8 | | | | | [viii]. European Commission (1999). Cycling: the way ahead for towns and cities. Directorate-General for the Environment, European Commission, Brussels. | Relate to 8.7.1.2. |
| 17910 | 8 | | | | | [ix]. Berlin JA, Colditz GA (1990). A meta-analysis of physical activity in the prevention of coronary heart disease. American Journal of Epidemiology, 132:612–628. | Relate to 8.7.1.2. |
| 17911 | 8 | | | | | [x]. Colditz G.A. et al. (2002) Harvard Report on Cancer Prevention, Volume 5: Fulfilling the potential for cancer prevention: policy approaches. Cancer Causes and Control 13: 199–212. | Relate to 8.7.1.2. |

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| 15741 | 8 | | | | | General remarks on Chapter 8:<br>A complete list of abbreviations is missing (CO2, BEV, LGV, ICE, EV, FCV …)<br>I like the cautious approach of the authors on the mitigation potential of the transport sector in the short-term. (This has also entered the general summarizing chapter on mitigation options: chapter 6, p.60, line 32 and ch.6, p.76, line 8.)<br>I also agree that, as a consequence, CO2-policies should focus on R&D and other preparatory measures for future changes. At the same time, policies should also speed up incremental developments of traditional road engines in order to help curbing the increase of CO2 emissions by the sector.<br>Finally, I also agree with most of the text. It gives a nice overview of the technological and other mitigation options in the transport sector.<br>However, I miss a comprehensive economic perspective. Information about the costs of different mitigation options is sparely given, and a comparison of cost-effectiveness of measures has not been attempted. In my view, this should belong to a WGIII transport chapter (and to all the other sectoral chapters 7 to 12, whereas it seems to be missing everywhere). If no or only a few background studies exist on this topic, the text should try to bridge the gap by at least highlighting the importance of this issue and the need for such studies.<br>This pertains particularly to the intermodal issues: p.30-33 (sections 8.4.2.3 and 8.4.2.4) and p.36 (section 8.6.2). In my opinion, policies aiming at substantial modal shifts (in developed countries) are extremely costly and time consuming compared to policies aiming to reduce the emissions of each mode, particularly the road. The text, in contrast, gives the impression that inducing modal shifts is in general a recommendable policy option. This impression is underpinned by quite extreme numbers on modal shift targets. Particularly the numbers taken from the EU White Paper are completely unrealistic, which is partly acknowledged in the text by the doubtful remarks on the corresponding investment needs (p.32). In fact, it is just as unrealistic as saying that in 2030 a corresponding share of cars will be electrified.<br>A clear distinction should be made between buses and rail, whereas in the text these are often lumped together (especially in the following mistaken titles: section 8.10.1 is labeled “Road transport” but is only addressing cars, section 8.10.2. is labeled “Rail transport” but also addresses light-rail and buses).<br>In my view, modal shifts to the railways should be treated with caution. The rail system suffers from a severe lack of intra-modal (i.e. on-track) competition, and the rolling stock industry cannot exploit the economies of scale and at the same time the high degree of competition as the car / truck / bus industry. As a consequence, the power and potential of the rail industry for realizing innovations (for example for CO2 reductions) is limited in comparison to that of the road industry. For that reason, a policy aiming at substantial modal shifts to the railways is risky in the long term.<br>It is a particular advantage of the roads that they are basically the same all over the world. Moreover, all over the world, roads dominate transport. As a consequence, we find a world industry for cars / trucks / buses consisting of several huge companies in fierce competition. I think it is much wiser to put this powerful industry under pressure to develop less CO2-intensive vehicles, and maybe even spend some public money to help them develop totally new technologies, rather than spending much money for a small modal shift to a much less potent and less dynamic railway industry.<br>Currently we can witness the effects of the powerful road industry: Every car maker is eager to develop new and | I like this series of comments very much…absolutely right about lack of cost effectiveness perspective…I’m sympathetic to views about modal shift, but this is a battle that must be waged among our group.<br><br>This is a very long comment addressing a range of issues. Its contentions that substantial shifts in freight modal split towards rail will be relatively difficult and costly and the critical comments about the EU modal split targets are note and may require an adjustment to the text.Agree on freght, but again this is due to the lack of published research on the subject. Several organisations have constructed marginal abatement cost curves for freight transport and reference could be made to this work in the report. Most of this additional literature is relevant and could help us elaborate. the economic perspective is important, but also very difficuklt to give over the time spans we are looking at (a century ahead basically) My feeling from many scenario studies is that economic arguments will not bring us much further as it does not really make a digference whether people or goods are transport by mode A or B as long as the passenger or ton is transported at a certain reasonable cost and time. Many economic studies show the status quo to be the best because chance is costing additional efforts. Furthermore, we must take note |
| 10950 | 8 | | | | | I unforunately did not get to read the chapter as I was busy reading other chapters! However, I expect that the emphasis on transport comparisons is based on a Global Warming Potential with a 100 year time horizon. This is a rather significant discussion, and this papers discusses some of those issues: Peters, G.P., Aamaas, B., T. Lund, M., Solli, C., Fuglestvedt, J.S., 2011. Alternative “Global Warming” Metrics in Life Cycle Assessment: A Case Study with Existing Transportation Data. Environ Sci Technol 45, 8633-8641. | Accepted. Report uses GWP-100 from SAR throughout. |

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| 4001 | 8 | | | | | Figure 8.3.1: "Fuel Consumption Potential.." has either (1) a mis-leading/incorrect caption or else is presenting a false comparison. The caption reads: "Fuel consumption reduction potential (%) for a range of LDV technology types in 2012 and 2030, compared with a base 2012 gasoline ICE vehicle." Since BEV vehicles are not used in any substantial quanity and FCEV are not commercially available, the correct comparision is to a an advanced gasoline vehicle in the year that the BEV or FCEV would be available. The vehicles should be standardize for size and performance. The caption should either be corrected to note the correct comparison gasoline ICE, or the figure should be re-done with data using an advanced gasoline vehicle. Indeed, we see that a 2030 gasoline ICE is significantly better than a 2012 gasoline ICE. A more fair comparison would be a BEV and FCEV to a 2030 gasoline ICE. As is, this is simply wrong as it now stands. It falsely suggests a greater advantage to non-ICE powertrains which provides mis-leading guidance to policymakers. | I agree we need to normalize for size/performance, which I think we have done, but will check; however I don't see any problem with comparing to an average new gasoline car in 2012, this then allows the comparison to include how much better the best conventional vehicles are, along with new propulsion systems/fuels. The logic of the reviewer escapes me. And incidentally there are plenty of BEVs available commercially in |
| 4003 | 8 | | | | | Table 8.4.1: It might be useful to add a collum to this table showing the GHG intensity of passenger vehicles. As shown in Davis et al. (TRANSPORTATION ENERGY DATA BOOK: EDITION 30—2011, Table 2.13, p. 2-15), for the US the energy intensity per passenger mile for cars is lower than for transit buses, while trucks have a higher energy intensity. | Reject as the tabel is just about mass transit. Due to more confusion about this table may be remove the table and simply refer to the page in IEA ref where |
| 7794 | 8 | | | | | General comments on the chapter: | Reject. Comment is too general. |
| 7795 | 8 | | | | | __ Most of the information in the chapter 8 focusses on the developed world. This provide litte skewness to the useful information provided to the reader. It appears, as one reads through, that most of the alternative actions/options/adaptive/and or mitigations measures may happen in the domain of the developed word. Except at few places, examples from fast growing developing countries like India and China are cited. In India, as well as in other developing countries significant efforts are directed towards climate change related issues. Such as towards GHG emission inventory, infrastructure development etc to address climate change issues. In my opinion a few good examples from these countries could be cited. | Agree |
| 7796 | 8 | | | | | India-specific examples: | Reject. Comment is too general. |
| 7797 | 8 | | | | | __In 2006, the Ministry of Railways adopted a long-term strategic plan to develop six high capacity (planned to be completed by 2046-47), high speed dedicated freight corridors (DFC) to meet the growing demand for freight transport and induce modal shift of freight traffic from road to rail. One of the DFC, the Delhi-Mumbai DFC (also known as Western DFC) slated to be operation in 2016. This will enable higher operational efficiency in both freight and passenger services since the congestion on existing rail network would reduce significantly. In addition to efficiency improvements, the DFCs would contribute to significant reduction of GHG emissions (hence could claim carbon credits). By 2046-47, the Western DFC project alone would reportedly reduce annual CO2 emissions by nearly 81% under BAU. The cumulative emissions (six DFCs together) over 30 years period (2016-17 to 2046-47) would reduce from 222 million tons CO2 under BAU (without DFC) to 52 million tonnes CO2 under BAU (with DFC) and 18 million tons CO2 under BAU (with DFC) under low carbon pathways (LC). With a potential to reduce 170 million tons CO2 over 30 years. | From road to rail or rail to road? add if find reference. Some useful new data worth incorporating. Interesting points about the efforts to shift freight from road to rail in India. What will be the carbon penalty associated with this new infrastructural development. Could be beneficial to include reference to Indian railway initiative especially as large carbon savings have been calculated. |
| 7798 | 8 | | | | | __In 2007 alone, 772 kt of CNG and 185 kt of LPG was used in road transport vehicles (intra-city buses, taxi and private cars as well as in three wheelers) in India and substituted conventional liquid fuels (diesel and petrol) thereby reduction in resultant GHG emissions. CNG and LPG use in road transportation started in 2001 and 2003 respectively. | Could add but need reference |
| 7799 | 8 | | | | | __Transportation sector in India is the 4th largest emitter of GHG emissions after electricity, industry and agriculture and 3rd largest in terms of CO2 emissions. The share of transportation sector to the total GHG emissions in India has increased from 6.5% in 1994 to 8% in 2007 with a CAGR of 4.48% | Could add but need reference |
| 7800 | 8 | | | | | __In India, the rise in fuel prices encourage people to shift from one fuel type (petrol) to another (diesel) because significant price differential between petrol and diesel prices exist in the country (due to subsidy). The current diesel LDV share in India is about 20%. All the HDVs in India run on diesel. Diesel prices are kept low because it was the fuel of choice for agriculture, and freight transportation and not for LDVs. But now diesel is also used in LDVs and run generators (due to shortage of electricity) | Could add but need reference - Some useful new data worth incorporating |

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| 12110 | 8 | | | | | There is a cross sector "energy" system synergies that will bring down the costs of transformation eg: namely the synergy between the transport sector (innovations in electric cars + batteries) and their potential to, through "Smart Grids", work with and enhance the transition the distributed renewable electricity supply. [Refs IEA (2011) Smart Grid Technology Roadmap. IEA at http://www.iea.org/papers/2011/smartgrids_roadmap.pdf + IEA (2011) Electric and Plug-In Hybrid Electric Vehicle Technological Roadmap. IEA http://www.iea.org/papers/2011/EV_PHEV_Roadmap.pdf ] I have published on this and can send a summary through if interested. | Noted. Please see Chapter 7 for the integration of transport integration into the wider energy system. |
| 11363 | 8 | | | | | Are the changes in the vehicle emission stantards (e.g. EUROIII, IV, V, and VI) worth being pointed out as a mitigation option in this table? | Reject. Thanks for the comment but probably not, as changes in vehicle emission standards should probably be |
| 8359 | 8 | | | | | From the perspective of development the main challenge for the sector of transport is to provide sustainable access to food, work, housing and other resources needed to cope with daily life. In most countries and cities the provision of the basic human needs is a core issue and the role of transport is to deliver access to resources of different kinds to maintain or improve quality of life. Today, living conditions are rapidly changing and systems of transport will have to respond to societal changes to confront deteriorating living conditions for an ever-increasing global population. If not, it is most likely that marginalisation, poverty and social unrest will spread.<br><br>The growing need for transport facilities, especially in developing countries, and the design of policy and planning measures to reduce polluting emissions is a paramount challenge that merits to be discussed upfront in the beginning of the chapter and, not as now mentioned towards the end of the chapter. There are some comments made towards the end but this is such an important and fundamental issue of global development that it will have to be properly addressed in a report from IPCC. The overwhelming increases in some countries and cities in Africa and Asia with low levels of income and where per capita travel rate is estimated to double and speed lowered interfere with policies that aims at a reduction of greenhouse emissions. Accordingly these issues will have to be presented and discussed up-front and not on the last pages.<br><br>Moreover, there is no definition of the notion of sustainable transport but there are several definitions that can be applied. One option is to build on the OECD way of defining sustainable transport which has been developed through regional collaboration in Asia under the guidance of UNCRD in Nagoya. See http://www.uncrd.or.jp/env/5th-regional-est-forum/doc/bangkok_declaration.pdf. The final outcome of the analysis is of course depending on the definition and the indicators that are used. This is the reason why exploring the content of various important notions of sustainable transport should be included and outlined as well. It makes a huge difference if the goal is to achieve for instance a low-carbon transport system or if the objective is to implement sustainable transport. To base the analysis on a notion such as low-carbon is not sufficient or good enough to alleviate the problems being brought up in this chapter. The various concepts will lead the different outcomes and hence you will also have to assess strengths and weaknesses of the various definitions that you apply.<br><br>So far the lead role in this text is given to technical enhancement and its potential to alleviate the problems. This is a core topic but technical fixes are far from enough and the strong emphasis on technical solutions will have to be balanced by stressing the social aspects and its potential together with political and economic regulations, laws and steering measures. About 10 per cent (or somewhat more) of global population are car owners and this chapter puts far too much emphasis on the attitude and behaviour of car owners on behalf of 90 per cent (6 billion persons) of global population.<br><br>Besides, there are no clear cut responses or fixes ready for implementation that will make a real difference and alleviate current problems associated with motorized mobility. This report will have to explore several other tracks as well. The “closure” around the car-and-road-system and the great success story of the auto-industrial complex in national strategies for development as we have seen in the Asia over the last two decades and earlier on in | Noted. Thank you very much for your various thoughts. We have taken them into account in our discussions and have tried to take up a number of the issues raised by you in the new draft, particularly improving the balance of the chapter putting more focus on non-technology aspects. Concerning suggestions on reorganizing the chapter we are bound to the first level structure provided by the IPCC plenary. For definitions of sustainable development and the usage of this term adopted in this report please see Ch.4. Please note that it is not the task of the IPCC to provide "recommendations" but rather to provide an overview on options and possible pathways for different goals. Concerning the nexus of transport and cities, please also see the respective sections in Ch.12. |

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| 17965 | 8 | | | | | An introductory sentence along the example of Chapter 9 referring to the agreement reached in Wellington (p. 36) might be helpful for readers: "Barriers and opportunities are referred to as conditions that hinder or facilitate the implementation of the analyzed measures." | Accepted. Seems too obvious to put in but happy to do as suggested. |
| 5693 | 8 | | | | | Especially "activity" depends on external reason (e.g. economy) and not constant. This may spoil simplicity of this formula but better to suggest its complexity with some annotation. Especially, there's a positive feedback loop between activity and ecomomy. | Accept but aiming at policy makers |
| 3436 | 8 | | | | | I suggest removing this table and merging it with Table 8.8.1 - see also my general recommendation for this chapter | Table will be revised for the Second-order Draft. |
| 3425 | 8 | | | | | In the interest of shortening the chapter, this figure could be deleted | Will consider |
| 3426 | 8 | | | | | Please explain the acronyms of the regions that appear on the top of the graph | To be added |
| 3427 | 8 | | | | | In the interest of shortening the chapter, this figure could be deleted | Rejected. Providing an overview on historic global emission trend is thought |
| 18903 | 8 | | | | | Please consider changing and amending the figure in the following manner: (1) Turn this figure into a pie chart, as it adds up to 100%. Accompany the this pie chart with the following two: (2) Pie chart giving shares of the different transport modes for the same year and (3) Pie chart giving the energy sources consumed [all data is in the above paragraph, which could be the mostly cut.] | To be considered |
| 18905 | 8 | | | | | It would be very good to get global data for this! | Noted. This figure was deleted. |
| 18909 | 8 | | | | | Giving this in percentages is good to show the shift between modes, please consider to also present absolute numbers which indicate the expected increase of traffic. | Rejected. Sufficient as is to make point in text. |
| 15347 | 8 | | 6 | | | need a comma before the "of" | Can not be addressed as not stated which page this refers to. |
| 8888 | 8 | | | | | This section is too much focused on agriculture and should include other trade besides agriproducts | Not Chapter 8 |
| 6495 | 8 | | | | | General Comments - a. The main comment of this chapter is that it is written more from the developed countries perspective (except the arguments from 8.9). Arguments and examples from developing countries are lacking (in comparison to developed countries) as travel demand is growing more rapidly in such developing countries than developed countries. Need to strive for balance. Also it would be good to explain the diversity of issues and solutions in developing and developed countries in the initial sections and in solutions.<br>b. The document still needs lot of editing. The arguments keeps getting repeated – for example drivers are mentioned at 8.2.1.1 and 8.4.1.1 and not makes an easy reading.<br>c. The document is relatively silent on two and three wheelers which is the main source of transport for developing countries and current population of such vehicle exceeds more than 200 million . Except a couple of times.. no good argument has been made.<br>d. The chapter can be shortened at 8.3 Mitigation technology options, practices and behavioural aspects , 8.6 Costs and potentials and Sectoral implication of transformation pathways and sustainable development | Noted. The comment is well taken. Please note the unbalance between publications relating to developed and developing countries affecting also the weight in the chapter. We have extended the coverage of 2- and 3-wheelers. Thank you for your feedback on reducing redundancies. |
| 16224 | 8 | | | | | I guess it's good to add and spot on electric motor cycle, to encourage people to use this cycle which reduce GHG emissions specially in the high denisty population cities. | Agree. Covered |
| 4397 | 8 | | | | | The GDP/cap could be expressed in more recent USD, say 2010. All of the figures would be up to date, even if the trends displayed in the graph remain unchanged. | Agree. All costs to be in USD 2010 |
| 8877 | 8 | | | | | The sub-chapter focuses too much on shipping and does not include an overview of the indirect GHG emissions from transport. But it does touch upon non-GHG gases that are precursors for GHGs | Amended. |
| 2667 | 8 | | | | | Section 8.1.3 is poorly organized. I would recommend that this discussion be combined with the energy discussion and make the distinction there between energy and GHG emissions. A separate section could be devoted to a brief discussion of indirect GHG emissions. | Amended. |
| 17777 | 8 | | | | | this section is very good, but very long | Agree |

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| 2720 | 8 | | | | | This section is very repetitious of other sections. Do you want to discuss general policy options or the specifics of policies that have or could be implemented? As mentioned in comment 49, there should be more structure to how policies are presented - this section does a better job than previously, but please consider how these sections are repetitious of each other. Would be good to lay out the economic rationale for various policies somewhere in the text, and then link these to specific policy options. Section 8.10 could be a place for these specifics. | Amended. |
| 16225 | 8 | | | | | With the call for increased use of transport by rail to reduce overhead transport by road, advice for the development of rail cars for transport of goods to consist of two floors because of its advantages to reduce the cost of transportation, which reduces the burden business and shipping requirements, and the use of electric railway limitsemissions of carbon dioxide and reduces the cost of energy use and limit the use of conventional energy. | Will consider but needs a reference - and double decker trains limited by bridge and tunnel heights in many locations. |
| 16226 | 8 | | | | | I guess it'll be good to add a Matrix as a comparison between energy that could be obtained through the application of each type of new and renewable energies compared to the cost of financial investment, and by imposing a best suitable conditions for that and also impose worst, I suppose that comparison will be useful purely for developing countries and least developed countries | Such costs to be covered in 8.6. |
| 16227 | 8 | | | | | Talk more and spot on the new Aviation Techniques to enhance fuel effecieny to reduce GHG emission according to ICAO rules and try to match with EU restrictions to reduce GHGs, which made a stress on the Aviation Industry specially in Developing Countries. | Fuel covered in 8.3.1.6 etc. EU ETS discussed |
| 2779 | 8 | | | | | Remove "hybrid vehicles" since they are included in the "improved efficiency/all vehicles". | Accept |
| 3438 | 8 | | | | | In the beginning of this Section I suggest mentioning that there is a very significant gap in basic knowledge about average distance travelled by vehicle type as well as about total passenger and tonne kilometres, particularly in the developing world. As a result, the effectiveness of future mitigation policies will be hard to monitor. Moreover, there are three additional gaps in knowledge: uncertainty about the difference between test and on-road fuel economy; uncertainty about how much fuel economy regulations will lead to a rebound effect in a wider sense; and lack of knowledge about the lifecycle emissions of alternative vehicle technologies and fuels, which are crucial in order to correctly assess GHG benefits from alternative technological options. For a more detailed but still concise explanation of all this, see the following reference: Schipper L., 'Epilogue – The Future of the Automobile: CO2 May Not Be the Great Decider'. In: Zachariadis T. (ed.), "Cars and Carbon", Springer, 2012, ISBN 978-94-007-2122-7, DOI 10.1007/978-94-007-2123-4_17, pp. 409-411. | Agree. Should be amended |
| 4000 | 8 | | | | | This section: trends and drivers is missing a section on trends in petroleum carbon intensity. In particular, in certain parts of the world (US, Canada, South America, Africa, China), the carbon intensity per barrel (or unit of extracted energy) is increasing as we move to either heavier crudes (Alberta), to deaper off-shore oil (greater energy use in pumping the oil) or coal-to-oil (South Africa, China). This is likely to continue as we deplete easy-to-access conventional oil. This is a major over-looked driver in future carbon emissions and needs to be addressed. I suggest that it be moved to the summary highlight. | Reject - The changes in carbon intensity of crude oil that will be used in future years is a minor driver in carbon emissions. To the degree that this is an important driver should be covered in Chapter 10 as Chapter 8 does not |
| 14279 | 8 | | | | | This section could be significantly reduced in length. I wasn't sure of the relevance of the "Costs and prices" sub-section to climate change mitigation (especially the first paragraph). | Accept - We will reduce the length of this section but the cost and prices are important drivers in trends that are |
| 3991 | 8 | | | | | This section could be stronger. First, the section correctly notes that transportation costs and prices are major drivers (along with other factors). But, no supporting data is provided: e.g., how much have prices and costs changed in OECD and non-OECD countries; what are the projections for the future? Where's the time trend data? Also worth noting is the major increases in fuel economy standards in the US (in particular), but also in many other OECD countries. This is a major driver in decreasing the use of fuel and, hence, GHG emissions. At the same time, this lowers the cost per kilometre of driving which may exacerbate other driving related externalities such as congestion. | Accept - We will add data |

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| 3994 | 8 | | | | | This section could benefit from forward looking impacts from disruptive technology. While perhaps speculative, emerging technologies such as the well-publized driverless car from Google has the potential to drastically lower the time cost of driving (drivers can make their time productive) and hence spur increased driving. The use of advanced GPS and backup safety divices can extend the driving age for older people. The chapter should devote a modest amount of space to looking ahead at technology trends and what they mean for VMT and CO2. | Accept - We can add a few sentences about potential game changers |
| 3996 | 8 | | | | | This section on drivers fails to note the large increse is diesel fuel use compared to gasoline in Europe which was and is largely driven by fiscal policies (taxes) that favor diesel fuel. The impact on this shift on fuel economy has been mixed. While diesel engines are an inherantly more efficient drive train compared to gasoline engines, there is some evidence that consumers have purchased more powerful vehicles offsetting the technology gain. See Schipper 2011: "Similarly, the promise of savings from dieselization of the fleet has revealed itself as a minor element of the overall improvement in new vehicle or on-road fuel economy. And the fact that diesels are driven so much more than gasoline cars, a difference that has increased since 1990, argues that those savings are minimal. This latter point is a reminder that car use, not just efficiency or fuel choice, is an important determinant of total fuel use and CO2 emissions." Moreove, this contridicts the opening paragraph of section 8.2.1 of the WGIII "Data suggesting declines in LDV use in OECD cities since 2005 raise the possibility of a significant turning point in transport in developed countries (Goodwin, 2012; Millard-Ball and Schipper, 2011; Schipper, 2011), but this is not expected to off-set growth in developing countries." Please update/check the sources. | Accept - This will fit under economic drivers |
| 2813 | 8 | | | | | The titles of those sections ("Trends by transport sector" and "Trends by Sector") - are they intentionally differenciated? | Reject - The section and associated titles are fixed and cannot be changed |
| 3997 | 8 | | | | | This subsection correctly points out expected huge expansion in the LDV sector. The text notes an expected increase from 780 million vehicles to 2 billion vehicles in the next few decades. Actually, there is strong empirical evidence from Wards that we have already passed 1 billion vehicles - this should be updated. But the larger point is correct and needs to be emphasized in the introductory/summary material of this chapter. The world's LDV population is expected to double in 2 or 3 decades - this is a huge factor driving mobility, energy use and emissions. I urge in the strongest possible manner that the authors give significantly more weight to this trend. In some ways it a defining transition that needs to be adequately appreciated and addressed. | Accept - Will update data and references |
| 8881 | 8 | | | | | This section seems to be unfinished and is unreferenced. | Accept - Will expand and add refernece s |
| 4056 | 8 | | 26 | | 30 | This paragraph has no reference. | Accept - Will expand and add references |
| 4261 | 8 | | | | | There are major omissions of section on active travel (walking and cycling) for short journeys in urban areas and on improved urban mass transit systems. Increased physical activity has major benefits for health and there are additional benefits from reduced air pollution | not really something for tech chapter |
| 3412 | 8 | | | | | many percentages mentioned to indicate potential efficiency gains, but the reference year is hard to verify. | good point, need to address |
| 4054 | 8 | | | | | Section 8.3.1.2. LDV load reduction. How do these recommendations differ from AR4? | Rejected. Due to the significant amount of new publications since AR4 the |
| 4055 | 8 | | | | | Section 8.3.1.3 Medium and heavy-duty vehicles. How do these recommendations differ from AR4? | Added |
| 11878 | 8 | | | | | It is odd that rail is discussed mostly in terms of passenger transport while in many places (like the U.S.) the mode is dominated by freight. Are there trends in rail freight worth highlighting? For example, speed reduction (which is highlighted for ships below). Are there places where the absence of infrastructure means rail doesn't serve freight movements well? | Passenger / freight split for rail clearly varies for countries. Competition for available rail capacity between pass and freight is an important issue. Chap currently mentions the need for more rail |

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| 8882 | 8 | | | | | 8.3.2 could be merged with 8.3.1 to save space and the section should be looking at how the incremental changes could contribute to the absolute emission reductions from transport. Also, despite aircraft engines could be 50% more efficient by 2050 this wont be reflected in aviation emissions due to long life-span of aircraft | will look at merging opportunities; aviation - will mention turnover times of each mode |
| 8437 | 8 | | | | | The use of electric bicycle is growing very fast and thus some data could be found in literature to underline the importance that this means of transport could have in the future. | yes e-bikes and scooters deserve mention |
| 3992 | 8 | | | | | This section describing electric road vehicles can be significantly shortened. This is not the place to go into detail on this technology. The authors should refer to any of the many high-quality desciptions available elsewhere. | Accepted. |
| 3993 | 8 | | | | | This section describing fuel cell vehicles can be significantly shortened. This is not the place to go into detail on this technology. The authors should refer to any of the many high-quality desciptions available elsewhere. | Accepted. |
| 8883 | 8 | | | | | This section on low-carbon fuels is almost 100% focused on road transport. Discussion on other modes should be added. | Consistent with shortening some bits |
| 3999 | 8 | | | | | This section notes CNG's lifecycle GHG advantage at 20%-30% compared to gasoline and diesel. This figure needs to be qualified/updated to take into account newer estimates for CNG from hydrofracturing. Perhaps the text should read something like: CNG from conventional sources...20-30%, but if the rest of the world follows the trend in the US and Canada of sourcing CNG via hydrofracturing, the likely GHG benefit is likely to be ~ 5%-10%, etc. | shale gas - will add in estimates there is some controversy about fracking, but I doubt it is anywhere near settled what the GHG emissions from fracking operations are. |
| 3413 | 8 | | | | | I believe the considerable disadvantage of hydrogen (low energy density hence voluminous storage prohibiting use in aircraft) should be mentioned in this paragraph, not only in the indirect way that it is done in the next one. | will address this a paragraph on the difficulties involved in transporting and storing hydrogen would be appropriate |
| 8884 | 8 | | | | | 8.3.4 should be merged with 8.3.1 as it compares technologies | will look at merging opportunities. do not agree, 8.3.1 is about incremental |
| 2751 | 8 | | | | | The single most important quantitative information that the transportation chapter should contain is the lifecycle GHG emission comparison of various fuels, including gasoline and diesel oil and a representative set of alternative fuels. This is, however, not found anywhere in the chapter, although many have been published and are easily available. I recommend to use a German Energy Agency (DENA) bar diagram published in 2011 and available on page 5 of publication "The Role of Natural Gas and Biomethane in the Fuel Mix of the Future", at http://www.dena.de/en/publications/transport/natural-gas-and-biomethane-in-the-fuel-mix-of-the-future.html?tx_dscoverview%5Bliste%5D=1&tx_dscoverview%5Bpluginid%5D=3255. | its because we had trouble finding a good one, we will definitely have something like this in the next round. generally agree, but the range of answers is great |
| 2752 | 8 | | | | | Note that lifecycle energy consumption of BEV and PHEV may not be better than ICEs due to low efficiency of electricity production. Even is CHP is used in electricity production it is important to note that vehicle engines are also CHP engines. Their waste heat is currently used for heating, but it could also be used for cooling utilizing soption heat pumps (they are currently in demonstration stage). Lifecycle (well-to-wheel) emissions (please see DENA bar diagram mentioned in previous comment and EUCAR/CONCAWE/JRC, 2008) are relevant for AR5 instead of vehicle tank-to-whell energy efficiency. Emphasizing the latter is misleading. | both TTW and WTW efficiency (and emissions) matter, for different reasons. We need to show both in appropriate places. Agree that new technologies for ICE vehicles should certainly be in our comparisons and the most promising |
| 8885 | 8 | | | | | Again focused on road transport only | agree we want more non-LDV focus |
| 13110 | 8 | | | | | Generally, too much explanation for infrastructure modal shift and. | Reject, bit too general remark and no alternative or diection given. |
| 11889 | 8 | | | | | General comments: There seems an opportunity throughout the chapter to shorten the text by (1) avoiding repetition within the chapter and (2) avoiding repetition across chapters. For example, there is some overlap in the discussion of urban form and infrastructure between chapters 8 and 12. - Perhaps improved coordination or a clear division of topics addressed in each chapter could shorten both? | fair comment; will address the examples given. |
| 2755 | 8 | | | | | Add refueling infrastructure of renewable methane and hydrogen. They were proposed to be required by directive for all Member States of the EU by the EU expert group on future transport fuels report in December 2011. | agree indeed mention this. |

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| 2814 | 8 | | | | | The objective of this section is not clear. More explanation is needed at the beginning the purpose of this section and the logic of the structure. It might be better to revisit the structure following the "Activity"- "Structure" framework. | Accept - add a short general introduction about the idea (path depency, slow change, sunk cost, LCA, etc) |
| 8887 | 8 | | | | | This entire section is too long. Also, the heading should be rephrased - the secton describes modal shifts and path-dependencies and not only in urban environment. The sub-sections on urban transport shoould be merged. | Accept: may be shift the 'urban form' to the current section path dependencies and infrastructure (8.4.2) and rewrite this |
| 18908 | 8 | | | | | Consider mentioning safety as an incentive to use cars (with respect that protection is greater than using two wheelers or walking and with respect to safety from e.g. robbery) | Noted. |
| 14288 | 8 | | | | | Not sure of the relevance of this section to mitigation - it could be deleted. | Accepted. However, the role of car dependce is still a very important |
| 2697 | 8 | | | | | This section could benefit from a fuller discussion that is not just about European freight transport. There are major differences in rail freight between North America and Europe (and this is briefly mentioned), but the policy implications are probably quite different. In all cases, there is probably a need for more capacity as rail freight is at capacity in North America and passenger rail is at capacity in Europe. What is happening in Asia? How feasible is it to actually shift away from road and air freight? The discussion would also benefit from considering freight reduction, mainly through local production and consumption of goods, rather than transporting across large distances. | Noted. |
| 5696 | 8 | | | | | There's no prisnor's dilemma situation in freight. The whole shift can be accelerated by applying information and communications technologies (ICT or IT). There are many patents for optimizing logistic cost using ICT. (e.g., WO2004/018116, WO2004/019242 by Deutsche Post AG ) Algorythms for efficient transportation are proposed. (e.g. Sato, "A Formal Approach for Milk-run Transport Logistics" IEICE Trans. on Fundamentals E91-A (2008) pp. 3261-3268) In Japan Sagawa Express Co., is operating fast cargo train and basic technologies are proven. The missing piece is an actionl plan. | Accepted. |
| 8889 | 8 | | | | | This section should shortened be and merged with 8.5.3 and be on infrastructure and routes for all transport modes and forms | Reject. Will shorten the section. Transport routes as described in this section are susbtantially different to the infrastructure issues dealt with in 8.5.3. |
| 14293 | 8 | | | | | Not sure if this fits best here, but an important insight is that decarbonisation itself is likely to reduce freight demand for shipping and therefore reduce shipping emissions as well. This is because a large proportion of demand for shipping is transport of fossil fuels (e.g. 50% in the UK). See Committee on Climate Change (2011), "Review of UK Shipping Emissions", p25 (http://downloads.theccc.org.uk.s3.amazonaws.com/Shipping%20Review/CCC_Shipping%20Review_single%20page_smaller.pdf). | Noted. Taken into account. |
| 2756 | 8 | | | | | Rural train transport using overhead power cables is the most vulnerable transport technology to the effects of climate change. | Accepted. See Section 8.5.3 |
| 4058 | 8 | | 29 | | 44 | Section 8.5.3 has some assessment of the interactions of mitigation and adaptation actions. What are the potential conflicts? Are there any optimal actions? | Accept. This should be highlighted more clearly. |
| 2757 | 8 | | | | | Air conditioning can also be done with waste heat of the vehicle engines using sorption heat pumps. | Taken into account. Partially agree at least for trainstations etc, not for cars. |
| 4059 | 8 | | | | | This section is about the interaction of climate change impacts with feedback from vehicle fuel efficiency but also air conditioning demand in transportation. Title of the section should be changed to "Climate impacts on vehicle fuel efficiency and emissions." | Accept. |
| 4060 | 8 | | 2 | | 13 | How will temperature and moisture changes affect Nox, CO2, and PM? | Accept. Will mention this. |
| 8890 | 8 | | | | | Too much focus on the urban form and forgetting other transport modes | Accepted. Urban form is one way to reduce demand but other forms do exist as well. We will try to ammend text |

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| 8891 | 8 | | | | | Too much focus on the urban form and forgetting aviation and shipping | Accepted. Urban form is one way to deal with the structure effect/modal shift but other forms do exist as well. We will try to ammend text to also better portray |
| 4062 | 8 | | | 40 | | Table 8.6.2. The range of potentials is portrayed optimistically as "…up to x% efficiency or emission reduction improvement. The range of cost-effectiveness should also reflect a wide-range in order to reflect the higher costs to achieve the higher efficiency or higher emission reductions. | Table will be revised for the Second-order Draft. |
| 4057 | 8 | | 26 | | 38 | Cost of modal shifts are not stated here. Only cost savings per household is stated. What is the net cost? | Accepted. We will try to better reflect |
| 8892 | 8 | | | | | Too much focus on road transport and forgetting rail and shipping | Accepted. We will try to better reflect |
| 11887 | 8 | | | | | The title of this section is strange - what does "effect component" mean? Also, there is quite a bit of repetition with earlier discussions of vehicle technologies - it might be an opportunity to remove some content here. | Title tries to follow the Kaya Identity logic. With respect to possible repetitions, we will try to clearly |
| 2758 | 8 | | | | | Low efficiency of electricity production and its resulting emissions have not been taken into account. The potential of increasing efficiency by better engine technological properties of many renewable fuels (compared to gasoline and diesel oil) have not been taken into account, e.g. biogas octane value 140. | Accept. |
| 2762 | 8 | | | | | Mitigaton options Fuel switch: add renewable methane (RM) | Table will be revised for the Second- |
| 14295 | 8 | | | | | This section is too long and could be significantly reduced in length. It is not clear to me how relevant many of the sub-sections are to mitigation (e.g. 8.7.1.3 traffic accidents - is this supposed to suggest that reducing demand for travel could reduce deaths as a co-benefit? If so, it needs to cite some evidence in support of that argument. Since the main route to decarbonisation of surface transport is likely to be electrification, rather than reduced demand, I find it hard to believe that reduction in traffic accidents is likely to be a significant co-benefit). | Accept. We will rewrite |
| 6387 | 8 | | | | | Chapter 8 needs a discussion of risks and uncertainties, especially with respect to the mitigation benefits of proposed alternatives. Section 8.7 seems to be more about the risks from transport (as is) rather than the risks associated with approaches to mitigation. Co-benefits and spillovers seem to be in reference to mitigation strategies, so it would seem appropriate to discuss the risks associated with these as well. | Acept. We will rewrite |
| 17953 | 8 | | | | | Introductory sentences like the ones in Chapter 10 might be a good idea to prepare the reader for the following discussions: "Besides economic cost aspects, several other aspects have implications on the final deployment of mitigation technologies. Co-benefits, co-costs, risks and uncertainties associated with alternative mitigation technologies as well as public perception thereof can affect investment decisions of companies and priority setting of governments." | Accept. We will rewrite |
| 2815 | 8 | | | | | "Co-benefits": definition should be provided in the first place as there are still some disputes over the definition. (e.g. see Zusman et al, 2011- which is already in the list of reference). | Accept. We will rewrite |
| 3429 | 8 | | | | | This section does not contain very important information in the IPCC context; it should be considerably shortened to become as long as e.g. Sections 8.7.2 or 8.7.3 | Accept. We will rewrite |
| 17954 | 8 | | | | | Although this paragraph describes the costs of traffic congestion, it does not explain how mitigation would interact with traffic congestion which is crucial to deserve mentioning here. | Accept. We will rewrite |
| 8894 | 8 | | | | | Has overlaps with 8.7.3 and should be merged | Accept. We will rewrite |
| 2767 | 8 | | | | | Use of methane as traffic fuel has been shown to decrease all public health issues and reduce lost health (measured in DALYs) drastically. Electric vehicles have even higher potential. | Noted |
| 17955 | 8 | | | | | This sub-section 'Public health' should be moved to section 8.7.3 which is suitably called 'Environmental and health effects'. | Accept. We will rewrite |
| 2768 | 8 | | | | | Electric vehicles, incl. fuel cell vehicles, have potential to increase traffic accidents due to their low noise level. | Accept. |
| 17957 | 8 | | | | | Although this paragraph describes the costs of traffic accidents, it does not explain how mitigation would interact with traffic congestion which is crucial to deserve mentioning here. | Accept |

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| 2769 | 8 | | | | | Renewable electricity, renewable hydrogen and renewable methane always offer these benefits. For liquid biofuels potential is much smaller and in some cases they make situation worse. | Accept. We will rewrite. Not appropriate. Marcio |
| 8376 | 8 | | | | | Most of this has already been said in other places. Especially the lines 17-21. | Accept. We will rewrite |
| 17958 | 8 | | | | | This sub-section should be moved behind the section 8.7.3 since it builds on results of health issues. | Accept. We will rewrite |
| 6490 | 8 | | | | | 8.7.2 Climate change mitigation as a co-benefit and 8.7.3 Environmental and health effects have contradictory statements. 8.7.2 suggests – "Some policies that aim to tackle the high social costs of urban transport can also result in climate change mitigation being a co-benefit. Air pollution and noise can be reduced by technological advances (such as vehicle building materials) and regulations for vehicles (Section 8.11) but such measures rarely have influence on climate change mitigation." And<br>8.7.3 - "Strategies that target the mitigation of local air pollution also show potential to reduce GHG (Yedla et al., 2005) and black carbon emissions. In designing mitigation measures to reduce specific pollutants GHG emissions reductions can also occur. For example, measures to reduce PM2.5 particulates to reduce air pollution also reduce emissions of black carbon." | Accept. We will rewrite |
| 6488 | 8 | | | | | This section needs improvement/editing. Also PM 25 is PM 2.5. | Editorial |
| 2770 | 8 | | | | | Diesel engines are the main culprit in industrial countries. E.g. in the EU the common denominator of all air pollutants, which are not decreasing, are diesel emissions. It can be solved by using gaseous fuels, i.e. bio-DME and renewable methane, in diesel engines. And by increasing the share of other motor technologies.<br>In developing countries 2-stroke engines are the main culprit. It can be solved by using renewable methane in 2-stroke engines and by increasing the share of other motor technologies. | Reject. Beyond the scope of this Section. |
| 4063 | 8 | | | | | Technological solutions, improved fuel efficiency, reduction in noise levels may improve environmental quality but mobility problems remain. | Accept. We will rewrite to clarify. |
| 17962 | 8 | | | | | The content of this section does not seem to have anything to do with either technological or operational risks which should be discussed in this section according to the agreements reached in Wellington (p. 36). The text has either introductory charachter or relates to biofuel assessment.<br>Please consider a broader discussion of risks and uncertainties along the classification of risks and uncertainties provided in Section 6.7. Please liaise with the other sector chapter LAs to discuss the process by which a more consistent approach can be reached. | Accept. We will adapt the structure of Ch 6.7 |
| 8378 | 8 | | | | | The challenges of providing access, equity and low carbon transport or sustainable transport for a growing global population is not outlined well. When it comes to defining sustainable transport -basically the developed world and its possibilities to mitigate and adapt to the new realities are highlighted. As a consequence issues of technology advancement and polices of the developed world are well presented and discussed in the text. But the substantial changes yet to come will take place in other and less developed conditions. The overwhelming growth in travelling taking place in most countries and cities in the world merits a better presentation and analysis. PIs pay more attention to this topic and outline ways of handling the issue.<br>For instance what will be the role of transport in the cities in the world? Which are the lifestyle and security issues and opportunities related to modes of transport and emissions? The social activities will define the requirement infrastructure and modes of transport.<br><br>This part of the chapter is weak. It would be good to present a couple of different cities (as mentioned earlier) and outline the typical mobility issues and how they can be transferred to match the need of low carbon policy or the kind of sustainable transport that IPCC will promote. To increase sustainability a new set of planning models and tools will have to be developed -otherwise modern mainstream transport will continue to greenhouse gases also in the future. □ | Its hard to respond specifically as this is a critique of the whole style of the chapter and report. If we did Shanghai as a case study they would be surprised how positive you could be about the future….8 million passengers a day on their Metro after ten years building. But examples can be only anecdotal to data on the whole system. |
| 2772 | 8 | | | | | 1. barriers: BEV potential only in LDV:s in urban transport (< 20 % of all transport) | Disagree. More than LDVs. But the data |

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| 17967 | 8 | | | | | Since the section is called barriers and opportunities, this sub-section should be more about the financial barriers of low-carbon transport than about different policy instruments that should also be discussed in the policy section. | Disagree. We do discuss finance but barriers are much more than finance. |
| 17968 | 8 | | | | | Sincce the section is called barriers and opportunites, the word 'aspects' in the title of this sub-section should be changed to 'barriers and opportunities' accordingly. | Agreed. Chair will need to agree. |
| 3430 | 8 | | | | | I don't think that this section is necessary as a whole. In the interest of shortening the text, I would suggest that a small part of Section 8.9.1 is inclused in Section 8.2 in the beginning of the chapter, and that the rest of Section 8.9 is either deleted or included in other chapters. | Rejected. Sections are fixed within the chapter. |
| 2774 | 8 | | | | | It is very worrying and against the decarbonization trend that renewable gases are not included, e.g. renewable hydrogen, renewable methane, bio-DME, bio-LPG. | Accepted. It will be considered |
| 2715 | 8 | | | | | Section 8.9.1 was very well and concisely written. One of the best in the report. | Thank you for the comment. |
| 11888 | 8 | | | | | This section could probably be shortened without loss of content. Technologies have already been described previously in the chapter, and it seems quite straightforward to indicate barriers/adoption rates, etc. either more concisely in this section or elsewhere in the chapter. Also, the term "bus rapid transport" is used - but "bus rapid transit" is used elsewhere in the chapter. Finally the discussion of modal shifts can be simplified. It seems quite obvious that shifting from bike to metro could increase energy use, so perhaps these possibilities don't need to be explicitly included? | Accept. This session will be subject to changes in SOD comments will be considered. |
| 14298 | 8 | | | | | Not sure of the relevance of this section to mitigation - it should be removed. Not to deny the importance of sustainable development, but it is a very separate issue from mitigation with very separate aims and policy implications and the two issues should not be conflated. | Rejected. Sections title is fixed by negotiation of governing body of IPCC. |
| 8438 | 8 | | | | | I suggest to move all the box in Chapter 5 | (Assume this means section 8.1.1. - not a box) It sets the scene for this chapter 8 |
| 8868 | 8 | | | | | The entire Executive summary needs to made stronger and clearer | Aiming to for next draft |
| 8898 | 8 | 0 | | | | Chapter 8 generally covers transport and climate change related issues. More focus on transport modes other that road transport is needed. Also there is significant amount of space dedicated on urban transport - this could be condensed. The sections should be better linked to each other and other chapters to avoid unnecessary repetitions and contradictions. The factual accuracy of GHG emissions related sections should be checked. In some places the chapter seems to be a repetation of IEA reports - there must be other sources out there covering the topics. Also very little attention is paid upon future transport GHG emissions scenarios by mode and explaining the feasibility of absolute reductions in GHGs from transport. I am sure that the authors were planning to address some of these issues while preparing SOD. | Agree changes will be in SOD |
| 7400 | 8 | 0 | | | | provide more assessment of uncertainty, affordability, and spillover impacts related to mitigation and mitigation policies and measures in transport sector, particularly for developing countries. | Agree will do if space is available |
| 4400 | 8 | 0 | | | | The organization of the Chapter does not appear coherent or easy to follow. For instance, the authors describe heavy goods vehicles, move on to passenger vehicle transport and back to freight transport. There is not much discussion on shipping, rail or aviation. As such, the Chapter is focused on LDV. The Chapter could be shortened by eliminating repetitious statements and combining sections, such as technological advances with costs. | Cannot merge sections which are fixed by IPCC. Agree, in progress, though this partly reflects the relative amounts of research done on the decarbonisation of the various freight modes. There has been a significant increase in the |

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| 11595 | 8 | 0 | | | | Chapter difficult to read and to review. It's not wrong, but has several major shortcomings: 1) Lack of focus: A holistic assessment of the full climate impact of transportation today and in the future, as well as its mitigation potential is not done. 2) Lack of balance: Most is on passenger transport, not balanced with the role of freight transport. 3) Lack of comprehensiveness: Results from single studies are highlighted in charts and figures. I would however expect summary charts and tables from a review. Exceptions and hence good examples: Tab. 8.6.2 and Tab 8.8.1 seem to summarize, but are hard to read (even because of bad reproduction quality). These tables seem to be key and should be expanded furhter, better placed highlighted. Figs 8.9.1/2 are very interesting as well, though source is missing. 4) Lack of specifics/too broad brush: Though it is acknowledged throughout the text that there are important regional differences, you do not highlight and distinguish them clearly. Suggestion: Try to identify some (country) case studies for which you pull through your quantitative results. Good countries, standing for larger country groups, could be: US/WEU/JPN; CHN/IND. Here you could nicely illustrate eg. levels of transportation (e.g. as pkm/cap and tkm/GDP; energy intensity; total transprot energy use; total transport emissions of LL and SL GHG; analysis what mitigation options would seem feasible and what impact that might have. Trying to do all at once has resulted in the current stew.5) A lot in this chapter is on energy demand. Translate this to GHG emissions and impacts, then you are better in focus. | very reasonable criticism, although it is quite difficult to do a side-by-side comparison of alternative studies…..there tend to be large differences in timing, underlying assumptions about energy prices and policies, baseline vehicles, etc etc that are hard to normalize. will do case studies if space is available |
| 11596 | 8 | 0 | | | | Useful but missing references for the whole chapter, individual sections, and particularly for impact assessment: J.S. Fuglestvedt, K.P. Shine, T. Berntsen, J. Cook, D.S. Lee, A. Stenke, R.B. Skeie, G.J.M. Velders, I.A. Waitz, Transport impacts on atmosphere and climate: Metrics, Atmospheric Environment, Volume 44, Issue 37, December 2010, Pages 4648-4677, ISSN 1352-2310, 10.1016/j.atmosenv.2009.04.044.<br><br>D.S. Lee, G. Pitari, V. Grewe, K. Gierens, J.E. Penner, A. Petzold, M.J. Prather, U. Schumann, A. Bais, T. Berntsen, D. Iachetti, L.L. Lim, R. Sausen, Transport impacts on atmosphere and climate: Aviation, Atmospheric Environment, Volume 44, Issue 37, December 2010, Pages 4678-4734, ISSN 1352-2310, 10.1016/j.atmosenv.2009.06.005.<br><br>Veronika Eyring, Ivar S.A. Isaksen, Terje Berntsen, William J. Collins, James J. Corbett, Oyvind Endresen, Roy G. Grainger, Jana Moldanova, Hans Schlager, David S. Stevenson, Transport impacts on atmosphere and climate: Shipping, Atmospheric Environment, Volume 44, Issue 37, December 2010, Pages 4735-4771, ISSN 1352-2310, 10.1016/j.atmosenv.2009.04.059.<br><br>Elmar Uherek, Tomas Halenka, Jens Borken-Kleefeld, Yves Balkanski, Terje Berntsen, Carlos Borrego, Michael Gauss, Peter Hoor, Katarzyna Juda-Rezler, Jos Lelieveld, Dimitrios Melas, Kristin Rypdal, Stephan Schmid, Transport impacts on atmosphere and climate: Land transport, Atmospheric Environment, Volume 44, Issue 37, December 2010, Pages 4772-4816, ISSN 1352-2310, 10.1016/j.atmosenv.2010.01.002. | Will try and include - space permitting |
| 12335 | 8 | 0 | | | | General comment: Mobile air-conditioning and commercial refrigeration in the transport sector should be cover in more detail. Rationale: Mobile cooling is increasing and choices with regard to the phasing out of existing agents (CFCs, HCFCs anf HFCs) and the alternatives (HFCs, natural agents, natural cooling) will have significant implications on total CO2-equivalent emissions from the sector. The IPCC special report "Safeguarding the Ozone Layer and the Global Climate System - Issues Related to Hydrofluorcarbons and Perfluorcarbons" (Chapter 6 and others), as well as more recent publications, might serve as a basis for this coverage. | Accpeted. |

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| 8558 | 8 | 0 | | | | "Travel demand and choice of transport mode depend on land use planning interventions that alter density, diversity and design (Cervero and Kockelman, 1997) of urban space can reduce travel demand (Ewing and Cervero, 2010)"<br>COMMENT:<br>Ewing and Cervero calculate an average elasticity of vehicle travel demand of -0.04, which means that when density is doubled, vehicle travel is nearly doubled. This is such a small reduction that the inclusion of this reference can be misleading. Indeed, given the greater traffic intensity associated with higher densities (Ewing and Cervero and others), it is possible that the GHGs would increase from vehicle traffic as a result of the reduced fuel efficiency. This issue should be covered<br>(See also comments 16, 17 and 18) | Rejected. This quote provided here is not part of the chapter, i.e. we do not know what you are referring to. |
| 8559 | 8 | 0 | | | | MISSING ISSUE: HOW TRAFFIC CONGESTION REDUCES THE IMPACTS OF VKT REDUCTIONS. As Ewing and Cervero (2010) show (there is also volumnous additional literature on this) as urban densities increase, vehicle demand increases. This means that there is more traffic on a road system that is virtually never expanded in such compact city programs. Thus, traffic slows down, and becomes more congested. As this occurs there is a reduction in fuel efficiency and the often presumed one to one relationship between the reduction in petrol consumed and GHG reductions is broken. This yields such strategies less effective and this should be said. See: Transport Canada Environmental Affairs, The Costs of Urban Congestion in Canada, www.gatewaycouncil.ca/downloads2/Cost_of_Congestion_TC.pdf<br>and Treiber, M. A. Kesting and C. Thiemann (2008)," How Much does Traffic Congestion Increase Fuel Consumption and Emissions? Applying a Fuel Consumption Model to the NGSIM Trajectory Data, paper presented to the Annual Meeting of the Transportation Research Board." | Accepted. |
| 8560 | 8 | 0 | | | | MISSING ISSUE: HOW TRAFFIC CONGESTION INCREASES HEALTH HAZARDS<br>Greater traffic congestion leads to higher air pollution levels at the neighborhood level and negative health risks. For example, research published by the American Heart Association indicates that "air pollution levels vary significantly in urban areas and that people who live close to highly congested roadways are exposed to greater health risks." See: Brook, R. D., B. Franklin,W. Cascio, Y. Hong, G. Howard, M. Lipsett, R. Luepker, M. Mittleman, Jonathan Samet, S.C. Smith, & I. Tager (20040, "Air Pollution and Cardiovascular Disease: A Statement of the Health Care Professionals from the Expert Panel on Population and Prevention Science of the American Heart Association," Circulation, Vol. 109, 2004, pp. 2655–2671 and USEPA (n.d.b), Health, http://www.epa.gov/air/nitrogenoxides/health.html. | Include in 8.7.1.2 |
| 8561 | 8 | 0 | | | | MISSING ISSUE: HOW COMPACT CITY POLICIES INCREASE TRAFFIC CONGESTION (TRAFFIC INTENSITY). This point emerges from the Ewing and Cervero (2010) research (and others) | Accepted. |
| 15858 | 8 | 0 | | | | Chapter appears to be more of a qualitative high-level literature review than quantitative analysis that highlights and compares the best ways to reduce transportation GHGs from transportation. This makes it hard to get to a bottom line set of conclusions. Chapter should contain more quantitative analysis that highlights and compares the best ways to reduce transportation GHGs from transportation for all modes and regions | Endeavouring to quantify SOD |
| 15860 | 8 | 0 | | | | There are numerous optimistic, academic statements, e.g., "up to", "targeted", "expected", "if", "emissions could double…". These should be tempered by using more pragmatic projections from auto or fuels industries, and perhaps presenting a range of values (P10-P90), and the most probable value in the middle (P50, median). Careful when forecasting expectations on deployment of technologies that are still in R&D (e.g., opposed cylinders). Also, need to clearly state timeframe – what are the reference characteristics (e.g., midsize LDV) and what is the reference year for baseline (e.g., 2010) and projection (e.g., 2035) | Noted. |

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| 15864 | 8 | 0 | | | | •Cost implications need to be better addressed: customers respond mainly to 2-4 yr net paybacks for their vehicles, possibly slightly longer for fleets. If the cost of GHG technology is low and competitive, then consumers may buy it, but if not, it would be a hard to sell. Incentives can help but they generally do not last over the long term. Also, the chapter should focus on lowest $/tonne CO2 reduction options.<br>•There are some examples of new technology penetration due to incentives or regulations, but generally not due to consumer environmental "goodwill". The e-wheelers in China were generally a result of local government mandates banning gasoline motorbikes, while HEVs in Japan were spurred by incentives.<br>•I would question the realistic potential for large penetration of advanced vehicles in developing world when most customers are upgrading from scooters, bikes to small, simple (nano-type) cars that they can afford.<br>•There is customer balance/preference for vehicle performance (e.g., acceleration, amenities) over fuel economy. This needs to be recognized. Heywood et al (MIT) have studied this in detail. | Bullets 1, 3, 4: Accepted, see Sections 8.3 (behaviour) and 8.10; Bullet 2: Rejected. The transition to e-wheelers in China can be attributable to a combination of economic, technical, and political factors. The substantial driving factors are resident income growth and E-bike price decrease. The banning of gasoline motorbikes is important but not dominating factor. See Jonathan Weinert et al. (2007). The transition to electric bikes in China: history and key |
| 15868 | 8 | 0 | | | | •Ch. 8 should also better quantify short term potential for each mitigation strategy, instead of just qualitative discussions<br>• This should be study of studies – there are several examples of graphs pulled from one source (e.g., Fig. 8.4.1). These have the potential to only represent one view. Pull charts from a range of informed sources, not just from one publication, and compile into one chart to show a range.<br>• Cite more "real world" examples (systems already built) rather than potential future projects<br>• Potential sections to shorten: 8.4, 8.5 (overlap with WG2- adaptation?), 8.10.5, 8.10.6, 8.9.2 (some repetition from previous sections), table 8.8.1<br>• Use more charts and graphs to convey results, esp. in section 8.6.3, 8.6.4 | Accepted. Improved quantification and synthesis. |
| 10758 | 8 | 0 | | | | There are some papers that I think could be useful for this chapter: 1) Berntsen and Fuglestvedt, 2008. Global temperature responses to current emissions from the transport sectors. Proceedings of the National Academy of Sciences (PNAS), 105 (49): pp. 19154-19159.<br>2) Skeie et al., 2009. Global temperature change from the transport sectors: Historical development and future scenarios. Atmospheric Environment, 43 (39): pp. 6260-6270. 3) Borken et al., 2010. Specific climate impact of passenger and freight transport. Environmental Science and Technology, 44 (15): pp. 5700-5706. 4) Tanaka et al. 2012. Climate effects of emission standards: the case for gasoline and diesel car. Environmental Science & Technology 46 (9), pp 5205–5213<br><br>In addition, there are several relevant studies from the EU projects QUANTIFY (www.ip-quantify.eu) and ATTICA (www.ssa-attica.eu). | these don't sound relevant to our task but will check |
| 10759 | 8 | 0 | | | | In a few places in the chapter the unit CO2-equivalent is used without any explanation of what this is, and how it is calculated. It should be made clear that the GWP-100 is used. It should be noted which components that are inlcuded in the calcuations of CO2-eq. In addition, it could be made clear that several studies have shown limtations of GWP in the context of transportation and how alternative metrics could be used. It is important to note that other time horizons and metrics would produce a different result; see figure 2 in Fuglestvedt et al., 2010: Transport impacts on atmosphere and climate: Metrics. Atmospheric Environment 44 (2010) 4648–4677. See also WGI, chapter 8, fig 8.31. | Noted. This will be covered in Chapter 1 and the glossary (Annex I). |
| 10760 | 8 | 0 | | | | The role of non-CO2 components could be given more attention since these components are important for the total climate impact of transport. | Noted. |
| 10761 | 8 | 0 | | | | The climate impact of the shipping sector could be given somewhat more attention. In particular the cooling effect (due to SO2 and NOx) and the long term warming effect of CO2. This issue is summarized in a short paper by Fuglestvedt et al., 2009 (ES&T), but also studied and discussed in several other papers in the literature. | Noted. Already covered in 8.2 but could expand. |

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| 10762 | 8 | 0 | | | | The climate impacts of aviation could also be given more attention. There are potentially strong warming effects of contrails and aviation induced cirrus which are very uncertain. There are several papers on this in the literature (e.g. by Ulrike Burkhardt and Bernd Kärcher in Nature Climate Change, March 2011). | Accpeted, added to 8.2 |
| 13427 | 8 | 0 | | | | In the aviation part, we should mention about the impact of the Low Cost Carrier. That business will be getting larger in the world. And its impact will be not so small. | Rejected, as reference is missing. |
| 16947 | 8 | 0 | | | | I regret I have not had time to review the Sectoral chapters in depth. It may be interesting to illuminate the hypothesis that Transport sector transitions are the most heavily dependent upon “Third Domain” characteristics of system evolution driven by innovation and infrastructural developments, and less dependent upon carbon prices than other sectors.<br>This is the broad suggestion laid out in the structure-setting Chapter 3 of Grubb, Hourcade and Neuhoff, Planetary Economics: the Three Domains of Sustainable Energy Development, Taylor & Francis forthcoming (Chapters 1 – 5 submitted, others in draft available on request).<br>Tranpsort transitions, including relationships to oil and integration with electricty developments, are discussed in chapters 3 and 11 of the book | Rejected. Need reference to be published. Reference is in the book by reviewer Grubb, Hourcade and Neuhoff, Plenetary Economics and the three domains of sustainable energy development (Ch.2), Taylor&Francis 2012. For the Transport sector that its transition depend on third domain (system) may be a good hypothesis difficult to prove or document with the |
| 8350 | 8 | 0 | | | | I suggest the summary of AR4 and what's new be added like Chapter. 9. | Accepted. Agree that we should call out "what's different" in this section |
| 2724 | 8 | 0 | | | | Please do not shorten sections 8.3.2. 8.3.3 and 8.3.4 but preferably increase their coveradge. In the other sections shortening possible. | Accepted. Need a balance. agree with this comment |
| 11272 | 8 | 0 | | | | This chapter covers a lot of very important mechanisms to mitigate climate change. In particular it does not only cover technological but also behavioral factors (see figure 8.1.2.b). However, there is still a strong focus on technological mechanisms. In the figure 8.1.2.b the area "activity" refers to all developments in society that, ultimately, affect transport; but these behavioural and structural dimensions, in my point of view, are not considered enough in their potential impact. For instance, it is not only economic wealth and development affecting kilometers travelled by persons. Nor is it sufficiently explained by adding urban form as a factor (though it is a very important factor): examples from Europe (eg. compare Copenhagen, Amsterdam and Zurich on the one side as good practices with other central European cities) show that even on the local level policy may affect "activities" and travel patterns in an important way; researchers discuss the concept of "mobility cultures" meaning that the (non-) dominance of certain modes of transport is a policy outcome (which is not closely related to economic development or other "hard" factors). Addtionally, over the last year a discussion of "life quality" and "happiness" emerged in the angloamerican literature which may shed some light on related questions. | Behaviour to be re-addressed in SOD |
| 13236 | 8 | 0 | | | | This chapter decomposes GHG emissions into activity, structure, energy intensity and carbon intensity and is grounded to latest academic literature on the subject. However we find that this approach might be counterproductive because it does not fully recognize the systemic nature of cities. It does not recognize that transportation system is fundamentaly linked with activity system. Therefore the question of transportation in not only a technical one (which instruments can lower each category) but also an economic one : to what extent can low energy cost be compatible with sustainability? | This is in Ch 12 |
| 13238 | 8 | 0 | | | | To reduce this chapter, section 8.3 could be reduced from 10 pages to 6 approx. by changing the description of each transportation technology into main challenges ; for instance : energy storage, new propulsion systems, supply chain change. Sections 8.3.4 and 8.3.5. should be kept. | Rejected. Authors don't see how they're going to cut the technology section down to 6 pages without killing off a lot of important detail (and of course many of the comments ask for more detail, |

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| 4046 | 8 | 0 | | | | The chapter on transport offers a virtual encyclopedia of options and possibilities, some already emerging, some are just hints at being possible. The author team did an excellent job in offering such an enthusiastic and comprehensive treatment of "transportation." At the same time, there will be places in the chapter where shortening and reformatting much text into succinct tables and graphics would help not only with understanding but also page limits. | Agree. Moving into tabular format will certainly save space…the question is, will readers actually READ the tables….I know that I tend to focus much more on text. |
| 4047 | 8 | 0 | | | | Transformation of transport is possible, but can we transform the whole system in major regions of the world in time -- especially in the context of achieving the 2 degree C rise -- by the end of this century. | probably not….but it's our responsibility to show how it might be done |
| 4048 | 8 | 0 | | | | Chapter 8 needs to convey more explanations about the key differences in outlook or projections from AR4 to AR5. For example, has the assessment of projections in technology advances and needed changes in policies assessed in AR4 become facts in AR5? Perhaps a succinct table of such items would help the reader understand the challenges and barriers in one glance. What are the drivers for or hurdles against such changes? For example, page 10, statement about AR4 begs the question about what has changed? | I agree….we really do need to define what's different…not only technology and policies adopted, but also our emphases (e.g., more emphasis on behavior and planning).….some ideas about technology and policy change: the latest round of U.S. fuel economy standards...VERY ambitious, and encouraging…stop-start systems in |
| 4049 | 8 | 0 | | | | Asking about the differences between AR4 and AR5 is another way of asking whether we are heading for and looking at second-best, no-longer-ideal scenarios and projections. I think that this question is important and needs to be posed and addressed. | As above (comment 4048). we should also, in this light, track what's happened on automobile sales since AR4 |
| 4050 | 8 | 0 | | | | There is too much text that describes data. Putting the data into tables or graphs could help reduce page length. For example: pages 11 and 12 (sections 8.1.2 - 8.1.3; page 13 (section 8.2.1) | Agree |
| 3576 | 8 | 0 | | | | Freight mitigation solutions are underrepresented. | Agree. would like to increase the freight / |
| 3577 | 8 | 0 | | | | Freight being responsible for about 35% of all transport ghg emissions, at least 20% of WGIII AR5 transport chapter authors, text length, citations, references, policies and costs statements should be also allocated to freight solutions. Now it is about 5%. | Agree |
| 3578 | 8 | 0 | | | | Only one of the CA of Chapter 8 is a recognised international freight expert. At least 2 authors should be recognised freight experts. | Agreed. Brought in further freight experts (Allen McKinnon). |
| 3579 | 8 | 0 | | | | I strongly disagree with the merging of freight and passenger mitigation statements. The types of policies might be similar, the way of implementing them is radically different and need specific approach and comments. | Not clear which section this refers to. would like to increase the freight / logistics content Most of this additional literature is relevant and could help us elaborate . This is partly true. There is certainly a need for greater harmonisation of the measurement and reporting of carbon emissions from freight transport. This should be mentioned in the report. On the other hand, there is an emerging consensus on the key measures that should be |
| 3580 | 8 | 0 | | | | There is almost no science on climate change mitigation in freight and logistics that is also mentionning passenger transport, and vice-versa. So what does not exist in reality should not be suggested in a IPCC report. | Much too negative. Under-estimates the amount and rigour of research done on this topic. |
| 3581 | 8 | 0 | | | | There is an abundant literature on freight solutions that has not been mentionned or cited. Main authors, books and articles that would need to be cited: McKinnon Piecyk: Internalisation of external costs 2008; OECD: transport and globalisation 2010; McKinnon et al: Green Logistics 2012; Leonardi & Baumgartner TRD 2004; Rizet et al, TRD 2012; Allen et al, IATSS 2012; | To include. Agree, but this is due to the lack of published research on the subject. Several organisations have constructed marginal abatement cost curves for freight transport and reference |

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| 3582 | 8 | 0 | | | | There is almost no literature and data on comparative costs per tonne of CO2 savings of different freight and logistics solutions. | Agree that there is a lack of published research on the subject. Several organisations have constructed marginal abatement cost curves for freight |
| 3583 | 8 | 0 | | | | Therefore, the focus of policy oriented search for innovative solutions is on testing and trialing new technologies or organisation forms, and assessing their mitigation potential. This approach allows us to go from the idea over the trial to the industry scale diffusion of innovation without being obliged to wait for a complicated political strategy development. | Point unclear. Maybe follows on from point above (comment 3582) |
| 3584 | 8 | 0 | | | | No common understanding on how to measure CO2 mitigation effects in freight: too many approaches and assessment methods are competing. No universal standard of CO2 calculation. Solution: try to organise a universal ISO standard on CO2 calculation for goods and passenger transports. | Noted. We see your argument but the task of the IPCC is to assess existing research and other data. |
| 3585 | 8 | 0 | | | | Load factor and vehicle occupancy are too low. The effects of efficiency measures on increasing vehicle load factors have been poorly recorded. New attempts of slow logistics, waiting for more goods to be distributed before starting the round trips, are promissing, and at zero additional costs. | Agree that we could say more about opportunities to improve load factors in freight vehicles. There is very little macro-level data available, particularly outside the EU, to permit assessments of current loading and the potential for improvement. Very little is known about the cube utilisation fo freight vehicles. |
| 3586 | 8 | 0 | | | | Clean electric freight vehicles and city logistics consolidation centres are currently tested in several urban freight trials in Europe (project documentations are available at SUGARLOGISTICS.eu, BESTFACT.net, SMARTFUSION.eu, STRAIGHTSOL.eu, etc). The assessments that include ghg mitigation criteria show mostly a positive cost-benefit situation. This type of solution involves behaviour change, new technologies, logistics efficiency, data collection and analysis, local policy support, European subvention at the trial stage, and involvement of manufacturers and software providers. The integrated case study approach currently in use is therefore a radical contradiction to this Chapter 8 structure that separates the different policy activities into an artificial set of different solutions. | Noted. |
| 3587 | 8 | 0 | | | | The attempts to develop a European Logistics Strategy that would be mitigating climate change have failed in 2006-2007. There is no international concerted action or strategy on mitigating clinate change in freight. The most recent EU white paper however, have taken some elements on board, that could be useful for other countries. Most prominent is the support of electric vehicle use. | Chapter already refers to the EU White Paper's ambitious freight modal split target. Could reinforce references to freight transport policy in other parts of the world. The European 2006-7 initiative is presumably the Logistics |
| 3588 | 8 | 0 | | | | There is also a pressing need for dedicated policy departments /experts dealing with freight and logistics at different governmental levels. | Need literature to support this point. There is evidence that governments around the world are attaching greater importance to logistics, though not always developing policies to address its environmental impacts. Raises wider |

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| 3597 | 8 | 0 | | | | Cite the new EU white paper "33. A strategy for near- 'zero-emission urban logistics' 2030<br>□ Produce best practice guidelines to better monitor and manage urban freight flows (e.g. consolidation centres, size of vehicles in old centres, regulatory limitations, delivery windows, unused potential of transport by river).<br>□ Define a strategy for moving towards 'zero-emission urban logistics', bringing together aspects of land planning, rail and river access, business practices and information, charging and vehicle technology standards.<br>□ Promote joint public procurement for low emission vehicles in commercial fleets (delivery vans, taxis, buses…).<br>" | Chapter already refers to the EU White Paper's ambitious freight modal split target. Could summarise other freight policy initiatives in this white paper as they have a clear climate change focus. Need also to bear in mind other comments that chapter is already too EU- and US-centric. |
| 7801 | 8 | 0 | | | | The chapter repeatedly writes "black carbon and aerosols". The need to focus specificly on black carbon is understandable. However, as black carbon is also an aerosol species, I would suggest writing "… and other aerosols" or just "aerosols". | Need to clarify this. |
| 12878 | 8 | 0 | | | | The chapter offers a wide perspective on climate-related transportation issues, in particular a wide range of technological and system-wide perspectives. Elaborations on policy instruments to tackle a carbon-intensive transportation path together with means to is financing do however not make up a large part of the chapter. Thus, a separate section on policy instruments and relevant studies is suggested. Changing the order of section 8.9 and 8.10 may be recommended. Strenghtening sections 8.9 and 8.10 may also benefit the chapter. Several citations are missing in the reference list. | Section 8.10 is on policy so point not clear. |
| 18649 | 8 | 0 | | | | Readable<br><br>The exsum readable and gives a real overview (not hidden in the FAQs) | Noted. |
| 18650 | 8 | 0 | | | | Indirectly indicates that the investment boom that will come with decarbonisation can be challenging (seen from a shorter term emissions perspective?) | This comment could not be addressed as it is unclear to which part of the |
| 18651 | 8 | 0 | | | | Trade? Discussed an earlier chapter – should be coupled with some of the content in this chapter. | This comment could not be addressed as it is unclear to which part of the |
| 18652 | 8 | 0 | | | | Reuse?<br>Recirculation? | This comment could not be addressed as it is unclear to which part of the chapter it is referring to. |
| 18653 | 8 | 0 | | | | Interesting section/annex on waste – could be expanded into something more general | This comment does not refer to Chapter 8 and hence has not been addressed. |
| 18654 | 8 | 0 | | | | Less known but seems partly depressing. Harder to estimate the full (and long-term) potential? | This comment could not be addressed as it is unclear to which part of the |

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| 5187 | 8 | 0 | | | | The whole chapter might be more system-based. Scenario analysis might be helpful to draw general tendencies, feedbacks, rebounds, and major policies and to what exten these policies should be integrated. While this chapter could be a systemic synthesis of existing knowledge, it now tends to be more a long list of all sorts of measures that might help to reduce emissions, without showing the many interrelationships between policies that might anhance or reduce the effectivity of the individual policies. Examples are: investing heavily in road infrastructure, while campaigning to get more commuters in public transport is not effective; same for investing in cheaper air transport (liberalisation of air market) and at the same time investing in high speed rail without really improving the economics of this latter system. Such contradicting policies will make it very difficult to make the mitigation progress needed. Scenario based refs: Åkerman, J., & Höjer, M. (2006). How much transport can the climate stand?--Sweden on a sustainable path in 2050. Energy Policy, 34, 1944-1957.<br>Banister, D., & Hickman, R. (2012). Transport futures: Thinking the unthinkable. Transport Policy, In press.<br>Bristow, A. L., Tight, M., Pridmore, A., & May, A. D. (2008). Developing pathways to low carbon land-based passenger transport in Great Britain by 2050. Energy Policy, 36, 3427-3435.<br>Dubois, G., Ceron, J. P., Peeters, P., & Gössling, S. (2011). The future tourism mobility of the world population: emission growth versus climate policy Transportation Research - A, 45, 1031-1042.<br>Girod, B., van Vuuren, D. P., & Deetman, S. (2012). Global travel within the 2º C climate target. Energy Policy, 45, 152–166.<br>Gurney, A., Ahammad, H., & Ford, M. (2009). The economics of greenhouse gas mitigation: Insights from illustrative global abatement scenarios modelling. Energy Economics, 31, S174-S186.<br>McCollum, D., & Yang, C. (In press). Achieving deep reductions in US transport greenhouse gas emissions: Scenario analysis and policy implications. Energy Policy, Corrected Proof.<br>McJeon, H. C., Clarke, L., Kyle, P., Wise, M., Hackbarth, A., Bryant, B. P., & Lempert, R. J. (2011). Technology interactions among low-carbon energy technologies: What can we learn from a large number of scenarios? Energy Economics, 33, 619-631.<br>Meyer, I., Kaniovski, S., & Scheffran, J. r. (2011). Scenarios for regional passenger car fleets and their CO2 emissions. Energy Policy, In Press, Corrected Proof.<br>Meyer, I., Leimbach, M., & Jaeger, C. C. (2007). International passenger transport and climate change: A sector analysis in car demand and associated CO2 emissions from 2000 to 2050. Energy Policy, 35, 6332-6345.<br>Peeters, P. M., & Dubois, G. (2010). Tourism travel under climate change mitigation constraints. Journal of Transport Geography, 18, 447–457.<br>Scott, D., Peeters, P., & Gössling, S. (2010). Can tourism deliver its 'aspirational' greenhouse gas emission reduction targets? Journal of Sustainable Tourism, 18, 393 - 408.<br>Sgouridis, S., Bonnefoy, P. A., & Hansman, R. J. (2010). Air transportation in a carbon constrained world: Long-term dynamics of policies and strategies for mitigating the carbon footprint of commercial aviation. Transportation Research Part A: Policy and Practice, In Press, Corrected Proof.<br>Sterner, T. (2007). Fuel taxes: An important instrument for climate policy. Energy Policy, 35, 3194-3202.<br>Yang, C., McCollum, D., McCarthy, R., & Leighty, W. (2009). Meeting an 80% reduction in greenhouse gas emissions from transportation by 2050: A case study in California. Transportation Research Part D: Transport and Environment, 14, 147-156. | Noted. System aspects are particularly discussed in Section 8.9. |
| 5214 | 8 | 0 | | | | The social drivers to (international) transport as outlined in Chapter 10 (tourism section) are missing here. The problem is that tourism is developing into a system highly depending on long distance air transport, while currently air transport covers only less than 20% of all tourost trips, while long haul in the order of 5%; but still causing up to 80% of all emissions (Peeters, P. M., & Dubois, G. (2010). Tourism travel under climate change mitigation constraints. Journal of Transport Geography, 18, 447–457). When air transport is considered on its own, demand falls out of the equation, because the aviation sector can not be asked to reduce its own demand. Therefore it is important to integrate analysis of torism and transport and show the large opportunities to reduce only small segments of ourism (mainly long haul) to significantly reduce demand for air transport. The same seems truye for other parts of transport where current transport demand seems to be taken as a given, making it extremely unlikely to find enough mitigation opportunities. | Noted. Tourism and the effects of its demand is covered in Ch.10. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8016 | 8 | 0 | | | | "Policy and decision making for transport development in non-OECD countries are instrumental to meet urban sustainability and climate goals" from p64, l.11 is worth being mentioned in the Ex. Summary | Agree but space constrained. |
| 8021 | 8 | 0 | | | | "Without policy intervention, projected incremental improvements in fuel, vehicle and system efficiencies will be surpassed by annual growth in transport demand." from p.58, l.42 is worth being mentioned in the Ex. Summary | Agree but space constrained. |
| 8024 | 8 | 0 | | | | "However, a number of technology options, such as second-generation biofuels, electric- and hydrogen- powered vehicles will still require time to make substantial contributions to climate change mitigation efforts in the transport sector", "Historical analysis suggests that it takes 30-70 years to fully implement new infrastructures" and "It is likely to take the introduction of 5-10 million vehicles over 15-20 years for both BEVs and FCVs to break even in costs with ICEs" from 8.9.2 on p.55 (l.15f, l.19 and l.36f) should be mentioned in the Ex Summ. | Agree but space constrained. |
| 8025 | 8 | 0 | | | | "Achieving a 2oC stabilisation level will require major mitigation contributions to come from the transport sector over the next two decades" from p.55 l4f should be mentioned in the Ex Summ. (same for p.52, l.26) | Agree but space constrained. |
| 8029 | 8 | 0 | | | | "In turn, a transformation towards a sustainable transport system requires simultaneous changes in non-transport domains, e.g. in relevant public institutions" from p.29, l.29f should be mentioned in the Ex Summ. | Agree but space constrained. |
| 8034 | 8 | 0 | | | | "Recent trends suggest that current economic, social, or cultural changes alone will not be sufficient to mitigate global increases in atmospheric CO2 concentrations, and policy instruments, incentives, or interventions will be needed to reduce global CO2 emissions" from p.15, l.20f is worth being included in the Ex Summ. | Agree but space constrained. |
| 8036 | 8 | 0 | | | | The constant travel time budget (see p14, l. 4f: "Urban travel time budgets averaging around 1.0 hour per person per day or 1.1 – 1.3 hours per traveller per day (Zahavi and Talvitie, 1980; van Wee et al., 2006) have been found to occur in all cities where data is available, including developed and developing economies") is a fundamental rule for transport planners and thus should be mentioned in the Ex Summ. | Agree but space constrained. |
| 3162 | 8 | 0 | | | | This is hard to review because it is so far over limit. | Aiming to shorten |
| 3163 | 8 | 0 | | | | It would be useful to have more links between this chapter and others, notably on the choice of policy instrument (a topic addressed in several chapters) and on how transformation pathways play out in the transportation sector. (IN this sense, chapter 9 offers a useful model. Here is a copy of a comment I made on chapter 9 in that regard: "Section 9.9.1 is a good model of what's needed in other sectoral chapters—a link back to chapter 6 so that readers can see how a common set of transformation pathways affects each sector. ") | Have many cross-references already throughout text. Can add more. good point |
| 5692 | 8 | 0 | | | | Technologies that contribute to green transportation are not limited to energy saving. IT (Information Technologies) can reduce emission by inproving efficiencies of logistics. | Agree. Covered already but can expand |
| 18765 | 8 | 0 | | | | Please consider discussing planned obsolesence in context of sustainability or reference Ch.10 where this might be centrally discussed. | Unclear what this refers to. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18962 | 8 | 0 | | | | General Comment: Storyline. The chapter still lacks a storyline. A storyline should take the following aspects into account:<br>(1) The transport sector is the most difficult to decarbonise. In order to avoid dangerous climate change also the transport sector is required to significantly contribute to mitigation. This requires dramatic changes – this does not come across when reading the chapter. The chapter should clearly address this challenge and outline different pathways to solve the problem. I.a. they should cover how a rebound effect can be avoided. At the current state of the chapter implications of trends and options do not become clear to policy makers. Develop own back-of-the-envelope scenarios to convey estimates for different options, e.g. illustrating expected total emissions for different scenarios (i.a. expected BAU increase of LDVs modest technological progress vs. different mitigation cases).<br>(2) What is the potential of the respective pathways? What do they cost?<br>(3) What are the policy instruments that can facilitate this? What is the role of policies in different scenarios? E.g., should the sector be included in carbon pricing? Assessment of experience with different policy instruments is needed.<br>(4) What are the trade-offs?<br>(5) Further, better carve out the barriers that hinder potentials being realized.<br>(6) Ensure that the approach you take on this is compatible with the other sectoral chapters to enable comparison and possible synthesis. | Noted. |
| 18963 | 8 | 0 | | | | General Comment: Redundancies, structure and synthesis. The chapter presents a lot of data, but in large parts lacks synthesis – this is needed, though, to substantiate key messages. The Kaya identities are used in several parts of the chapter but improvements are needed in using it as structuring element (particularly as common reference point throughout the chapter) and for synthesis (outlining key strategies, how much each component can contribute [differentiated by regions] – also quantitatively [not only for examples as in Section 8.6]), e.g. "Transportation has a low to medium reduction potential for demand reduction (0-30%), a medium potential through modal shift (X%-20%), for energy intensity reduction a potential of Y% for air travel, Z% for shipping incl. waterways, A% for rail and B% for roads. The carbon intensity can be reduced by ...". | Agree. We will amend. |
| 18964 | 8 | 0 | | | | General Comment: For all sectoral chapters there must be more clarity about what is covered in the section “Cost and Potentials” (8.6) and in “Sectoral implications of transformation pathways and sustainable development” (8.9). The coming meetings (SIE-3, LAM3) should work on this. | Agree. We will amend. |
| 18965 | 8 | 0 | | | | General Comment: In order to improve the flow of the text numbers should be moved from the text to tables and/or (better) figures. The text should focus on giving the context and interpreting. | agree…especially in early sections, too many numbers |
| 18966 | 8 | 0 | | | | General Comment: Focus. There is still too much focus on technologies (vehicle types and propulsion technologies) | Don’t agree as the balance has been discussed |
| 18967 | 8 | 0 | | | | General Comment: Length. The chapter is well beyond its page limit. | Agreed |
| 18968 | 8 | 0 | | | | General Comment: Linkage. A strategy needs to be developed of how to synthesize and possible aggregate data (incl. costs) that will function as a counter part to scenario data from Chapter 6. Explicit references to Chapter 12 are needed and clarification what is covered in this chapter and in Chapter 12 | Chapter 12 already X-referenced widely. |
| 18969 | 8 | 0 | | | | General Comment: Costs. Concerning costs, a common metric should be established, LCCEs provide such a metric. | Agree section 8.6 |
| 18970 | 8 | 0 | | | | Please consider adding a discussion on land-use, land prices and its implications to the chapter, including land area used by different modes (per passenger per time), differences of costs between running public transport underground or on the ground. | Rejected. Relevance not clear. Addressing such issues is not feasible given the limited size of the chapter. |
| 18971 | 8 | 0 | | | | Concerning policies consider discussing the consequences of ownership of land and/or transportation infrastructure for the ability to implement policies (e.g. ownership of rail networks). | Rejected. What relevance to transport mitigation? Maybe in Ch 12 and/or |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11605 | 8 | 0 | 0 | | | Chapter difficult to read and to review. It's not wrong, but has several major shortcomings: 1) Lack of focus: A holistic assessment of the full climate impact of transportation today and in the future, as well as its mitigation potential is not done. 2) Lack of balance: Most is on passenger transport, not balanced with the role of freight transport. 3) Lack of comprehensiveness: Results from single studies are highlighted in charts and figures. I would however expect summary charts and tables from a review. Exceptions and hence good examples: Tab. 8.6.2 and Tab 8.8.1 seem to summarize, but are hard to read (even because of bad reproduction quality). These tables seem to be key and should be expanded furhter, better placed highlighted. Figs 8.9.1/2 are very interesting as well, though source is missing. 4) Lack of specifics/too broad brush: Though it is acknowledged throughout the text that there are important regional differences, you do not highlight and distinguish them clearly. Suggestion: Try to identify some (country) case studies for which you pull through your quantitative results. Good countries, standing for larger country groups, could be: US/WEU/JPN; CHN/IND. Here you could nicely illustrate eg. levels of transportation (e.g. as pkm/cap and tkm/GDP; energy intensity; total transprot energy use; total transport emissions of LL and SL GHG; analysis what mitigation options would seem feasible and what impact that might have. Trying to do all at once has resulted in the current stew.5) A lot in this chapter is on energy demand. Translate this to GHG emissions and impacts, then you are better in focus. | Repetition of comment 11595, see answer there. |
| 10442 | 8 | 0 | 0 | | | The new technologies that create the savings in Co2 are exciting, but I do not see an explicit connection spelled out here between these green technologies and exact impacts on the environment. | Noted. Section 6.9 is meant to provide a systems perspective showing the |
| 10443 | 8 | 0 | 0 | | | Need more developing country focus | Agree. |
| 7393 | 8 | 0 | 0 | 0 | 0 | This chapter should include a section (and a statement in the executive summary) that considers and discusses the role of GHG metrics (GWPs etc) for transport, particularly for lifecycle assessments of transport emissions. E.g. Peters et al, EnvSciTec 2011; Azar and Johansson ClimChan 2012; Fuglestvedt et al, AtmosEnv 2010. Such information is highly policy relevant especially for policy approaches that try to consider short-lived as well as long-lived forcing agents (an issue that also seems to have received very little attention in this draft; e.g. for regional approaches to limit transport emissions, and for lifecycle assessments). This discussion could link with Section 3.10.3 but build on it by demonstrating the particular instances where metrics are important in the transport sector. | Noted. The choice of GWPs etc. is covered in the framing chapters. We added a reference. |
| 3437 | 8 | 0 | 0 | | | You write about demand reduction in Sections 8.6.1 and 8.10.1. You write about modal shift in Sections 8.4.2.3 & 8.4.2.4 and in Section 8.6.2 (and ignore modal shift in Section 8.10.1). I understand that Sections 8.4, 8.6 and 8.10 deal with different aspects, however all this multiple reference to the same topics is confusing. | Demand reduction is more than modal shift. |
| 3443 | 8 | 0 | 0 | | | You write about demand reduction in Sections 8.6.1 and 8.10.1. You write about modal shift in Sections 8.4.2.3 & 8.4.2.4 and in Section 8.6.2 (and ignore modal shift in Section 8.10.1). I understand that Sections 8.4, 8.6 and 8.10 deal with different aspects, however all this multiple reference to the same topics is confusing. | Accept. Chapter will be revised and repetitions will be avoided. However, in some cases, because different aspects of a same issue have to be dealed with from a different perspective in the different sections of the chapter, the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3444 | 8 | 0 | 0 | | | General comment: Obviously the chapter contains essentially all the important information about the transport sector - especially with regard to passenger transport with which I am more familiar. The authors are experts in the field and are very well aware of the literature. However, the organization of the chapter could be improved in my opinion because I found it confusing from Section 8.4 onwards. Therefore, when writing about mitigation costs and potentials, opportunities and barriers, I suggest following the ASIF structure shown in Figure 8.1.2.b: Adrress one Section to each one of the four parameters of the equation - demand reduction, modal shifts, changes in energy intensity and changes in carbon intensity respectively. The latter two parts are very well covered by the excellent Section 8.3. Subsequent sections and subsections dealing with behavioural aspects, urban form, infrastructure, costs etc. could be grouped together in line with the ASIF structure; this would greatly improve the clarity of the messages of this chapter. Policy options should be described in a similarly structured and clear manner. Table 8.8.1 could be extended to include potentially more policy options plus a column on cost-effectiveness of each measure, and thus it would become the key summary table of the whole chapter. | worth considering but cannot change level 1 sub-headings as set by IPCC Plenary. |
| 17778 | 8 | 1 | | | | somewhere in the text there should be a mention of the EPA 2017-2025 light duty vehicle rule - does t discourage alternative fuel use? | Accept - will need a reference |
| 17779 | 8 | 1 | | | | For the executive summary - consider the formats used in chapters 16 and 10 | This version based on past IPCC |
| 13872 | 8 | 1 | | 100 | | Authors often refer to future when estimating the interest/potential of a specific measure, then it may be useful to clearly define which kind of baseline is used. + It could also be useful to better define "Cities" (versus urban area) and to link the definitions used with chapter 12 (Human settlement) + There is no need to start (as always) with technology first as a solution: to avoid main emissions in the future through urban form should be stronger emphasized. □ | Accepted. Please note, though, that as chapter is based on various studies, it is not possible to refer to a consistent baseline throughout and that using one would also be not inspirit of a |
| 11183 | 8 | 1 | 1 | 1 | 1 | Chapter 8 is well-organized and very informative. It contains many new important subjects. | Agree |
| 2438 | 8 | 10 | 10 | | 13 | This definition is a good one - but accessibility is not mentioned again (apart from passing - p29 and 38) - until the end (p58) and then not in terms of sustainable mobility - issues of affordability, equity and efficiency are also not referred to again in the context of this definition. | Accept. |
| 17708 | 8 | 10 | 10 | | | Is transport about mobility or access? The chapter emphasizes the first rather then the second. But surely mobility is a means to an end, rather than a value in its own right? There is little in the chapter that tackles explicitly what might be done to reduce travel (without reducing welfare). | Both. I thought there was quite a bit about density and urban planning |
| 15320 | 8 | 10 | 13 | | | I think "between" will sound better as "across". :-) | Accept |
| 15321 | 8 | 10 | 14 | | | "whereas" needs a comma in front of it. | Accept |
| 15322 | 8 | 10 | 15 | | | open parens in front of Zegras should be removed. | Accept |
| 15323 | 8 | 10 | 16 | | | "Diminishing" should probably be "Reducing" (since that is a more active/appropriate verb & is simpler to read & quickly understand). | Accept |
| 8871 | 8 | 10 | 2 | | | Not sure that HDVs are used in urban regions only | Agree. sentence doesn't say this |
| 11607 | 8 | 10 | 2 | 10 | 2 | HDV increase in urban areas. What's the evidence? | Amended. good question |
| 15805 | 8 | 10 | 20 | 10 | 25 | suggest omitting this paragraph. Does not add much value | To be considered in next draft. agreed…unless we add something later |
| 15324 | 8 | 10 | 20 | | | "assessing" should be "assess" | Accept |
| 14751 | 8 | 10 | 20 | 10 | 20 | Please name indicators. Furthermore a lot of transport indicators are uncertain (travel activity, load factors, on-road fuel economy) and data collection needs improvement (especially on-road fuel consumption) to obtain a better picture of todays transport system | Accept |
| 15325 | 8 | 10 | 21 | | 23 | all those references need to be in one set of parentheses | Amended |
| 15326 | 8 | 10 | 25 | | | citation is imperfect (should only have one last name, no initials, etc.) | Amended |
| 15327 | 8 | 10 | 26 | | | cross cutting needs a hyphen | Accept |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15330 | 8 | 10 | 26 | | 35 | I am not sure why a "this chapter does this & this" paragraph suddenly shows up in the middle of all these paragraphs. It is out of place (& those "this chapter" refs can probalby be deleted, since they're a bit generic). Of course, an intro to a chapter's contents is always nice to see (but that should be plainly in the chapter's intro). | Moved |
| 14752 | 8 | 10 | 26 | 10 | 35 | Something like this should maybe occur at the beginning of the chapter? | Moved |
| 2809 | 8 | 10 | 26 | 10 | 30 | What this sentence intends to convey is not clear. This para seems to explain the structure of the chapter. Then, the sentence should be rewitten to indicate that this chapter first discusses a system-based framework of indicators. It would further need what specifically mean "a system-based framework of indicators" | Amended |
| 5186 | 8 | 10 | 26 | 10 | 30 | I feel the "system-based framework" is not very well presented nor developed. Such a framework should make use of systems thinking and show, e.g. through causal loop diagramming, the feedback mechanisms between transport quality, transport cost, transport speed, energy efficiency, spacial structure and transport volumes (a tourism related sample in Peeters, P. (2010). Tourism Transport, Technology, and Carbon Dioxide Emissions. In C. Schott (Ed.), Tourism and the Implications of Climate Change: Issues and Actions (Vol. 3, pp. 67 - 90). Bingley (UK): Emerald. Furthermore my suggestion would be to mch more base this chapter 8 on the many scenario based literature and its conclusions (see general chapter remark nr 6). | Agree that this paragraph doesn't work here, and it's not clear we've used a system based framework. Tourism in Ch 10. |
| 15328 | 8 | 10 | 28 | | | comma needed before "including" & this whole sentence (which is very confusing & unusually long) should be overhauled (& shortened, to get to the point) | Amended |
| 15329 | 8 | 10 | 31 | | | comma missing before "along with" | Amended |
| 12884 | 8 | 10 | 34 | 10 | 35 | This sentence is not very comprehensible and should be elaborated. It could help to refer to the chapters where the subject/the distinction is implemented. Or is it meant that behavioural aspects of mitigation in the transport sector are treated marginally, e.g. chapter 8.3.5 is just about one to two pages in contrast to several pages of technological options? Please clarify. | Amended. and technology doesn't belong in a sustainable perspective? This sentence shows a distinct bias against technology |
| 11609 | 8 | 10 | 36 | 10 | 49 | You miss behavior change and demand reduction among the mitigation options. | Amended |
| 15331 | 8 | 10 | 36 | | | colon is needed after "factors" (rather than a comma) | Accept |
| 14753 | 8 | 10 | 36 | 10 | 49 | Why fuel switch is always mentioned first? I would start with vehicle efficiency measures as these include cost efficient, near term action. | Is no ranking order intended. not important |
| 4290 | 8 | 10 | 36 | 10 | 37 | Three main factors, carbon intensity (CO2eq/MJ), energy intensity (MJ/km), and activity (km/capita) are correct. However, actual vehicles transports the passenger or freight fewer than a capacity. Transport efficiency (road factor) affects the GHG emissions per capita or per ton. Therfore, I propose next decompose.<br>GHG emissions = carbon intensity (CO2eq/MJ) × energy intensity (MJ/capacity-km) × activity (man-km, or ton-km) / road factor(real number of passenger/capacity, or real tons of freight/capacity) | Good point included. This is correct for freight and reflected in the current references to carbon intensity in the chapter. worth considering |
| 16279 | 8 | 10 | 37 | 10 | 37 | Energy intensity is usually defined in terms of MJ per passenger-km (pkm) or MJ per tonne-km (tkm), and activity is usually defined in terms of pkm or tkm. | Amended |
| 15332 | 8 | 10 | 38 | | | Bongardt should not have a parenthesis in front (both citations' years should be in parens, but not the author names, in this case). | Accept |
| 15333 | 8 | 10 | 39 | | | I'd remove "(energy carriers)". There's on need for it here & it's not a term I would use. (A carrier is usually a freight carrier, sent by a shipper. So energy carrier reminds me of a system or firm to carry energy, not a material or substance. ;-) ) | Common term for fuels etc. Editorial. the term "energy carrier" usually refers to electricity or hydrogen, not to all fuels, I |
| 5396 | 8 | 10 | 39 | | 40 | why would varying carbon intensity affect activity? Perhaps this would be true once a strong carbon tax were in place, but otherwise why would this matter? | eg limited range of electric vehicles but deleted |
| 15316 | 8 | 10 | 4 | | | "as" should be ", since". | Accept |
| 15334 | 8 | 10 | 40 | | | "on" should be struck in *both* instances. I also don't understand why a fuel type would affect activity (though I realize that a battery limits range, so BEVs don't really allow for long-distance vacations, for example). Specifics are importnat throughout this chapter. There is too much generic info on this page, I feel. | Editorial. Deleted. Agree |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15335 | 8 | 10 | 40 | | | "therefore" should be struck | Accept |
| 15336 | 8 | 10 | 42 | | 43 | the "thereby" clause should be struck ("switching modes" is the only change in the list that has a specific example, and it's rather obvious why switching modes could be helpful, so no example is needed). | Accept |
| 16280 | 8 | 10 | 42 | 10 | 43 | The phrase "thereby reducing the shares of less efficient modes" is redundant and should be deleted. | Accept |
| 15337 | 8 | 10 | 44 | | | "whereas" needs a comma in front of it. Please seek & replace throughout the chapter. There may be other instancesI'm not catching. | Accept |
| 15338 | 8 | 10 | 45 | | | comma belongs after the parenthetical (not before) | Accept |
| 15339 | 8 | 10 | 46 | | 47 | comma needed after "chapter" (this is a long sentence, and the reader needs a breath break here ;-) ) Or you can just remove the "in order to give…" clause. | Accept |
| 15340 | 8 | 10 | 48 | | | "on" should be struck | Editorial |
| 15317 | 8 | 10 | 6 | | | "public transport" should be "use of public transport" (to be consistent with other items in sequence), and "systems, related" should be "systems and related". | Accept. Editorial |
| 15318 | 8 | 10 | 7 | | | "intensive" should be removed. | Editorial |
| 8872 | 8 | 10 | 9 | 10 | 10 | unfinished sentence | Amended |
| 14273 | 8 | 10 | 9 | 10 | 25 | Not sure of the relevance of these two paragraphs - they could be removed without affecting the narrative. | Accept |
| 11608 | 8 | 10 | 9 | 10 | 35 | Suggest to delete. You don't need the SD debate here - and you don't take it up later anyway. | Accept |
| 15319 | 8 | 10 | 9 | | 10 | This odd first sentence of the paragraph should be removed (or overhauled). | Amended |
| 14750 | 8 | 10 | 9 | 10 | 19 | Please re-phrase | Amended or eliminate |
| 12883 | 8 | 10 | 9 | | | The second paragraph of this page begins with a sudden onset of the term "sustainable transport". It would help the flow of the text if the term was introduced. | Defined there. or deleted |
| 5185 | 8 | 10 | 9 | 10 | 19 | Suggest to add reference to e.g. Åkerman, J. (2005). Sustainable air transport - on track in 2050. Transportation Research - D, 10, 111–126 and Åkerman, J., & Höjer, M. (2006). How much transport can the climate stand?--Sweden on a sustainable path in 2050. Energy Policy, 34, 1944-1957. This is also linked to my comment number 2. | Agree. to include |
| 17167 | 8 | 10 | 1 | 10 | 8 | Good to highlight what the AR4 was saying; would be good also to show to what extent and how the AR5 is different | Will add |
| 6475 | 8 | 10 | 1 | 10 | 2 | Not sure as to why “urban” is indicated. Heavy duty trucks ownership and VKT has increased due to high rate of growth of expressways and road construction in rural areas when compared to improvement of railways and thereby road freight movement increasing its share and tonnage. | Agree. There is an important inter-urban dimension to road freight traffic growth which needs to be mentioned. This growth has not only be due to the expansion of road expressway capacity, however. needs to be |
| 2663 | 8 | 10 | 1 | 10 | 2 | Implication in this sentence is that the cause of freight transport growing more rapidly than passenger transport is 'the use of HDV in urban regions and ships for international movement of freight'. Please rephrase this sentence. | Agreed. There is a need for a more comprehensive explanation of why freight traffic volumes have been |
| 2665 | 8 | 10 | 26 | 10 | 35 | The discussion of sustainability indicators (other than co-benefits of GHG mitigation) seems out of place and unnecessary. | Amended |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8362 | 8 | 10 | 35 | | | PIs define what you mean by sustainable transport here (alt give a reference to the place in this report where you define it) and highlight the implications of sustainable transport on freight services. Otherwise the reader cannot follow your arguments and understand the separate meanings related to the technological perspective versus a sustainable transport perspective. And when implemented -what kind of results will the two different strategies lead to? | Agree, though this is clearly a matter of opinion and only one reviewer has made this point with reference to freight transport. A distinction is made between technological and sustainable transport perspectives. It is assumed that the reviewer is using the latter term to describe behavioural initiatives. It is probably true that, relative to the discussion of behavioural options for carbon mitigation in the freight sector |
| 2666 | 8 | 10 | 44 | 10 | 45 | "…whereas sustainable transport options, including behaviour, tend to focus on activity and structure." There are multiple definitions of 'sustainability', 'sustainable transport', etc. I disagree with how this is being defined and would recommend that this be deleted to avoid confusion. | agree |
| 13875 | 8 | 10 | 45 | 10 | 49 | Life Cycle Analysis should be considered for teh different transportation modes. See articles of Dr. Arpad Horvath (Professor, University of California, Berkeley) and Chester, Mikhail, UC Berkeley Center for Future Urban Transport) | Add to 8.1.3 |
| 2664 | 8 | 10 | 9 | 10 | 25 | These paragraphs seems out of place. Suggest this be deleted. | Amended |
| 17760 | 8 | 100 | | | | 33 pages of references, two-third of the chapter is references, just too many. Some references are of lttle significance. | It is a review of the literature. probably a a fair comment |
| 8873 | 8 | 11 | | | | It might be better to use a 2D graph here. Current figure seems to suggest that there is some passenger transport using pipelines going on. | Editorial. there's no reason for the 3-D effect |
| 2439 | 8 | 11 | | | | The key figure here misses one element - occupancy: either in terms of load (is the freight full or empty) or in terms of passengers - activity is only looked at here as a measure of distance - not what is going to be done at the destination - the figure needs rethinking. | Accept - amended in text. Allowance should be made for vehicle loading. good point |
| 4336 | 8 | 11 | | | | need emissions data for passenger only | Noted. Figure was replaced by different |
| 4337 | 8 | 11 | | | | need to provide original source: this is from Schipper (various IEA publications) | Assume this refers to Fig 8.1..2b but to |
| 11274 | 8 | 11 | | 11 | | I like this figure for disentangling certain mitigation options in 4 steps; however, there are some negative feedback mechanisms that may occur and that are not covered with this scheme (eg. Reductions in energy intensity may induce reductions in travel costs and, thus, increase the total amount of travel, as mentioned later in the report); moreover, the "activity" dimension could be elaborated further, see remark No. 1 | - rebound effect to be included. don't agree that negative feedback is not "covered"….it just isn't called out explicity, but nothing says the four |
| 14755 | 8 | 11 | - | 11 | - | The share of rail seems very small, compare e.g. ETP 2012, chp 13, fig 13.1 | To be revised. worth checking |
| 8351 | 8 | 11 | 1 | | | Kaya identity is shown almost in every sector such as transport (Ch.8), building (Ch.9) and industry (Ch.10). Therefore I think figure 8.1.2.b is deletable for shortening the volume. | Is outlined in detail in an earlier chapter. Here it will relate only to transport (figure to be replaced). if there is a discussion |
| 5188 | 8 | 11 | 1 | 11 | 1 | This figure, though in itself correct, is too linear, actualy stating that activity is a given, while activity (pkm, tkm) is a function of mode choice, energy source and associated cost, system efficiency (speed, cost), infrastructure development and maintenance, social sructure, car and biycle (and airplane) ownership. Furthermore, most of these parameters have feedbacks to the activity and to each other. By making the current figure the basis of the chapter, you run the risk to be unable to show many opportunities as well as threats to the success of mitigation policies, (including strategies aiming at car ownership and bicycle ownership policies and also season tickets for public transport; large shifts in infrastructure investments, road transport speed policies (increased recently by the Dutch government, which simply adds some 5-10% of emissions to the system). | Noted. We agree with the concerns - ASIF is used as a structuring element only. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4291 | 8 | 11 | 1 | | | For a reason same as the above,<br>Total GHG emissions = ∑Structure(% share of mode) × carbon intensity (CO2eq/MJ) × energy intensity (MJ/capacity-km) × activity (man-km, or ton-km) / road factor(real number of passenger/capacity, or real tons of freight/capacity) | Accept - new figure amended. This is correct for freight and reflected in the current references to carbon intensity in the chapter. Same as comment 457. we DO need to account for load factor….although it may just be |
| 8430 | 8 | 11 | 10 | 11 | 10 | Please specify in a note that LDV include both passenger cars and light commercial vehicles, since in a lot of references on road transport emission assessment (i.e. Copert program) the term LDV is used only for light commercial vehicles. | Accept. we should have defined LDV up front |
| 15341 | 8 | 11 | 10 | | | I'm not a big fan of "modal choice". I would never state it that way; I would just say "mode choice". | Editorial |
| 14754 | 8 | 11 | 10 | 11 | 12 | Re-phrase please | Accept |
| 17168 | 8 | 11 | 14 | 11 | 14 | The energy demand for rail freight is higher than for passenger rail according to IEA/UIC stats, figures needs to be updated for rail | The UIC Railway Handbook 2012 of Energy Consumption and CO2 Emissions (Figure 23), this is not true provides a break-down of rail passenger and freight energy use and CO2 by |
| 15342 | 8 | 11 | 15 | | | I don't know what "indicative" means; I'd strike that from the title. | Accept |
| 15343 | 8 | 11 | 17 | | | IEA reference needs parens removed & semicolon added | Accept |
| 8874 | 8 | 11 | 18 | 11 | 22 | these are tonnes carried and not t-km carried | Rejected. t-km is correct |
| 11613 | 8 | 11 | 18 | 11 | 22 | Good references:<br>Jens Borken, Heike Steller, Tamás Merétei, Filip Vanhove: Global and Country Inventory of Road Passenger and Freight Transportation: Fuel Consumption and Emissions of Air Pollutants in Year 2000. Transportation Research Record: Journal of the Transportation Research Board. Volume 2011, 1, 127-136. DOI - 10.3141/2011-14. http://trb.metapress.com/content/X2223425H545K651<br><br>Jens Borken-Kleefeld, Terje Berntsen, and Jan Fuglestvedt: Specific Climate Impact of Passenger and Freight Transport. Environmental Science & Technology 2010 44 (15), 5700-5706 | Noted. Most of this additional literature is relevant to freight and could help us elaborate . |
| 11614 | 8 | 11 | 18 | 11 | 22 | Only freight ? Add traffic volume figures also on passenger transportation. | Aiming to do that |
| 16281 | 8 | 11 | 18 | 11 | 18 | As shown in Azar et al. (C. Azar et al., 2003. "Global Energy Scenarios Meeting Stringent CO2 Constraints - Cost-Effective Fuel Choices in the Transportation Sector." Energy Policy 31, pp. 961-976), freight movement is dominated by international shipping. | Noted. |
| 8038 | 8 | 11 | 19 | 11 | 19 | I doubt if the '5100 bn tkm per year for global road freight' is correct, and I know that 'rail is moving globally 350 bio tkm' is wrong: In China alone in 2008 2500 bio tkm freight have been moved, in US and in Russia a similar number of tkm per year. This is 6000 or 7000 bio tkm freight by rail in these three countries alone. From wikipedia I learn that in 2010 9.281 billion tkm were transported on rail. | The statistics quoted in the chapter need to reviewed and if necesssary amended. as earlier comments noted, they think this is tonnes carried, not tonne-km. Agree. The rail transport volume is 9,281 billion tkm in 2010 globally (see world |
| 14274 | 8 | 11 | 20 | 11 | 21 | The average distance of international shipping cargo is known, and was around 4500nm per tonne in 2006. Reference is Committee on Climate Change (2011), "Review of UK Shipping Emissions", Figure 4 p19 (http://downloads.theccc.org.uk.s3.amazonaws.com/Shipping%20Review/CCC_Shipping%20Review_single%20page_smaller.pdf). This is calculated as global tonne-miles/global tonnes shipped. | The statistics quoted in the chapter need to reviewed and if necesssary amended. UNCTAD's annual review of Maritime Transport may be another authoritative |
| 15344 | 8 | 11 | 21 | | | The "and" should become a semicolon. | Accept |
| 2440 | 8 | 11 | 23 | | | A figure of 980 million LDVs is used here - on p15 li11 a figure of 780 million is used | Accepted. |
| 14275 | 8 | 11 | 23 | 11 | 30 | The information in this paragraph could be very usefully represented in a graph - this would make it easier to digest. | Agree |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15807 | 8 | 11 | 23 | 11 | 30 | Might mention that petroleum demand is leveling off in OECD nations but increasing in devleoping world | Reference? thought we did say this |
| 11615 | 8 | 11 | 30 | 11 | 30 | Cities don't consume, only people and their machines. Mind the language, as it transports images and possibly perpetrates concepts, for better or worse. | Accept |
| 12885 | 8 | 11 | 7 | | | The sequence of 'passenger' and 'freight' transport is opposite to that in the main heading 8.1 . As passenger shares of total transport demand are greater than for freight, passenger transport should figure first, as well in the main headline. | Accept |
| 11611 | 8 | 11 | 8 | 11 | 13 | marine shipping has as high a share as aviation. Hence single out and don't hide in rest. Besides, it unusual to lump agric., construction machinery into this. These categories do neither show up in Fig. 8.1.3, hence correct and delete | Agreed. Need separate energy estimates for each mode and exclusion of agric, construction and machinery. |
| 15806 | 8 | 11 | 8 | 11 | 13 | are %'s quoated here on energy, mass or volume basis - should specify | Energy shares. I think it's adequate as it is, % of oil consumption |
| 18902 | 8 | 11 | 8 | 11 | 13 | Consider making figure from data in this paragraph, for details see comments to Figure 8.1.3 | Accept. worth considering….this whole section uses too many numbers in the |
| 4398 | 8 | 11 | 20 | 11 | 20 | The lack of data to compare shipping freight t-km to road, rail and air is a severe. While normalizing measures hide absolute behaviour, this work is unable to compare the impacts of shipping to other modes of freight transport. | Is a work in process. Drawn attention to some new data-bases some which we should use for the next draft. The comment is unclear. Improving tonne-km data for the various modes is a work in process. Rather negative view on the |
| 4399 | 8 | 11 | 30 | 11 | 30 | Is the per capita energy use in cities for transport services only or all energy? | Transport demand quoted. good catch….text is unclear, will improve |
| 6477 | 8 | 11 | 18 | 11 | 18 | “Although data are uncertain, freight movement is dominated by road transport” - the same can be said about passenger transport activity and emission numbers atleast from the developing countries perspective | Agree though this may not be correct…freight ENERGY USE is dominated by roads, but rail and |
| 8363 | 8 | 11 | 25 | 26 | | Aren't the numbers for China and Africa referring to average numbers of cars in Chinese and African cities and not countries? | Country data. The numbers for China and Africa are country average but not |
| 6476 | 8 | 11 | 8 | 12 | 8 | Maybe it’s good to suggest that freight energy demand exceeds passenger energy demand in many Asian developing countries and diesel consumption exceeds gasoline. The trend is different in different regions based on the penetration of the road passenger vehicles. | Agree but needs references and access to more hard data on the relative energy use by freight and passenger services in |
| 4404 | 8 | 11 | 23 | 15 | 12 | Inconsistency between the current 780 million LDV in line 12 and 980 million LDV in 2009 in line 23, page 11 | Accepted. |
| 8431 | 8 | 12 | | | | I would delete this figure and substitute it with a more comprehensive figure (or table) showing average GHG emission factors for different means of transport, both passenger cars and freight. These data are of a great importance | Agree. Also need aviation Comment 528. agree…figure contains too little info to justify a separate figure |
| 8545 | 8 | 12 | | | | OUT OF CONTEXT (AND POTENTIALLY MISLEADING) CHARACTERIZATION. TEXT READS<br>"there is a clear but non-linear association between higher densities and greater public transportation use, with the largest effects taking place at up to 70 people per kilometre, beyond which returns are marginal (Rickwood et al., 2008)."<br>COMMENT: This characterization omits an important qualification in the very next sentence.... Here is the complete quote from (Rickwood et al, 2008, 18):<br>there is also a clear, and non-linear, association between<br>higher density and greater public transport use, with the largest effects taking place at<br>up to 70 people/ha, beyond which returns are more marginal. However, given that<br>population densities typically decrease with distance from the central business district<br>(CBD), the true underlying effect may partly or wholly relate to distance from the CBD,<br>rather than density.<br>As in comment #1, the issue may be distance from the CBD, rather than density. □ | Noted. Comment can not be addressed as there is a discrepancy between the reference provided and the content. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8546 | 8 | 12 | | | | IMPORTANT ISSUE MISSED (AS IN RICKWOOD COMMENT, LINE 2)The CBD qualification by Rickwood, et al (2008) is further supported by Turcotte (2008) of Statistics Canada, who finds that "Above 10 kilometres from the city centre, however, the impact of neighbourhood density on automobile use dwindles until it almost vanishes" http://www.statcan.gc.ca/pub/11-008-x/2008001/article/10503-eng.pdf | Noted. |
| 15808 | 8 | 12 | | | | Missing Air (planes) emissions | Agree |
| 8037 | 8 | 12 | | | | The broad range of specific emissions for freight rail is not helpful. Suggestion: Please insert a table including the big rail freight countries (China, Russia, US, India) and others and numerating the CO2 emissions per tkm for these countries. | The UIC / IEA Handbook for Rail 2012 Energy Consumption and CO2 Emissions provides a break down of railfreight energy use by country and region. Including this data will provide a more comprehensive picture. . even that would be problematic, given the differences in the type of cargo transported…U.S. numbers greatly aided by the huge volume of coal transported. I suspect. Agree. This |
| 17767 | 8 | 12 | 10 | | | there is no mention of "well-to-tank" in chapter 7 at present | Noted. |
| 16255 | 8 | 12 | 10 | 12 | 13 | Transparent links to other chapters. However, not all of the aspects listed here are explicitly addressed in the mentioned chapters. E.g., roads, ports, and airports are not treated individually in Chapter 12. Coordination needed. | Links being covered. |
| 11616 | 8 | 12 | 14 | 12 | 19 | You miss the impact from SLCFs, most important for aviation and shipping. Hence these references are not sufficient here. You find much better values in Jens Borken-Kleefeld, Terje Berntsen, and Jan Fuglestvedt: Specific Climate Impact of Passenger and Freight Transport. Environmental Science & Technology 2010 44 (15). or<br>Jan Fuglestvedt, Terje Berntsen, Gunnar Myhre, Kristin Rypdal, and Ragnhild Bieltvedt Skeie: Climate forcing from the transport sectors PNAS 2008 105 (2) 454-458; published ahead of print January 7, 2008, doi:10.1073/pnas.0702958104 | Noted. The central historic emission database used covers the Kyoto gases. |
| 3819 | 8 | 12 | 14 | 12 | 14 | Replace "100GT" by "100kt". | GT is gross tonnage. refers to line 7, I |
| 4401 | 8 | 12 | 15 | 12 | 23 | Reconcile the statements in lines 15 and 23 as it relates to total GHG emissions from transport. In the former, it is assigned to LDV at 45%. The latter statement assigns 45% of GHG emissions from transport to freight (assumed not LDV?) | Freight is part of LDV, all of HDV, some aviation, some marine, some rail and pipeline. no contradiction….other 10% is |
| 14756 | 8 | 12 | 17 | 12 | 17 | Please cite more up-to date source, e.g. IEA ETP 2010, IEA ETP 2012 | Accept |
| 11618 | 8 | 12 | 20 | 12 | 22 | see also Elmar Uherek, Tomas Halenka, Jens Borken-Kleefeld, Yves Balkanski, Terje Berntsen, Carlos Borrego, Michael Gauss, Peter Hoor, Katarzyna Juda-Rezler, Jos Lelieveld, Dimitrios Melas, Kristin Rypdal, Stephan Schmid, Transport impacts on atmosphere and climate: Land transport, Atmospheric Environment, Volume 44, Issue 37, December 2010, Pages 4772-4816, ISSN 1352-2310, 10.1016/j.atmosenv.2010.01.002. | Noted. |
| 8876 | 8 | 12 | 24 | 12 | 25 | the 13% here is not correct | Accepted. Corrected. |
| 18227 | 8 | 12 | 26 | | | It is suggested to conclude line 26 with a reference to the IMO. All information until the full stop does nothing for the document drafting. If the volume of CO2 emissions by small fleet and fishing vessels is already supported with statistics, it is not relevant to stress that data of small boats is hard to gather and, therefore, uncertain. | Stats are crude. reasonable comment |
| 4292 | 8 | 12 | 27 | 12 | 28 | About Figure 8.1.4, we should write the reason there is a difference in the amount of CO2 emissions by Road and Rail and Shipping. Because the scope of the modal shift would have been limited, the possibility of a new mode of transport would have been rejected. The main reason is explained by the following.<br>The difference by the transportation mode of rolling resistance and water resistance, air resistance due to the drag coefficient (CD) and moving speed, gross weight / net weight. | Noted. Figure was replaced. |
| 17169 | 8 | 12 | 29 | 12 | 29 | fig 1.6 in IEA, 2009a provides a more complete picture for this graph, including aviation | To be updated. worth examining |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 14276 | 8 | 12 | 3 | 12 | 8 | Make aviation and shipping comparable (i.e. for aviation, need to state how much fuel in Mt or EJ, with international and domestic split, rather than % in each region). | Accept |
| 15346 | 8 | 12 | 3 | | | need to remove first initial of author | Accept |
| 14277 | 8 | 12 | 34 | 13 | 5 | Not sure that this paragraph is needed - it's just an intro to section 8.2, but that section already has a perfectly suitable intro. So I would suggest deleting this paragraph. | Noted. |
| 11619 | 8 | 12 | 34 | 13 | 5 | For aviation you need to discuss contrails and cirrus clouds, as the main effects. D.S. Lee, G. Pitari, V. Grewe, K. Gierens, J.E. Penner, A. Petzold, M.J. Prather, U. Schumann, A. Bais, T. Berntsen, D. Iachetti, L.L. Lim, R. Sausen, Transport impacts on atmosphere and climate: Aviation, Atmospheric Environment, Volume 44, Issue 37, December 2010, Pages 4678-4734, ISSN 1352-2310, 10.1016/j.atmosenv.2009.06.005. For shipping you should mention the cooling effect of SO2 aerosols. Cf Shipping Emissions: From Cooling to Warming of Climate—and Reducing Impacts on Health. Jan Fuglestvedt, Terje Berntsen, Veronika Eyring, Ivar Isaksen, David S. Lee, and Robert Sausen. Environmental Science & Technology 2009 43 (24), 9057-9062 | Agree |
| 5189 | 8 | 12 | 34 | 12 | 40 | Be very careful with the Fuglestvedt reference in this context: this study gives only the long term climate impacts of current (cumulative) emissions and tells nothing about the impact of nitrogen and methane in case transport activities are growing at current or increased levels. Actually, the paper's results are based on a scenario where all transport emissions would stop now for the next 100 years. This is interesting from a scientific point of view, but of not much practical use in a mitigation policy context. Please remove here (or at least thoroughly explain the context). | Accepted. |
| 11874 | 8 | 12 | 36 | 12 | 36 | Methane is referred to as a long-lived emission here (which I believe is correct) but in Chapter 7 it is referred to as a short lived climate forcer. I suggest that someone verify how the IPCC wants methane referred to and ensure it is consistent throughout the chapters in the report. | Noted. Here correct. |
| 10766 | 8 | 12 | 37 | 12 | 37 | The effect on stratospheric ozone is small and this effect does not need to be mentioned here. See papers from the ATTICA assessment for a good overview of effects of transport on climate. See: www.ssa-attica.eu | Rejected. |
| 8712 | 8 | 12 | 38 | 12 | 38 | Emissions of black carbon are particularly damaging in Polar Regions where they may accelerate melting of snow and ice. The rate of Arctic summer thaw has increased to the point where new shipping lanes are now considered viable. (IMO, 2009. Shipping GHG study) | Accepted. See Section 8.5 |
| 8875 | 8 | 12 | 6 | | | what did shipping consume? Heavy oil? Diesel? | A fuel mix. Added. mostly heavy |
| 12886 | 8 | 12 | 9 | 13 | 5 | The chapter 8.1.3 omitts GHG emissions that derives from mode-specific infrastructure and infrastructure maintenance; they should be indicated here. The relevant literature should be cited, e.g. Mikhail V. Chester, Arpad Horvath, Samer Madanat (2009), Comparison of life-cycle energy and emissions footprints of passenger transportation in metropolitan regions, and/or a reference to section 8.4 should be given. Additionally it is not clear, why GHG emissions/tkm are indicated but GHG emissions/pkm are omitted? | Noted. Section restructured/rewritten. |
| 7714 | 8 | 12 | 20 | 12 | 22 | The emissions of F-gases are mainly from refrigerants' are understandable but the amounts of around 10,000 metric tonnes of leakage look like too large. Please confirm the amounts come from emission or consumption. | Accepted. |
| 10772 | 8 | 12 | 9 | | | This paper could be relevant here: Peters et al. 2011: Alternative 'Global Warming' Metrics in Life Cycle Assessment: A case study with existing transportation data. Environmental Science & Technology, 45: pp. 8633-8641. | Accept |
| 7802 | 8 | 12 | 9 | 13 | 5 | Suggest changing the title of the section. The section is confusing as is also covers emissions of NOx and aerosols, which are not GHGs. The section also does not give values for indirect emissions from transport. | Indirect included. Nox/ aerosols moved to 8.2. I see no problem with |
| 17768 | 8 | 13 | | | | consider changing the title to "Current emission trends and drivers" | Reject - The section and associated titles are fixed and cannot be changed by the chapter working group. no…..no discussion of drivers…but also, no |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8549 | 8 | 13 | | | | RESEARCH NOT INDICATIVE OF ACTUAL TRENDS<br>"A rising fuel price combined with stagnating incomes can force people to abandon their LDVs. (Newman and Kenworthy, 2011b) suggested that increased fuel costs have led to the major shift from LDVs in developed countries."<br>The use of the terminology "major shift" is an exaggeration. There has been, at best, a modest reduction in vehicle travel in developed countries, and no major "shift" has been documented. It would be fair to suggest that there has been a leveling off of vehicle use (or in some countries a slowing down of the rate of increase). It should also be noted that this effect has been in the context of the worst downturn in the economy since the 1930s (and may well have been deepened by the rise in petrol prices themselves.).<br>This conclusion of the cited research is an exaggeration and the reference should be deleted. □ | Accept I agree….and note that the discussion illustrates only past trends, does not discuss what will happen in the future |
| 18524 | 8 | 13 | | | | In this section it may be useful to refer to the discussions on tourism that appear in Chapter 10 (particularly section 10.3.3), which discusses e.g. international and domestic air travel in more detail. | Accept - We can add references to Chapter 10 if possible |
| 16283 | 8 | 13 | 12 | 13 | 23 | In Section 8.2.1, the definition of CO2 emissions should be clarified, e.g., by replacing the phrase "CO2 emissions" with total CO2 emissions, transport CO2 emissions, etc. | Accept - Will define and use consistently in Chapter |
| 8878 | 8 | 13 | 13 | 13 | 14 | It should be mentioned that these are transport co2 emissions | Accept - if true….needs clarification. Will make this explicity clear |
| 14278 | 8 | 13 | 13 | 13 | 14 | These are annual growth rates (the 4.3%, 1.2%)? If so, make clear. | Accept - Will check and update numbers |
| 16282 | 8 | 13 | 13 | 13 | 13 | The phrase "at a rate of 4.3%" should be modified to "at an annual rate of 4.3%". | Accept . agree…or 4.3%/year |
| 10767 | 8 | 13 | 2 | 13 | 2 | Stratospheric cooling is not an important element of mitigation policies and this may be left out here. | Reject - We need to address climate change mitigation and not only emissions that have positive forcing. |
| 3439 | 8 | 13 | 20 | | 23 | The possibility for 'peak travel' in developed countries is mentioned (with the same words and same references) many times in the whole Chapter 8. Please consider revising to avoid duplication. | Accept |
| 14757 | 8 | 13 | 24 | 15 | 4 | Maybe restructuring, beginning with travel time budget, travel money budget, costs&prices esp. the fuel cost influence | Accept |
| 2977 | 8 | 13 | 25 | | 26 | Income should figure as the main driver, this is used in nearly all models as key driver (see: a Schafer, 'The Future Mobility of the World Population', Transportation Research Part A: Policy and Practice, 34 (2000), 171–205 <doi:10.1016/S0965-8564(98)00071-8>; Lew Fulton, Pierpaolo Cazzola and François Cuenot, 'IEA Mobility Model (MoMo) and Its Use in the ETP 2008', Energy Policy, 37 (2009), 3758–3768 <doi:10.1016/j.enpol.2009.07.065>; Page Kyle and Son H Kim, 'Long-term Implications of Alternative Light-duty Vehicle Technologies for Global Greenhouse Gas Emissions and Primary Energy Demands', Energy Policy, 39 (2011), 3012–3024 <doi:10.1016/j.enpol.2011.03.016>; Andreas Schafer and others, Transportation in a Climate-constrained World (Massachusetts: MIT Press, 2010); Bastien Girod, Detlef P van Vuuren and Sebastiaan Deetman, 'Global Travel Within the 2 Degree Climate Target', Energy Policy, 2012.). In contrast travel time budget is not a driver but a constant (see also next comment). | Accept - We discuss income in the context of costs and prices. strongly agree!...sort of implied in "economic drivers," |
| 11620 | 8 | 13 | 25 | 13 | 26 | Substitute: "costs and prices" against "costs and prices versus disposable income" | Accept - May need to wordsmith. not necessary IF income is recognized as |
| 11621 | 8 | 13 | 25 | 13 | 26 | This seems to have passenger transprot in mind. I suggest that you identify drivers for passenger and for freight transport explicitely. | Agreed. Would like to increase the freight / logistics content |
| 15809 | 8 | 13 | 25 | 13 | 26 | "costs and prices" and "economic" are same drivers, not different - might argue that drivers are are all related to economics (fuel and tehcnology costs, costs of time), social trends (also impacted by economics), vehicle km traveled, and technology advances | Reject - Need to separate Macro-enocmic factors and drivers of personal preference. perhaps….but defining income as a key driver will do a lot to |
| 2442 | 8 | 13 | 27 | | 47 | The income question needs to be clearer - and elasticities of income - less importance of costs as incomes rise. | Accept - See comments above |
| 11622 | 8 | 13 | 27 | 13 | 31 | Delete from "Capital costs…" to "….(Rolon, 2008)." | Accept - Need to re-write this paragraph. agree…doesn't seem to serve the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3989 | 8 | 13 | 27 | 13 | 31 | The sentences: "Capital costs…..,2008)" is confusing and can be eliminated. | Accept - Need to re-write this paragraph. |
| 5190 | 8 | 13 | 31 | 14 | 23 | Cost/price is important but really shaping transport is transport speed and travel times, certainly for passenger transport, to some extend also for goods transport. I would replace the order of this section with the next one about travel time budget. TTB is leading. See extensive literature on TTB from Schafer, and e.g. Metz, D. (2008). The limits to travel. How far will we go? London: Earthscan. | Accept - Will change order of sub-sections and emphasize travel time budget and other drivers over costs and prices. perhaps, but rising incomes |
| 11623 | 8 | 13 | 36 | 13 | 47 | This section suggests that fuel price and oil price are linked. But in countries with highest fuel efficiencies the fuel price is dominated by taxes. Hence mention this important measure that governments have! | Accept - Need to better address fuel pricing. worth stressing this |
| 11624 | 8 | 13 | 36 | 13 | 47 | Too much emphasis on prices, given that transport demand is relatively price insensitive | Accept - Will restucture as noted above. But certainly not for freight….don't |
| 15810 | 8 | 13 | 36 | | | add" or shift to more fuel efficienct vehicles" after "LDVs" | Accept. well, yes, but basically reviewers feel this whole point is quite |
| 14758 | 8 | 13 | 36 | 13 | 47 | This paragraph needs to be reworked substantially. LDVs, HDVs, rail, ships and aircrafts are kind of mixed up. | Accept |
| 5397 | 8 | 13 | 36 | | 38 | Has there really been a "major shift from LDVs in developed countries?" Not clear what this refers to? Even in Europe, car share, as a fraction of total pkt, is very high | Accept - Need to make that include better coverge of the literature |
| 3990 | 8 | 13 | 36 | 13 | 37 | The statement: "A rising fuel price combined with stagnating incomes can force people to abandon their LDVs. (Newman and Kenworthy, 2011b) suggested that increased fuel costs have led to the major shift from LDVs in developed countries." Is generally not supported by the literature. Except for a very brief period (2 years?) the trend is for increased kilometres driven in OECD countries. The reference supporting this statement is a valid reference, but it stands alone in the literature against significant evidence that does not find this effect. This statement should be removed or supported with additional per reviewed evidence. At the very least the broader trend towards greater driving should be noted as a major challenge. | Accept |
| 3995 | 8 | 13 | 40 | 13 | 42 | Is there something wrong with this sentence: "(Rubin and Tal, 2008) estimated that the cost of transporting a single unit container from Shanghai to Columbus, Ohio, increased by 265 %, from USD3,000 to USD8,000, when oil rose from USD20 to USD130 per barrel." In particular, is the price rise really $20 - $130? Really $20? If this is correct, then this sentence seems unbalanced (not relevant) since the consensus estimate on oil prices has them in a more narrow band of $80 - $150 for the foreseable future. | Accept - We will check primary reference and other reference to get a better sample of data. I agree that the statement says little about shipping charges in the range of likely |
| 15811 | 8 | 13 | 43 | | | after 'engines", add "smaller vehicles" | Accept |
| 8714 | 8 | 13 | 45 | 13 | 45 | However, given that fuel costs are a relatively high share of total aviation costs, improving fuel efficiency makes good economic sense. Fuel costs also account for a significant proportion of operating costs for maritime transport, and periods of high fuel costs have led to spontaneous uptake of GHG abatement options such as speed reduction and hull coatings (AEA, 2008) - AEA, 2008. Greenhouse Gas Emissions from Shipping: Trends, Projections and Abatement Potential. | Accept - We can add a statement to this effect but the capital costs of aircraft has a large impact on fleet replacement. good addition, although we're not supposed to be adding |
| 8713 | 8 | 13 | 47 | 13 | 47 | Replace "reasons" with "sense" | Accept |
| 4402 | 8 | 13 | 13 | 13 | 13 | The rate of emissions growth is per year or over the 2000-6 period? | Accepted. It is per year. |
| 4403 | 8 | 13 | 21 | 13 | 23 | The notion of peak travel exists for km travelled/GDP, rather than absolute transport demand. As before, such a normalized metric hides the growth in km travelled in OECD countries, even if it is not as fast as GDP. | Accept - Need to make this point clear. whole issue of peak travel must be |
| 9070 | 8 | 13 | 6 | 16 | 30 | 8.2 New developments in emission trends and drivers can be deleted due to limitations on the nos of pages | Reject - We will shorten but not eliminate this section as this provides an |
| 6478 | 8 | 13 | 13 | 13 | 14 | It would be good to show the latest data sets as the current information from 2000 to 2006 is relatively old | Accept - We will obtain updated data |
| 6479 | 8 | 13 | 24 | 13 | 26 | Maybe suggest that there are other major drivers also – urbanization, infrastructure, motorization, ageing of society/demographic changes, Globalization. | Accept - these need to be explained in the context of the current drivers and not added as new drivers.true….though |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13900 | 8 | 13 | 25 | 15 | 4 | I would strongly recommend to include the ASIF framework here (The total activity (A), mode share (S), fuel intensity (I), and fuel type (F) (ASIF) framework(Schipper, L., Marie-Lilliu, C., Gorham, R., 2000. )Flexing the link between transport and greenhouse gas emissions: A path for the WorldBank. International Energy Agency) is the world recognized methodology to break down the influence of urban policies on transportation energy consumption drivers. See also Zegras, C., 2007. As if Kyoto mattered: The clean development mechanism and transportation. Energy Policy, 35. | Accepted. |
| 13896 | 8 | 13 | 33 | 13 | 35 | Elasticity of car use to fuel price should be discussed, notably because it can be very low: see Ewing, R., K. Bartholomew, et al. (2008). Growing Cooler: The Evidence on Urban Development and Climate Change. Washington, DC, Urban Land Institute: elasticities of VMT to real fuel price = -0,17 in US and -0,11 in California; See Rodier, Caroline. U.C. Berkeley, Transportation Sustainability Research Center, "A Review of the International Modeling Literature: Transit, Land Use, and Auto Pricing Strategies to Reduce Vehicle Miles Traveled and Greenhouse Gas Emissions," August 2008; See Weidner, T. and S. Seskin (2001). California Smart Growth Energy Savings MPO Survey Findings, Parsons Brinckerhoff Report P600-01-021F, California Energy Commission. Sacramento, CA; □ | Accepted. |
| 3463 | 8 | 13 | 36 | 13 | 47 | The exportation of used cars from developed countries to developing countries, is as well one of the main problems regarding low efficiency and high emission vehicles fleet in developing countries. Address this issue in the future can contribute to reduce GHG emissions from the road transport sector | Accepted. |
| 8364 | 8 | 13 | 25 | 26 | | In this part the implications of the modem urban lifestyle should be outlined because the urban social activities (work, school, family life and so on) set the agenda of travel demand and where, when and how individuals need to travel. The modern lifestyle is rapidly spreading affecting millions of families (and billions of individuals) on all continents. Mobility is not an end activity in itself but an expression of the social life of a person and when it comes to define needs for travelling and the actual travel patterns the social activities often overrule other drivers (technical, economic, safety concern and environmental values). Depending on the socio-economic status of a family the income might also be decisive in defining the transport mode of a person.<br><br>Age and sex are other determinants decisive for travel patterns as well as modes of travelling since it largely defines the activities of a person. An example: In some cultures or social classes women's options of transport are decided by prevailing social norms. This means that in some places women cannot go by bicycle, are not supposed to walk alone or, do not have enough money to buy a car impeding on their choices of means of travelling. In other parts of the world walking and bicycling is seen as a healthy and positive exercise for females of all ages. Cultural norms and socio-economic conditions are closely related to number of travels and distances travelled as well as modes of travelling. | Accepted. As too large of a topic to address fully in this section focussing on clarifying importance of lifestyle and providing references. |
| 13880 | 8 | 13 | 25 | 14 | 51 | Regarding urban transportation, real estate and housing markets are also recognised in the littérature to have a structuring effect on mobility and transport infrastructure deploiement. See Bertaud, A., Renaud, B., 1997, Socialist Cities without Land Markets, Journal of Urban Economics, vol.41, n° 1.; Bertaud, A., 2004, The Spatial Organization of Cities: Deliberate Outcome or Unforeseen Consequence?, World Development Report 2003, Washington, DC.: World Bank, Background Paper, http://alain-bertaud.com; Lefèvre, B., 2008, Visión a largo plazo e interacciones "transporte-urbanismo", los excluidos en el éxito del SBR TransMilenio de Bogotá, CIUDAD Y TERRITORIO Estudios Territoriales, XL (156); Ascher, F., 1995, Métapolis. L'avenir des villes, Éditions Odile Jacob; Ascher, F., 1998, La République contre la Ville : essai sur l'avenir de la France Urbaine, Edition de l'Aube. | Accepted. Incuded as a driver linked to urban form under social and cultural drivers. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2980 | 8 | 14 | | | | This figure is very misleading, it can be read as that radiative forcing from aviation could be negative by 2020, which is against all robust model projections (a Schafer, 171–205; Fulton, Cazzola and Cuenot, 3758–3768; Kyle and Kim, 3012–3024; Andreas Schafer and others; Girod, van Vuuren and Deetman.). | Noted. Wrong page, but important comment. |
| 2441 | 8 | 14 | 1 | | 23 | The travel time section is weak on a variety of counts: Is aviation used in the 60 minute budget? The city is not one hour wide - as journeys are return, so it would only allow travel to the city centre, not across the city; Where is the evidence on needing space between where you live and other activities? Perishable freight products have the same limitations? What is infrastructure development - does it include management as well as investment? But overall the links made between cities and travel time is far too strong - cities have not developed on the basis of travel time - but for many other more important reasons. | Noted. |
| 2978 | 8 | 14 | 1 | | 13 | The travel time budget is very relevant for future GHG emissions, but not as a key driver, since travel time budgets are more or less constant they do not drive travel demand. It is a passive anthropological invariant, which makes that lower price and higher speed lead to rebound effects (cf. Bastien Girod, Peter de Haan and Roland Scholz, 'Consumption-as-usual Instead of Ceteris Paribus Assumption for Demand', The International Journal of Life Cycle Assessment, 16 (2011), 3–11 <doi:10.1007/s11367-010-0240-z>; Andreas Schafer, 'The Global Demand for Motorized Mobility', Science, 32 (2010), 455–477; Mathias Binswanger, 'Technological Progress and Sustainable Development: What About the Rebound Effect?', Ecological Economics, 36 (2001), 119–132 <doi:10.1016/s0921-8009(00)00214-7>.). In addition the combination of travel time budget with the constant travel money budgets (constant in share of income but increasing in expenditure) causes a shift towards faster transport modes with increasing income (Girod, van Vuuren and Deetman; Andreas Schafer and others.). But again here income is the driver. The whole section should shifted to trends in the transport sector (next section), to explain the shift towards faster transport modes, which is very relevant for GHG emissions because faster transport modes are also more GHG intensive (Girod, van Vuuren and Deetman; Andreas Schafer and others.). | Rejected. The fact that travel budget is constant is an important driver for GHG emissions. |
| 11625 | 8 | 14 | 1 | 14 | 23 | Urban travel is about 1/3 of total pasesnger travel. You need to address long-distance travel as well. | Accept |
| 11626 | 8 | 14 | 1 | 14 | 23 | This does not explain anything on freight | Noted. Increased the freight and logistics |
| 2810 | 8 | 14 | 1 | | | "Travel time budget" - this word should be firstly defined. | Accept. sort of self explanatory |
| 13239 | 8 | 14 | 11 | 14 | 13 | Travel speeds of 20-30 km/h for transit and 40-50 km/h for cars are announced without acknowledgment of the variability of travel speeds between countries, and between cities within a country. We suggest to write : "at speeds of around 5 km/h for walking, 10-40 km/h for transit and 30-60 km/h for LDV, the latter values being subject to great variability among cities" - database from UITP, 2001 (Union Internationale des Transporteurs Publics) show these ranges. | Accept. seems reasonable |
| 17710 | 8 | 14 | 12 | | | In the history of cities, did the use of different modes of transport lead to variations in land use (as suggested here), or was it the other way round? | Noted. |
| 14281 | 8 | 14 | 13 | 14 | 15 | Sentence beginning "Road infrastructure..." does not seem relevant to travel time? | Rejected. Increase of average speed |
| 8210 | 8 | 14 | 15 | 14 | 16 | This section (and the whole chapter) is lack of considering "internal congestions", meaning the impact of congestions within public transport modes (e.g. congestions in bus and subways). The impact to the public health due to in-mode internal congestions in some developing ciites could be huge. Please add this concern and do more literature reviews. | Rejected. Not directly relevant for the topic of this chapter and not a prominent issue in the scientific literature. |
| 12887 | 8 | 14 | 16 | | | What is walking/bicycling congestion? | Accept - awkward, but self explanatory, I guess. We will make this clearer |
| 14282 | 8 | 14 | 18 | 14 | 20 | Sentence beginning "The basis of..." does not seem relevant to mitigation. Also, it is too black and white - road rage does not automatically set in once a certain threshold has been passed! | Accept - Agree that this is not well connected to the section. statement does seem a bit extreme…in terms of relevance to mitigation, it's relevant if it means getting work and home closer together would be thwarted by this |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5331 | 8 | 14 | 18 | 14 | 19 | Reference to biological or psychological need. Biological need seems very unlikely. What is the confidence that there is a psychological need, and what is the evidence? Alternative explanation of better house prices and living conditions further from employment centres seems more plausible. | Accept. I think we're hand waving on this "need" |
| 5399 | 8 | 14 | 18 | | 19 | The biological or psychological basis for travel times seems unlikely to be an established fact or based on strong analysis…..sounds like speculation | Accept - Need to rework this section |
| 2979 | 8 | 14 | 22 | | 23 | I also strongly disagree with this sentence. Using more time can result in a shift towards slower transport modes, which are generally less energy and GHG intensive (Girod, van Vuuren and Deetman; Andreas Schafer and others.). The crucial point is how many money is spend with in the travel time, hence income is the main driver (see comment above). | Accept |
| 14283 | 8 | 14 | 22 | 14 | 23 | Last sentence beginning "Travel time..." does not seem relevant to mitigation - in a decarbonised transport system, whether travel time remains within budget is irrelevant to climate change. | Rejected. Travel time is directly indicative for fuel/energy used and might |
| 11627 | 8 | 14 | 22 | 14 | 23 | Last sentence normative and incomprehensible. Delete! | Accept . I'm sypathetic, but travel time budgets may limit options….but we need to be more robust about the real |
| 2443 | 8 | 14 | 24 | | 51 | Missing elements here include population growth - one of the main drivers of increased mobility - and the changing population structure, including the ageing of the population. | Accept |
| 11628 | 8 | 14 | 24 | 14 | 29 | Good! Very succinct. | Thanks, |
| 12888 | 8 | 14 | 24 | 14 | 26 | This sentence reads as if growing female job participation is repsonsible for growing transport demand, in particular together with the following sentences that starts with the word "shopping". Changing the formulation is recommended as it is foremost rising income (GDP) that drives demand for transport. | Accept - We will rewrite to avoid such implications. rising income IS the primary driver…but if we have evidence |
| 5191 | 8 | 14 | 24 | 15 | 4 | The problem with these social drivers seems, to my humble opinion, that it actually is the quality and cost of the transport system itself that allows for most of these social drivers, so they are not the drivers perse, but mainly the result of the transport system and sometimes mutally part of a positive feedback loop. Just imagine we can only walk, what would then be the shape of our social networks, emancipation, urban areas design, etc, etc? The drivers to travel larger distances as soon as transport speed allows, seem pretty fundamental in humans, but are not at all well understood from a psychological point of view and only to some extend from an evolutionary point of view. | Reject - he does have a good point but such a discussion would not fit in this section. This section seeks to explain drivers and not to critique social drivers. |
| 17711 | 8 | 14 | 26 | | | Is there any information on the effect of the growth in internet shopping on travel? | Noted. |
| 14759 | 8 | 14 | 30 | 14 | 51 | In my opinon this is too much detail and could be significantly shortened. | Accept - This section needs to be re-written given comments above and will potentiall not be shortened but will add |
| 5245 | 8 | 14 | 33 | 14 | 51 | Again no recognition that in rural areas, even in industrialised countries, 4X4 vehicles are a necessity if winter road conditions are to be faced safely. This paragraph needs to be explicit about the full range of 'social factors' - including decisions to seek to safeguard the lives of the driver and family. | Accept - We will acknowledge these drivers but these driver are not a large driver of personal transport in most |
| 17712 | 8 | 14 | 34 | | | There is no mention here of the role of industry in promoting the "symbolic and affective functions" associated with motorized 2-, 3- and 4-wheelers. There is plenty of literature on this, from the time of Henry Ford onwards. | Noted. See section 8.4. |
| 11629 | 8 | 14 | 37 | 14 | 44 | Delete from "In some societies…" to "…Bamberg et al. 2011)." | Rejected. This is social driver that |
| 14280 | 8 | 14 | 4 | 14 | 8 | Line 4 refers to a travel time budget of 1hr per day, but it's not clear whether line 8 ("1hr for commute between work and home") is per day or just one way. | Accept - Will clarify and update numbers |
| 15812 | 8 | 14 | 4 | 14 | 5 | 1 hr per person and 1.1-1.3 per traveler seem to refer to same data. This is confusing. | Accept - Will clarify. this sounds like time/capita and time/actual traveler, e.g. the latter leaves out babies, the infirm, |
| 5285 | 8 | 14 | 46 | | | ADD: While comfort also plays a role, a study in Lyon, France shows that time constraints and complexity of itinerary associated to work are fundamental factors At issue is the fact that daily mobility is in a very large part structured by work which is difficult to modify for climate purposes. (S. La Branche. « Les déplacements quotidiens face à la schizophrénie écologique. Le cas de Lyon ». special issue Vertigo. 2011.) | Accept. interesting but we have too many space limitations |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3440 | 8 | 14 | 46 | | 48 | You could add here: "For example, detailed mobility surveys have revealed a clear change in mobility preferences in German cities among younger generations, where people under 30 years old show a declining ownership and use of cars (Chlond 2012). The reference is: Chlond (2012), Making People Independent from the Car - Multimodality as a Strategic Concept to Reduce CO2-Emissions. In: Zachariadis T. (ed.), "Cars and Carbon", Springer, 2012, ISBN 978-94-007-2122-7, DOI 10.1007/978-94-007-2123-4_17, pp. 269-293. | Noted. Too much detail. |
| 11630 | 8 | 14 | 50 | 14 | 51 | I doubt, but if really growing then please provide more evidence. | Accept - We will provide a more balance and supported perspective. I might agree that young people might have different habits….but people prepared to |
| 17709 | 8 | 14 | 6 | | | lots of old references in this paragraph (pre-2007) | Accept |
| 5330 | 8 | 14 | 7 | 14 | 9 | Need to clarify whether 1 hour commute is 1-way or 2-way. City is 1 hour wide if 1 hour commute is 2-way (i.e. 30 minute one way from outer suburb to centre). | Accept - Will Clarify. but in most cities, the suburbs to center model no longer |
| 5398 | 8 | 14 | 7 | | 9 | The logic of a 1 hour wide city is not clear….if one considers the development of cities, they tend to grow in physical space at the same time that traffic slows from congestion….so they should be expanding in "time space" | Accept - This section needs to be re-written and better supported. agree….logic isn't clear for our 1-hour |
| 2668 | 8 | 14 | 1 | 14 | 23 | Most transport researchers discount the idea that travel time budgets are fixed. These are usually seen as being sensitive to the generalized costs of travel, which include primarily monetary cost and time cost, but can also include various more difficult to quantify effects, such as reliability, aesthetics, comfort, etc. Of most relevance for this report is how these concepts affect the design of policies, such as road or fuel pricing and policies that increase or decrease infrastructure. I would refer the authors to the literature on induced travel, specifically the following papers: Noland, Robert B., and Lewison L. Lem, "A Review of the Evidence for Induced Travel and Changes in Transportation and Environmental Policy in the US and the UK", Transportation Research D (Transport and Environment), 7(1), (2002), 1-26; . Noland, Robert B., "Relationships between Highway Capacity and Induced Vehicle Travel", Transportation Research A (Policy and Practice), 35(1), (2001), 47-72.; and, Robert Cervero (2003), "Road Expansion, Urban Growth, and Induced Travel: A Path Analysis." Journal of the American Planning Association Vol. 69, No. 2, pp. 145-164. | Accepted. Added this perspective. |
| 2669 | 8 | 14 | 48 | 14 | 48 | Reference to Parkany et al. is incorrect. This study did not analyze social media and transport behaviour. | Accept - Will review and correct |
| 8365 | 8 | 14 | 51 | | | This point is far too vague and sharper formulations are required. The paragraph continuous on the next page and the argument needs to be further outlined here. I am aware of the shortage of suitable statistics but you can refer the spreading of the urban lifestyle and link it to the presentation of economic growth in Chapter 1 Section 1.2.1.2. The world macroeconomic situation, pp 7, 8 and so on and connect the analysis to the part on urbanisation and trend in Chapter 14, Section 14.2.3 page 20 line 7 and on. I miss linkages between the social aspects related to transport and mobility and the other chapters in this report. There are many more highly relevant connections to make as to strengthen the argument put forward in the text.<br><br>Which are the dominating location trends for the growing middle class? In successful city planning such information is compiled together with preferences, estimations about future changes, fruitful scenario building and so on. The analysis of social trends can be divided into different areas for instance: lifestyle changes, changes in family structure and size, employment patterns and so on. □ | Accept. not sure what to do with this…..though clearly deserves attention |
| 12889 | 8 | 15 | 10 | 15 | 14 | Add literature to IEA citation, e.g. Meyer, Ina; Scheffran, Jürgen, Kaniovski, Serguei (2012), Scenarios for regional passenger car fleets and their CO2 emissions, Energy Policy, 41, 66-74; Meyer, Ina; Leimbach, Marian; Jaeger, Carlo C (2007), International Passenger Transport and Climate Change: A Sector Analysis in Car Demand and Associated CO2 Emissions from 2000 to 2050, Energy Policy, 35, 12, 6332-6345 | Accept |
| 3820 | 8 | 15 | 11 | 15 | 11 | Here the reference year is 2009, implying in 780 million LDV. At the begin of the paper the figure quoted is 980 million in 2009. Check consistency. | Accept - Will check and update numbers |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8035 | 8 | 15 | 13 | 15 | 13 | you may include also Germany (e.g. http://www.germanwatch.org/klima/mt07stag.pdf) | Accept |
| 14285 | 8 | 15 | 14 | 15 | 16 | For air transport, it is not just US, Canada and Australia where demand has continued to rise. Demand is increasing across all world regions as it is strongly linked to income growth. Fastest growth is in developing countries (e.g. India, China), but demand is still growing in developed countries as well (including UK) although some short-term falls due to the recession. | Accept |
| 14761 | 8 | 15 | 20 | 15 | 23 | This seems to be a quite random phrase | Accept - We will edit to make a stronger connection to the section. This is a key |
| 12890 | 8 | 15 | 20 | 15 | 23 | Well, in the recent economic and financial crisis 2007/08/09 emissions in particular from freight transport dropped substantially in several countries. The sentence must thus be reformulated. | Accept - The key point is that decreased do to the econimic downturn will not lead to long term mitigation of GHG from transport. Alan: The recent recession has dramatically used freight volumes, particularly for air and sea freight, though in both cases volumes 'bounced back' quite quickly on many routes and services. Sentence will be amended. Steve: irrelevant….recessions hopefully will not last forever. Alan: in the ASIF framework that we have adopted, A stands for avoiding transport, but I would agree that the chapter does not adequately explore the various ways in which companies and economies decouple freight demand from output. Reference should be made, for example, |
| 11634 | 8 | 15 | 24 | 16 | 15 | For aviation you need to discuss contrails and cirrus clouds, as the main effects. D.S. Lee, G. Pitari, V. Grewe, K. Gierens, J.E. Penner, A. Petzold, M.J. Prather, U. Schumann, A. Bais, T. Berntsen, D. Iachetti, L.L. Lim, R. Sausen, Transport impacts on atmosphere and climate: Aviation, Atmospheric Environment, Volume 44, Issue 37, December 2010, Pages 4678-4734, ISSN 1352-2310, 10.1016/j.atmosenv.2009.06.005. For shipping you should mention the cooling effect of SO2 aerosols. Cf Shipping Emissions: From Cooling to Warming of Climate—and Reducing Impacts on Health. Jan Fuglestvedt, Terje Berntsen, Veronika Eyring, Ivar Isaksen, David S. Lee, and Robert Sausen. Environmental Science & Technology 2009 43 (24), 9057-9062 | Accept |
| 8879 | 8 | 15 | 25 | 15 | 28 | Jump from methane and n2o to f-gases. How much ch4 and n2o are emitted by transport globally? | Accept - Will clarify |
| 17769 | 8 | 15 | 25 | | | state what are the non-CO2 pollutants, should include NOx | Accept - Will clarify what is included and |
| 11875 | 8 | 15 | 25 | 15 | 27 | It isn't clear why methane is listed as a significant agricultural GHG for biofuels production. Methane emissions from agriculture are dominated by rice cultivation and ruminants - neither of which are significant sources of biofuels. | Reject - Fuel production is included in Chapter 10 and is not included in Chapter 8. Not appropriate |
| 5332 | 8 | 15 | 25 | 15 | 25 | Needs re-wording. Currently reads as if methane arises from production of vehicles. | Accept |
| 3998 | 8 | 15 | 25 | 15 | 26 | I found this sentence mis-leading: "Methane emissions are largely associated with leakage from the production and filling of natural gas powered vehicles." In the context of transportation emissions this is probably true, but I do not think it is correct at face value: methane emissions from CNG vehicle refueling etc. dwarf agricultural and landfil sources of CNG. Please check and verify that this is correct. Plus, the source appears to be the USA; what is true for the USA is not likely to be correct for the world as a whole. | Accept - Will clarify this statement |
| 12336 | 8 | 15 | 27 | 15 | 28 | The sources of transport-related f-gas emissions should be mentioned. | Accept |
| 8211 | 8 | 15 | 28 | 15 | 28 | "EPA, 2006": this source is old. | Accept - We will find updated references |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10768 | 8 | 15 | 29 | 15 | 29 | It should be made clear that significant positive forcing applies to the direct effect of BC. Thus, I suggest adding "direct" after "significant". (And "have" should be changed to "cause") | Accept . no on direct, yes on "cause" |
| 14745 | 8 | 15 | 29 | 15 | 34 | Include IEA ETP 2012 Figure 13.7 p.437, rates of dieselization? | Accept but trying to CUT |
| 14760 | 8 | 15 | 29 | 15 | 34 | You might include IEA ETP 2012 Figure 13.7 p.437, rates of dieselization? | Accept |
| 3442 | 8 | 15 | 3 | | 4 | The fact that absolute and relative emissions from transport rise with rising incomes is mentioned several times in the whole Chapter 8. Please consider revising to avoid duplication. | Accept. I'm not concerned….this relationship is crucial, I don't believe |
| 2811 | 8 | 15 | 31 | 15 | 34 | The reference is old-dated (2004). I would recommend to refer to the UNEP's report on SLCF. The overview of emissions of black carbon can be found in para 2 of page 9 of "Near-term Climate Protection and Clean Air Benefits: Actions for Controlling Short-Lived Climate Forcers: A UNEP Synthesis Report (2011) <http://www.unep.org/pdf/Near_Term_Climate_Protection_&_Air_Benefits.pdf> | Accept. worth looking at this source |
| 15813 | 8 | 15 | 32 | | | 2004 refernece may be old - US has now reqiured ultra low sulfur diesel (<15ppm S) which has reduced diesel related PM emissions significantly | Accept. as has Europe….we need to be sure we're not outdated here |
| 11631 | 8 | 15 | 33 | 15 | 34 | Delete sentence | Reject - This sentence helps from BC emissions from transport. |
| 4037 | 8 | 15 | 34 | | | after "(Bond et al. 2004)." add the following text: "It is essential that the relative proportion of black carbon and organic carbon in diesel road transport and off-road diesel emissions is very low (0.2–0.8) as compared to other sources. Therefore measures to reduce black carbon emissions in this sector will almost certain reduce net anthropogenic forcing (UNEP and WMO 2011)." Source: UNEP and WMO (2001). Integarted Assessment of Black Carbon and Tropospheric Ozone. Available at http://www.unep.org/dewa/Portals/67/pdf/BlackCarbon_report.pdf | Accept- Will include this point but not necessairly this wording. too much detail…. |
| 15746 | 8 | 15 | 35 | | 39 | As far as I have understood, the role of aerosols in general is two-sided – they contribute to the green house effect, but they also lead to stronger reflection of sun radiation. In WGI of AR4, aerosols are qualified as having a net cooling effect (like volcanic ashes). This paragraph refers to “aerosols that do not absorb light“ and contribute to warming. There should be a footnote on this and, if possible, a reference to WGI where these different sorts of aerosols are discussed. Also, the following Figure 8.2.1 seems to imply that the aerosols from aviation have a cooling effect; maybe this should be taken up in the paragraph. | Accept - We do not seek to restate what is stated in WGI but need to reference what is presented by WGI. |
| 5400 | 8 | 15 | 35 | | 39 | no mention here of whether these emissions have positive or negative feedback….quite important, obviously | Accepted. |
| 17713 | 8 | 15 | 4 | | | The statement that rising wealth is associated with increased emissions from transport should be qualified, I suggest. This relation has applied in the past, but as a consequence of a particular pattern of development. There is no necessary link between wealth and emissions from transport. A comparison of North American countries with Europe would demonstrate this. | Accept - This is an important point that needs to be clarified. ouch….probably true once full industrialization has been achieved, e.g. Europe/US |
| 11632 | 8 | 15 | 40 | 16 | 3 | Unger et al. 2010 miss the biggest part for aviation, namely AIC & contrails. Hence this figure is misleading. Better replace by figures from Skeie et al. AtmEnv 2009 (43), see above. | Accept - We will find a different presentation of this data to show the relative importance of emissions in the short and long term horizons. |
| 10769 | 8 | 15 | 40 | 15 | 48 | It should be made clear that the various effects not only differ in sign (i.e. warming and cooling) but that they also operate on very different time scales (see e.g. figure 1 in Berntsen and Fuglestvedt, PNAS, 2008, vol 105 no 49. This is also shown in a recent paper by Aamaas et al. for the response in temperature and not only RF. See http://www.earth-syst-dynam-discuss.net/3/871/2012/esdd-3-871-2012.pdf. In addition, see figure 8.32, 8.33 and 8.34 in WGI. | Accept - This point needs to be made better |
| 10774 | 8 | 15 | 40 | 15 | 51 | It is not the relative contributions that are shown in fig 8.2.1. Thus, delete "Relative". | Accept |
| 12891 | 8 | 15 | 41 | 15 | 42 | Why does the study not provide realistic projections? | We will replace this graph and add new |
| 3821 | 8 | 15 | 41 | 15 | 41 | What is the definition of "perpetual constant emissions from 2000". | Accepted. |
| 14762 | 8 | 15 | 43 | 15 | 46 | The list of climate forcing gases and pollutants might be redundant | Accepted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5192 | 8 | 15 | 46 | 16 | 3 | The use of Unger, 2010 is not vey useful, could even be misleading, in this context for two reasons. (1) If we want a realistic outlook on total RF in 2100, we cannot escape the use of realistic emission scenarios. (2) if we want realistic outlooks we will have to include contrail and contrail induced cirrus for aviation (as clearly outlined in Lee, 2010, you refer to, but also in ten-twenty recent papers (since 2009) about contrails and cirrus and resulting from the QUANTIFY study.<br>With respect to (1): the impact of non-carbon RF of aviation has been shown to be very much depending on the growth scenario chosen. This is clearly explained in my double blind reviewed book chapters Peeters, P., & Williams, V. (2009). Calculating emissions and radiative forcing: global, national, local, individual. In S. Gössling & P. Upham (Eds.), Climate change and aviation: Issues, challenges and solutions (pp. 69-87). London: Earthscan and Peeters, P., Williams, V., & Gössling, S. (2007). Air transport greenhouse gas emissions. In P. M. Peeters (Ed.), Tourism and climate change mitigation. Methods, greenhouse gas reductions and policies (Vol. AC 6, pp. 29-50). Breda: NHTV.<br>To give some examples (see figure 3.2 in the 2009 reference): the current best estimate of RF multiplier is 2.1 and will be reduced to 1.2 in the case of constant aviation emissions, meaning that by 2100 the historic cumulated carbon will dominate aviation's RF and total 2100 RF in your figure needs to be increased by 20% of the carbon part of it. However, in a more realistic scenario, with 4% aviation volume growth but less emission growth due to a more efficient fleet by 2100) the multiplier (excluding average cirrus) will reach a level of 3.3. Of course the carbon related amount of aviation in 2100 in your figure would incease extensively under 4% aviation growth per year, roughly by a total factor of 3.7, thus causing overall in<br>2100 an additional RF of a factor 8.5 higher than your figure thus some additional 360 mW/m2. So, while the Unger calculations have theoretical value and are correct, the politicy relevance is rather limited. Based on the above rough calculation aviation would almost equal road RF in the same graph (and road carbon emissions are not growing by far as much as aviation is). The priority to reduce aviation impacts would be much more clearly shown based on real RF scenarios. My strong advice: first give a clear overview ofemissions and RF in 2100 based on real scenarios, not these constant, yotally unrealistic, figures, because only then it is possibble to valuate the size of the mitigation assignment in transport and specifically in aviation with its technical limitation to reduceemission by at most some 50% there is no way to accomodate aviation's volume in the long term future (see e.g. Bows, A., Anderson, B., & Peeters, P. M. (2009). Air transport, climate change and tourism. Tourism and Hospitality: Planning & Development, 6, 7-20). | Accepted. Replaced this with a different graph to show the relative short term and long terms impacts of different transport related pollutants on radiative forcing. |
| 10775 | 8 | 15 | 47 | 15 | 48 | I think the effects of aviation need to be better explained. And for many readers the RF number given here does not give much information. See Skeie et al., 2010 (Atmospheric Environment) for effects of aviation in terms of temperature (and contributions to total man made warming) - which is easier to understand for many readers. | This is Working Group I's role. WG III is dealing with mitigation. |
| 14284 | 8 | 15 | 7 | 15 | 8 | Demand for transport of goods and people is increasing in line with increasing incomes. | Agreed. Recent TR D paper contains a graphs which shows clearly how freight tonnes per capita rises with per capita income. Worth mentioning. not clear |
| 3441 | 8 | 15 | 7 | | | With regard to reference Bleijenberg (1993): A more recent article by the same author, enriched with much more recent data and policy suggestions, is the following.: Bleijenberg (2012), 'The Attractiveness of Car Use'. In: Zachariadis T. (ed.), "Cars and Carbon", Springer, 2012, ISBN 978-94-007-2122-7, DOI 10.1007/978-94-007-2123-4_17, pp. 19-42. Therefore I suggest changing the citation to Bleijenberg (1993) to Bleijenberg (2012). | Accept. sounds reasonable |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13876 | 8 | 15 | 3 | 15 | 4 | "As people become richer, absolute CO2 emissions from transport rise, as well as their relative share of total emissions" suggest a correlation which is at least debatable. As Litman and Laube(2002) show: "Many wealthier regions have balanced transportation systems while porrer are quite automobile dependent. The differences result from public policies that affect transport choices and land use patterns" (Litman, T., Laube, F., 2002, Automobile Dependency and Economic Development, Victoria Transport Policy Institute) | Noted. Statement is about absolute emissions and shares relative to other sectors. |
| 4405 | 8 | 15 | 12 | 15 | 17 | These sentences repeats the earlier sentiments from p13, line 21. My criticism from above and suggested caveat remains. | Accept - Need to make this point clear. repeats earlier criticisms |
| 6480 | 8 | 15 | 20 | 15 | 22 | I am not sure if this is written based on developing Countries or developed Countries perspective. In developing Countries – changes In economic, social and cultural factors are driving the increase In emissions | Accept. correct, but not clear what should be changed |
| 3464 | 8 | 15 | 6 | 15 | 17 | There is a very importan increase in the motorcycle fleet, mostly in Latinamerica and Asia. It should be mentioned that the emissions from this fleet will increase in the future | Accept |
| 2670 | 8 | 15 | 25 | 15 | 26 | production and filling of natural gas powered vehicles' - I believe this should read: 'production of natural gas and filling natural gas powered vehicles' | Accept. yes…and it's "production and distribution" |
| 7715 | 8 | 15 | 27 | 15 | 28 | The emission number 350 Mt CO2-eq is consistent to the amounts 10,000 metric tonnes? | Accept - We will double check the |
| 7803 | 8 | 15 | 29 | 15 | 29 | Suggest adding "direct" after "significant" as the magnitude and even sign of the net effect of black carbon including all indirect effects is highly uncertain. | Reject - We will leave this debate to WGI and use these assessment of BC |
| 6923 | 8 | 15 | 29 | 15 | 39 | Please provide a more specific reference to WGI AR5. | Accept |
| 6481 | 8 | 15 | 33 | 15 | 34 | "Black carbon emissions are also significant in parts of Asia, but mainly stem from biomass and coal combustion and not from transport (Bond et al. 2004)" – This statement is not entirely true. The BC emissions from poorly regulated vehicle fleet especially in Asia having lax emission standards are a major source of BC emissions. The intensity and magnitude of emissions are high in Asia. Its quoted in many reports now including - http://nexleaf.org/surya/papers/USAID%20RDMA_Black%20Carbon%20Emission%20in%20Asia%204-2010.pdf Overall, the transportation sector is the third largest source of black carbon emissions in Asia and it is expected to become the second largest source by 2030. □ | Accept - Agree that future impacts of transport will be greater with reduction in biofuels and coal combustion emisisons. assuming this is correct, we need to revise |
| 7804 | 8 | 15 | 35 | 15 | 39 | The effect of contrail-cirrus from aviation should be included here, as current best estimates give a strong positive RF from aviation induced cloudiness (see e.g. Burkhardt & Kaercher (2011). Global radiative forcing from contrail cirrus. NATURE CLIMATE CHANGE Volume: 1 Issue: 1 Pages: 54-58 DOI: 10.1038/NCLIMATE1068. I could not find any mention of this impact in the chapter. | Accept |
| 7805 | 8 | 15 | 40 | 15 | 41 | This figure does not give contributions relative to CO2 (as in CO2-equivalents or Global Warming Potential), but the absolute impact in mW/m2 | This is correct. For reasons stated above, we will repalce this figure with a different presentation. agree…..most |
| 7806 | 8 | 15 | 46 | 15 | 47 | This is an important point and more should be said here (e.g. Berntsen & Fuglestvedt (2008). Global temperature responses to current emissions from the transport sectors, PNAS Volume: 105 Issue: 49 Pages: 19154-19159 DOI: 10.1073/pnas.0804844105 and Fuglestvedt et al. (2009). Shipping Emissions: From Cooling to Warming of Climate-and Reducing Impacts on Health. ENVIRONMENTAL SCIENCE & TECHNOLOGY Volume: 43 Issue: 24 Pages: 9057-9062 DOI: 10.1021/es901944r. . | Accept - Will add these references. probably needs to be left to the other report |
| 7807 | 8 | 15 | 47 | 15 | 48 | Is this including contrail-cirrus? Using the same emissions? Should be made clear. | Accept - We will clarify |
| 7808 | 8 | 16 | | 16 | | This figure gives absolute RF, not relative contributions as stated in the text. | Accept - We will be replacing this figure with a differnet presentation but will be clear. and RF not especially useful to the |
| 8033 | 8 | 16 | | | | To me it seems that contrails and cirrus clouds from aviation are not included in the global radiative forcing shown in this figure. Neglecting them does not map a good comparison of the different modes. This should be changed (see literature e.g. of David Lee, compare p.15, l.47 - 48) | Accept - We will address this issue |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3166 | 8 | 16 | 1 | | | figure 8.2.1 might usefully have an insert that has information on shares of mobility by mode. | Accepted. |
| 14286 | 8 | 16 | 12 | 16 | 15 | Not sure of the relevance of this paragraph to transport? It could apply to all sectors. | Accept - We will revise text to make it clear how this is relevent to transport |
| 11635 | 8 | 16 | 12 | 16 | 15 | You better cite: Drew Shindell, et al. Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security. Science 13 January 2012: 335 (6065), 183-189. [DOI:10.1126/science.1210026] | Accept. worth citing |
| 11636 | 8 | 16 | 12 | 16 | 15 | You need to mention problem of time scales of actions and of impacts; problem of appropriate metric and partial trade-offs. | Accept - This cannot be addressed in depth but we can add a statement. this |
| 12892 | 8 | 16 | 12 | 16 | 15 | Give an example what kind of strategy this could be. | Rejected. Insufficient space to go into |
| 5194 | 8 | 16 | 12 | 16 | 15 | I would recommend to use a scenario approach to found this statement on; unclear where the F-gases come from, why they are relevant in this context and whether there is not e more recent reference to say something abot trends (this one is 12 years old). | Rejected. Due to space limitations. F-gases also covered in other chapters (Ch.1, Ch.5). |
| 11362 | 8 | 16 | 12 | 16 | 14 | It could be mentioned here that the climate mitigation requires one to strike a balance between the abatement of long-lived climate forcers (e.g. CO2) and that of short-lived climate forcers (e.g. black carbon) (e.g. Berntsen et al., 2010, Climatic Change Letters, 10.1007/s10584-010-9941-3). | Noted. |
| 14764 | 8 | 16 | 16 | 16 | 24 | Needs to be rephrased. Redundant list of climate forcing gases and pollutants | Accept |
| 5195 | 8 | 16 | 17 | 16 | 24 | Drivers for contrails and cirrus are important but missing here. Please add from the recent Quantify studies. | Accept - Clearly we need to address |
| 2812 | 8 | 16 | 18 | | | Local air quality reculations do not seek only human health. For example, the US has secondary standards to protect vegitation. The phrase "that seek to protect human health" should be modified. | Accept - We can revise to read "human health and human welfare," but the point is that these are not directed at climate |
| 11637 | 8 | 16 | 25 | | | Add referneces | Accept |
| 14765 | 8 | 16 | 25 | 16 | 30 | Needs to be dropped or some actual trends by sector | Accept |
| 15814 | 8 | 16 | 26 | 16 | 27 | after "drecrease", "per vehicle" - overall emissions might be increasing if vehicle fleet increases | Accepted. |
| 14763 | 8 | 16 | 4 | 16 | 8 | Needs to be rephrased | Accept |
| 5401 | 8 | 16 | 4 | | | seems like an odd statement; how can non-CO2 emissions be impacted by "the same carbon intensity?" This is possibly true for black carbon, but that's about it, I think. | Reject - The BC issue is the prime example andor ozone as well. |
| 8880 | 8 | 16 | 9 | 16 | 11 | Any references to support this statement? Might be worth looking at Woodcock et al., 2009, The Lancet, Volume 374, Issue 9705, Pages 1930 - 1943, doi:10.1016/S0140-6736(09)61714-1 | Accept |
| 11633 | 8 | 16 | 9 | 16 | 11 | reference? | Accept. needed! |
| 4053 | 8 | 16 | 9 | 16 | 10 | How did the authors quantify the phrase "…largely offset these [fuel efficiency] penalties?" | Accept - Will add quantititve numbers to |
| 2671 | 8 | 16 | | | | Section 8.2.2.1 seems unnecessary and lacks detail as currently written. | Accept - Will be re-written to add detail |
| 7809 | 8 | 16 | 23 | 16 | 23 | There has been a lot of focus on this lately; is it possible to find more recent references? | Accept |
| 2672 | 8 | 16 | | | | Section 8.2.2.2 also seems unnecessary. | Accepted. Restructured section. |
| 12893 | 8 | 17 | 1 | | | It is recommended to include a table in chapter 8.3. that gives an overview of all the mitigation strategies/technologies offered. | Noted. |
| 2444 | 8 | 17 | 11 | | | Are the units GJ/km? | Confirmed. |
| 12895 | 8 | 17 | 14 | | | Full electric vehicles and LNG/CNG vehicles are omitted and should be added for the sake of completeness. | BEVs are included later under new propulsion systems. full electric vehicles |
| 11638 | 8 | 17 | 22 | 17 | 24 | You can mentino that there is a big spread, with models emitting less than 95 g CO2/km already on the market today! | Yes the range of available vehicles is important. good point |
| 15815 | 8 | 17 | 22 | | | 25% w.r.t. what? | A base vehicle, we will clarify. good point…wrt preceding model |
| 15772 | 8 | 17 | 27 | | 28 | What has driven this? Are the vehicles priced to encourage hybrid sales, or is there a govt mandate of some sort? | Noted. Text was edited, does not contain this anymore. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15816 | 8 | 17 | 27 | 17 | 28 | is hybridcars.com peer reviewed? Probably not. 20% HEV penetration in japan is mostly due to incenitves, might explain this | Accepted. Replaced with better substantiated reference. |
| 15817 | 8 | 17 | 29 | | | Might show a table of $/mpg improvement vs. mpg improvement (or kpg) for each of technologies mentioend to make this more practical. Check SAE papers , Heywood, Fulton, Duleep, etc | Noted. |
| 15869 | 8 | 17 | 32 | 17 | 33 | The “strong increases in efficiency” for opposed cylinder engines may be overstated; more testing of these engine in actual vehicles is needed to be certain about this. | Accepted. Restated using "with lab results …" |
| 3594 | 8 | 17 | 4 | | | replace high duty with heavy duty | Accepted. |
| 5333 | 8 | 17 | 4 | 17 | 4 | HEAVY duty vehicles | Accepted. |
| 12894 | 8 | 17 | 4 | | | heavy duty vehicles (not high duty) | Accepted. |
| 16284 | 8 | 17 | 4 | 17 | 4 | The phrase "high duty" should be modified to "heavy duty". | Accepted. |
| 2445 | 8 | 17 | | | | This is one Section that can be reduced in length - it is all about the potential and not the reality - what progress has been made since AR4? It is also mainly targeted at the long term and not the next 10 years. The importance of LCA is made, but it does not come through in terms of the energy and carbon sunk in the system - the infrastructure, the maintenance, the vehicles and the processes - the potential transition costs to any new technological system is vast - issues relating to niche markets (not replacements), the lead time required, the necessary conditions for economies of scale, and market penetration do not come through - these are just as important as the technological - there also needs to be comment on where the potential 'big hits' or 'low hanging fruits' are - where are the low risk and high return technologies. This means that several of these Sections could be reduced in length - and perhaps comment made on their risks and returns. | Noted. |
| 13901 | 8 | 17 | 1 | 26 | 48 | Simlarly, it is supprising that the Avoid, Shift and Improve strategy (See Dalkmann, H., Sakamoto, K., 2011, Transport, Investing in energy and resource efficiency, UNEP Green Economy Report) is not mentioned here. | Noted. ASI (or ICCT's new ASIT, that adds "transformation" to "Improve") is |
| 13902 | 8 | 17 | 1 | 26 | 48 | It is strongly recommended to refer to the ASIF framework as a key reference and ground breaking work in the field of transportation. Schipper, L., Marie-Lilliu, C., Gorham, R., 2000. Flexing the link between transport and greenhouse gas emissions: A path for the WorldBank. International Energy Agency; Zegras, C., 2007. As if Kyoto mattered: The clean development mechanism and transportation. Energy Policy, 35. | Done |
| 13903 | 8 | 17 | 1 | 26 | 48 | This section could effectively mention the three-pronged investment strategy proposed in the Transport Chapter of UNEP Green Economy Report (Dalkmann, H., Sakamoto, K., 2011, Transport, Investing in energy and resource efficiency, UNEP Green Economy Report) : promote access instead of mobility; shift to less harmful modes of transportation; and improve vehicles towards lower carbon intensity and pollution | Noted. These comments seem to refer to whole chapter, not technology section |
| 11284 | 8 | 17 | 1 | | | Studies should be done here before we talk about increased use of automobiles in developing countries. Who are using cars? Is there a gender- and income sensitive documentation on this? Normally in the developing world it is not "the man in the street" that is the owner of the car. Low in-come people or people with no income has a bicycle (if they can afford it) and risk their life every day in the traffic. It is normally people in the middle class, organizations or governemet officials that are owners of cars. The large group of low/no-income people using bicycle are very seldome taken into consideration when new roads and transport systems are planned and implemented. In example there is only one bicycle lane functioning in East-Afrika and that is in Nairobi at UN-Avenue. Bicycle lanes and footpaths should always be a part of the road-profile when new roads are implemented, even in fragile states or in emergency situations as well as in the developed world. Decition makers, governments, organizations and large companies should encourage their employees to use a bicycle and also think of the signal effect when people at the very top, bike to work, instead of driving a car. For reference, see the bicycle lane project in Guatemala City implemented by Design Without Borders at: http://norskform.no/en/Themes/Design-as-development-aid/Avsluttede-prosjekter/Cycle-lanes-and-bus-stops/ | Noted. These comments seem to refer to whole chapter, not technology section |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8366 | 8 | 17 | 3 | | | In the introduction to this part the role of transport to make it possible to cope with daily life and the human basic needs should be stated. In modem societies access to food, medical care, schooling and other community activities often means that individuals study or work away from home and need to go from A to B. Besides sleeping, eating, basic protection and so on the lifestyle of person is defined somewhat different depending on religion, social norms, cultural belongings and so on. An understanding of the crucial impact of social norms and for instance how the reproductive social role of women is linked to travel pattern is left out but it needs to be included. In chapter 8 too many of the social aspects and their impact on travelling and emissions is missing impeding on a realistic analysis of travel needs, increases and the demand management. | Noted. These comments seem to refer to whole chapter, not technology section |
| 15866 | 8 | 17 | 1 | | | Show more summary plots: levelized all in costs in $/km (where costs include 1st cost (capex), opex, fuel, GHG taxes, …), well-to-wheel CO2e (gCO2e/km, BTU/km), $/gge for fuels<br><br>Each technology section is not consistent in content – some show more details than others, some include costs, others, not □ should standardize content.<br><br>Opportunities for technologies discussed, but also need to include balanced discussion of challenges | I agree with this one - we need about 4 really good tables/figures that synthesize stuff. good comment. same as the above, not relevant here |
| 2673 | 8 | 17 | 11 | 17 | 11 | compared to a 2010 base vehicle' - would this be a base US or EU vehicle as the base would be quite different as would the estimate of potential percent reductions from that base. This comment applies in many other parts of this section. | It is generic, but yes we should define it clearly - probably use a couple of models as examples. technology not so different, except for diesels…key difference is |
| 4406 | 8 | 17 | 9 | 17 | 12 | The estimate of 40-50% improvement is dependent on the base vehicle, the driving cycle and how the drivetrain is hybridized. The extent of improved energy intensity may not be the same across all vehicle sizes. | Noted. |
| 4407 | 8 | 17 | 31 | 17 | 31 | I'm not sure if HCCI qualifies as a new thermodynamic cycle. It may be implemented to address the temperature of the fuel-air charge at combustion, addressing NOx formation. | Noted. HCCI got deleted in new draft when rewriting. |
| 4408 | 8 | 17 | 38 | 18 | 7 | It is worth mentioning the effect of mass decompounding in the discussion of reducing vehicle mass. Specifically, reducing body in white mass means that other gross vehicle mass dependent components can be reduced. Examples include suspension, tyres, engine, gearbox and so on. Therefore, for each 1kg saved, a further 1.04 kg of secondary mass can be avoided. Reference: C. Bjelkengren. The Impact of Mass Decompounding on Assessing the Value of Vehicle Lightweighting. PhD thesis, Massachusetts Institute of Technology, Massachusetts, June 2008 (http://msl.mit.edu/theses/Bjelkengren_C-thesis.pdf). | yes, worth mentioning….though 1.04 factor is one of many estimates |
| 12337 | 8 | 17 | | 26 | | This chapter should also deal with issues related to the cooling agents used in air-condition equipment and commercial refrigeration in the transport sector. Rationale: Mobile cooling is increasing and choices with regard to the phasing out of existing agents (CFCs, HCFCs anf HFCs) and the alternatives (HFCs, natural agents, natural cooling) will have significant implications on total CO2-equivalent emissions from the sector. | Noted. |
| 11876 | 8 | 18 | 1 | 18 | 1 | Might be worth noting magnesium which already plays a significant role in lightweighting in vehicles, and will likely also play a lareger role in the future. | perhaps. This will be discussed in 8.2, not here |
| 16285 | 8 | 18 | 10 | 18 | 11 | The word "GJ" should be modified to MJ. The term "fuel economy" is usually used to refer to MJ/km. Throughout this chapter, the definition of "energy intensity", "energy efficiency", "vehicle efficiency", "fuel efficiency", "fuel economy", and "fuel use/consumption" seems confusing. It is better to clearly define these terms at the beginning of this chapter. To aboid confusion, I propose that the terms "energy intensity" and "fuel economy" be used and other similar expressions (e.g., vehicle efficiency) not be used. | good point |
| 16287 | 8 | 18 | 10 | 18 | 12 | First, in this sentence, the phrase "or more" is used twice, one of which should be deleted. Second, the phrase "vehicle energy" is ambiguous, so other concrete expression (such as on-road fuel economy) should be used. Third, it is better to modify the expression "if there are breakthroughs in weight reduction technologies" to "if breakthroughs in these weight reduction technologies would be achieved." | Noted. Changed "vehicle energy" to "vehicle loads"; "about 25% in vehicle loads, or considerably more if…." |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15774 | 8 | 18 | 11 | | 12 | This is very speculative, i.e., "if" there are breakthroughs... | Rejected. It is the opposite of speculative, refuses to predict whether |
| 16288 | 8 | 18 | 12 | 18 | 14 | This sentence should clearly describe which types of LDVs could reduce their fuel economy by up to half by 2025 comared to 2005, gasoline ICE LDVs, global average new LDV, or others. | Rejected. We chose not to detail this specific issue but have gone into more |
| 14766 | 8 | 18 | 17 | 18 | 23 | You might include IEA ETP 2012 Figure 2.25 p.91, Light-duty vehicle fuel economy and new vehicle registrations, 2005<br>and 2008, by region. In non-OECD coutries the inverse trend towards higher fuel consumption due to a shift to larger cars can be examined | Noted. |
| 17715 | 8 | 18 | 19 | | | suggest change to "the size distribution of vehicles offered to consumers" | disagree…ultimately, companies offer |
| 15775 | 8 | 18 | 20 | | | "Preference" comes down to payback period for the increased cost of fuel economy technology. If the consumer doesn't see a payback in 2-4 years, they are unlikely to select the more expensive technology. | correct, but this is the wrong place to expound on this |
| 11877 | 8 | 18 | 25 | 18 | 27 | This seems like a very U.S.-focused section. For example, is it true that most long haul trucks have "streamlined spoilers" around the world? Maybe it's OK to have a section that uses mostly U.S. data if it is all that is available, but it seems like that should be made explicit. | well, we said long haul trucks "often" have spoilers….didn't claim "most" do….but critic is probably correct, this is somewhat U.S. focused…I'm not sure |
| 16289 | 8 | 18 | 25 | 18 | 25 | According to Fulton & Eads (L.Fulton and G.Eads, 2004. "IEA/SMP Model Documentation and Reference Case Projection."), 60% of medium-duty trucks and 100% of heavy-duty trucks were estimated to have diesel engines at the global level. Reflecting this, the phrase "Modern medium and HDVs" should be modified to "Over half of medium-duty vehicles and almost all of HDVs". | I agree. In Europe, most of big trucks have spoilers, but there is a difference in the length of tractors, since the USA regulates the length of the trailer but not |
| 4293 | 8 | 18 | 25 | 18 | 38 | I suggest that as improvements of Midium and HDVs, add the following case.<br>・ Study in Sweden highways, Trolleybuses and Trolleytrucks, by Svenska Elvägar AB's project.<br><http://www.nordicgreen.net/startups/transportation/svenska-elv-gar-ab><br>Without installing expensive and heavy batteries, electric load can be achieved.<br>・ Inner city electric cargo train system in Utrecht, Netherlands.<br><http://www.cargohopper.com/><br>By reducing the air resistance and the gross weight, improve energy efficiency.<br>We can also combine these to make up trolley convoy. | Noted. |
| 11639 | 8 | 18 | 27 | 18 | 27 | 55% thermal efficiency? Pls clarify! | Not addressed as not clear what |
| 8715 | 8 | 18 | 30 | 18 | 42 | Some of the sources quoted are rather old and may benefit from using some newer sources. For example: Technologies in the drivetrain and vehicle categories have the potential for the greatest impact on fuel consumption. However fuel consumption benefit is highly dependent on vehicle duty cycle. While some technologies can provide benefit across a range of vehicle duty cycles, others have much greater benefits for some cycles and none for others. For vehicles operating on urban duty cycles with frequent stop/start behaviour, hybrid vehicles offer the most potential with benefits of between 20% and 30% reduction in CO2 emissions. For vehicles with a large portion of constant high speed operation, aerodynamic aids such as aerodynamic trailers and fairings can offer the greatest benefits of up to 10% reduction in fuel consumption. Source: AEA & Ricardo, 2010. Reduction and testing of Greenhouse Gas Emissions from Heavy Duty Vehicles http://ec.europa.eu/clima/policies/transport/vehicles/docs/ec_hdv_ghg_strategy_en.pdf | Accepted. |
| 16290 | 8 | 18 | 34 | 18 | 34 | Same as the comment No. 22. | Accepted. Clarified tat NRC report refers |
| 16291 | 8 | 18 | 34 | 18 | 35 | This sentence should clearly describe which types of medium and heavy-duty trucks can achieve a reduction in fuel consumption per km of 30-50% by 2020, diesel ICE trucks, global average new trucks, global truck fleet, or others. | ditto….report is referring to U.S. trucks |
| 8214 | 8 | 18 | 36 | 18 | 36 | rolling resistance tires | Accepted. Improved wording of |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15776 | 8 | 18 | 39 | | 40 | True, but heavy-duty hybrid technology is very expensive. Here and elsewhere: very optimistic statements need to be balanced with a rational discussion of costs and technology readiness. It serves no purpose to have this chapter appear to be an advocacy piece. | Noted. Yes, it's expensive, but lots of fleets are buying this technology….not only saves fuel but also reduces emissions and reduces brake repairs….it |
| 13240 | 8 | 18 | 45 | 18 | 46 | No mention is made on the fact that reducing train speed may also reduce energy consumption. Therefore no clear recommendations can be derived from that section : what technology is more appropriate to reduce energy consumption, considering physical characteristics of the train, and travel speed. | Noted. |
| 15773 | 8 | 18 | 5 | | 7 | At what cost? This has got to be very expensive. | Rejected. Actually, not so much….though perhaps the real cost is shifting away from the production |
| 15818 | 8 | 18 | 9 | | | need to consider new vehicle penetration rates base don fleet turnover of 7-8% per year (see US DOT data for typical vehicle lifetime and VMT per yr) | Rejected. This is relevant for establishing scenarios of total LDV energy use and emissions….but not |
| 17714 | 8 | 18 | 9 | | | More efficient on-board appliances would reduce loads; so would doing without features such as air conditioning. | Rejected. More efficient appliances already discussed….doing without a/c would improve fuel economy but |
| 2674 | 8 | 18 | 13 | 18 | 14 | Again, in comparing reductions from 2005 to 2025, what is the base of the new vehicle? Is it US or EU? | Rejected. Discussed above.,…Bandivadekar source refers to 2035 LDVs, not 2025…..considers both |
| 3428 | 8 | 18 | 17 | | | "Test" fuel economy should be explained with a short phrase | Accepted. Rephrased. |
| 2675 | 8 | 18 | | | | This section should mention speed limitation devices on trucks being required in EU. | Noted. |
| 12111 | 8 | 18 | 24 | 18 | 42 | Medium and heavy-duty vehicles - additional strategies not covered in this subsection include 1) Improved Driver behaviour and practices + review speed policy of fleets - "Reducing speed can yield significant fuel savings. Aerodynamic drag increases exponentially and becomes the major contributor to power requirements at speeds faster than 80 km/h. Reducing highway speed from 100 to 90 km/h can reduce fuel use by nearly 10%, and can lower tyre wear and crash risk." see refs at Australian government's road tranport site http://eex.gov.au/industry-sectors/transport/road-transport/opportunities/#Review_highway_average_speed_policy)<br>2) Load Consolidation 3) Replace ancillary equipment with more efficient models 4) Optimise gear settings<br>5) Solar panels – For details + refs please see official Australian government peer reviewed web portal at http://eex.gov.au/industry-sectors/transport/road-transport/ to save you time, I can send you refs for each of these - michaelh.smith@anu.edu.au | Agree. Reference needs to be made to these other ways of cutting CO2 emissions from the movement of freight in medium and heavy goods vehicles. Again, speed reduction is not a technology, it's a policy or behavior….2 and 3 seem to have been covered…..4 and 5 seem interesting . In Europe all trucks have their road-speed governors set by the factory to a specified value which is determined by law. (NRC,2010:Technologies and Approaches to Reducing the Fuel Consumption of Medium- and Heavy- |
| 17770 | 8 | 18 | | | | indicate one example form Chinese fast trains | Agree. The major improvement of China's rail system is the shift from non-electric rail to electric rail and high speed rail. The utilization of electric rail and high speed rail makes CO2 emission intensity of China's rail system decline by 86.7% from 1975 to 2007. (He et al., Energy Consumption of locomotives in |

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| 12112 | 8 | 18 | 43 | 19 | 8 | Rail - virtually no attention and coverage for specific GHG mitigation opportunities for Freight Rail. Strong recommendation to cover both passenger rail and frieght rail here separately. Here are the major GHG mitigation strategies for freight rail 1) Fuel efficiency strategies (driver assistence software, speed management, idle management devices, weight reduction, aerodynamics, double staking, auxillary power systems, electronically controlled pneumatic brakes) and Alternative Drivetrains (Engine Switching Locomotives, AC Traction, Hybrid Drivetrains, Dynamic Breaking, Battery Storage) - Ref Rare Consulting Pty Limited (2011) Potential Energy Efficiency Opportunities in the Australian Road and Rail Sectors– Supplementary information for EEO participants. The Commonwealth of Australia Department Of Resources, Energy And Tourism Available at http://eex.gov.au/files/2012/03/Fuel-for-Thought.pdf This report has undergone alot of peer review + industry peer review. | This and the following comments are good - we will add a paragraph on GHG mitigation for rail. Alan: Agreed. Technological opportunities for reducing rail freight emissions need separate discussion for the reasons mentioned. Most of this additional literature is relevant and could help us elaborate . Much of the literature to which we refer present overall values for transport as a whole |
| 16293 | 8 | 18 | 43 | 19 | 8 | I propose that large differences between passenger and freight railways (such as the current electrification rate, required investment in complete electrification, etc.) be mentioned in this section. | Agreed. There are important distinctions between passenger and freight rail operations which need to be brought out more clearly in the chapter.Would like to increase the freight / logistics content. Agree, though this partly reflects the relative amounts of research done on the decarbonisation of the various freight modes. There has been a significant increase in the amount of research done on carbon mitigation in the maritime and |
| 7716 | 8 | 18 | 43 | | | Regarding the railway situation, the case study in China should be necessary because of the recent rapid expantion of Shinkansen-type trains in China. | Agree. In fact, the China case was introduced at page 62 line 1. Difference |
| 12161 | 8 | 19 | | 39 | | All the section 8.10.4 should be rewritten , after all, the text sounds weak and simplistic to the AR5. | Noted. |
| 8716 | 8 | 19 | 10 | 19 | 13 | Note that shipping is only efficient if load factors are high - while this is true for any mode of transport, the enormous carrying capacity of large ships means that it is a much more important factor. Suggested rewording: Shipping is a comparatively efficient mode of freight and passenger ferry transport in terms of fuel consumption per unit of work. | Accepted. |
| 8717 | 8 | 19 | 10 | 19 | 13 | Do the currently referenced projections account for the new IMO measures? See the following: In 2011, the International Maritime Organization adopted new regulations which make mandatory, for new ships, the Energy Efficiency Design Index (EEDI) and the Ship Energy Efficiency Management Plan (SEEMP). An annual reduction of about 600-1000 million tonnes of CO2 is foreseen in 2050 due to the EEDI. For SEEMP, an annual reduction of about 103-325 million tonnes of CO2 is foreseen by 2050. Source: IMO, 2011. An Assessment of IMO mandated energy efficiency measures for international shipping. http://www.imo.org/mediacentre/hottopics/ghg/documents/report%20assessment%20of%20imo%20mandated%20energy%20efficiency%20measures%20for%20international%20shipping.pdf | Rejected. More explicit reference needs to be made to the projected impact of EEDI and SEEMP on energy consumption and emissions (e.g. In recent study by Lloyds for the IMO). |
| 16294 | 8 | 19 | 11 | 19 | 12 | The phrase "increase by 50% or more to 2050" should be modified to "increase by 50% or more from XXXX to 2050". | this is good information, but situation is still fluid. But the projection in our draft is derived by accounting some policy |
| 17772 | 8 | 19 | 15 | | | what is the reference (“Chapter 4 - Ship Structures,” 2008) | will check. from 2007 |
| 16295 | 8 | 19 | 20 | 19 | 22 | The phrase "reduce CO2 emissions by up to 43% per t-km by 2020" should be modified to "reduce CO2 emissions by up to 43% per t-km from XXXX to2020". | Will amend to clarify time scale. Anthony F. Molland, 2008: The Maritime |
| 11640 | 8 | 19 | 22 | 19 | 27 | Section 8.3.1 is on technology, not on operational changes. Either enlarge scope of section or move to appropriate place. | Interesting point - operational interactions with technology is important and there is no where else for it but we |
| 12897 | 8 | 19 | 22 | | | Alternative drive trains and alternative fuels do not play a role in emissions mitigation in shipping? | they do - will add |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15819 | 8 | 19 | 29 | | | Might describe fleet - e.g., small vs large planes, gasoline vs jet. Also give some concrete examples such as savings of B787 over B757 or A380 over a A340 or B747, etc… Might also quote recent biofuel jet trials and the cost of these biofuels (not cheap) | Accepted. But large commercial aircraft dominate fuel use. Can compare new models to old. |
| 12898 | 8 | 19 | 29 | | | Alternative fuels may play a role in air transport but are missing in the text. | in different section (biofuels) but will try |
| 14767 | 8 | 19 | 3 | 19 | 3 | Please emphasize that rail emissions heavily depend on the level of electrification and the primary energy source for power generation | okay - but large commercial aircraft dominate fuel use. Can compare new models to old, yes. Alan: : Obvious |
| 8032 | 8 | 19 | 37 | 19 | 40 | It is worth to mention that the design decision on the range of a plane (there is a trend that planes can fly on long distances) has negative impacts on efficiency (if the aircraft is designed for longer ranges fuel consumption is higher). As well as if they are designed for lower speeds (then the fuel consumption decreases). | can mention this if room |
| 11641 | 8 | 19 | 39 | 19 | 40 | I think you mean "potential to reduce CO2 emissions _per passenger_, but it sounds like absolute reduction. Clarify and correct! | will do |
| 12159 | 8 | 19 | 39 | 19 | 40 | My recommendation is include "a broad ranging integrated air traffic control system", because this strategy is very effective in terms of emission reduction as I showed, with the cooperation of ) in the paper doi:10.1016/j.enconman.2004.06.017 ("The Brazilian air transportation sector in the context of global climate change: CO2 emissions and mitigation alternatives"...this paper was published in 2004 in Energy Conversion and Management" and the co-author was Prof. Roberto Schaeffer, CLA of the present Chapter 8). So, my suggestion is to use "...The use of larger airplanes (and hence less flight frequency), the implementation of a broad ranging integrated air traffic control system has the potential...". | okay will do |
| 11642 | 8 | 19 | 45 | 20 | 2 | ATM for contrail avoidance! That's the biggest and immediate mitigation potential. Check results of REACT4C project.(http://www.react4c.eu/) | okay will do |
| 5193 | 8 | 19 | 5 | 19 | 8 | What is missing here is the very low abatement cost of electric rail (see e.g. Table 3 in Peeters, P. M., & Dubois, G. (2010). Tourism travel under climate change mitigation constraints. Journal of Transport Geography, 18, 447–457. ), as that equals the abatement of reducing carbon intensity of electricity production combined with one to reduce energy intensity of the rail transport itself. As rail is still in many places a declining secto and with a very large emphasis on commuting, causing very high peak hour factors, occupancy rates are currently generally much lower than could be achieved in ascenario where non-commuters are added to the system and the system is growung, i.e. lacking in capacity, and thus much better used. When a real modal shift would take place that would also reduce peak loads and improve occupancy and thus emissions per p-km. I suggest to add the link with electricity production, abatement costs and efficiency impact of total share of rail (the more you shift the more you also save per unit of transport activity pkm, tkm). | agree |
| 5196 | 8 | 19 | 5 | 19 | 8 | The remark about the modal shift, though true in itself, should not be posed in a way that further decarbonising of the rail system is less urgent. The point is that electric rail has the potential to be zero emissions with current technology (e.g. the Swiss railways run almost zero carbon; SBB. (2007). SBB environmental topics - energy. SBB CFF FFS. Available at: http://mct.sbb.ch/mct/en/umwelt/umwelt-umweltbereiche/umwelt-umweltbereiche-energie.htm). As the challenge; reduce emissions of transport by some 80% this century while transport volumes globally grow by a factor of 3 to 6 is almost impossible to realise so any chance to go to really zero carbon systems, which is most cheaply the case for electric rail, should be given high priority (electric cars are given high prioity, but, as cars are not grid-connected, this causes large technical and efficiency challenges due to the need for batteries, large amounts of resorces for those, much energy loss due to conversions of energy a several places, etc). | agree |
| 16292 | 8 | 19 | 5 | 19 | 6 | It is better to modify the phrase "the biggest" to significant. I can't understand the scientific basis of the view that this modal shift can make a "biggest contribution". | agree |
| 5694 | 8 | 19 | 6 | 19 | 8 | The reviewer strongly agree with the idea. | okay |

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| 12896 | 8 | 19 | 8 | | | …and the energy source of electricity (whether it is of renewable or fossil nature). | okay |
| 2676 | 8 | 19 | 4 | 19 | 4 | Note that carbon-free rail travel by 2050 is highly dependent on carbon-free electricity generation. | agree |
| 12113 | 8 | 19 | 10 | 19 | 27 | Shipping - A number of strategies for GHG mitigation missing here 1) Passenger Ferry - big savings from lightweighting. "Significant energy is used by ferries to push against the drag caused by water. This drag increases exponentially as the speed of ferries increase. Therefore, the light-weighting of high speed ferries has been shown to yield significant fuel efficiency savings by reducing the submerged surface area of the ferry. Over the lifetime use of a ferry, light-weighting results in energy savings in the range of 1,400 GJ for a 100 kg weight reduction. This is about ten times higher if compared to rail vehicles, but considerably lower as for aircrafts" Reference - Helms, H (2006) The Potential Contribution of Light-Weighting to Reduce Transport Energy Consumption. International Journal of Life Cycle Analysis, available at http://www.ifeu.org/verkehrundumwelt/pdf/Helms%282006%29_light-weighting.pdf | ferries use a tiny amount of fuel compared to int'l shipping but can mention this. |
| 12114 | 8 | 19 | 10 | 19 | 27 | Shipping - A number of strategies missing for GHG mitigation - 2) Anti-fouling coatings : antifouling coatings can increase fuel efficiency by preventing organisms such as barnacles and weeds adding additional resistance to the ship's progress through the water - REF- Pianoforte, K. (2008) 'Marine coatings market: Increasing fuel efficiency through the use of innovative antifouling coatings is a key issue for ship owners and operators', Coatings World, May | no room to mention lots of specific measure but will try to highlight a couple |
| 12115 | 8 | 19 | 10 | 19 | 27 | Shipping - a number of strategies missing - 3) Air floatation (15 per cent): by pumping air through cavities along the bottom of a ship, ships can effectively float on a thin bed of air, rather than water. Dutch company DK Group is investigating ways in which to reduce the frictional drag of water on large ocean faring vessels, estimating that fuel consumption can be cut by 15 per cent, while consuming only an additional 1 per cent of the ship's power. The first demonstration ship is being built, and it is predicted that this system would add approximately 2–3 per cent to the total cost. Ref - Kleiner, K. (2007) 'The Shipping Forecast', Nature, 20 September, vol 449, pp272–273 | I agree air floatation is a great one, needs mention. |
| 12116 | 8 | 19 | 10 | 19 | 27 | Shipping - a number of strategies missing - 4) Renewable energy for ships in port (90 per cent): renewable energy from onshore can be used for essential functions and services, such as lighting on ships while they are in port, potentially avoiding almost all emissions. Usually ships use onboard power generation by auxiliary diesel engines. In Göteborg Port in Sweden, renewable wind energy is being used to run essential services on ships in port, cutting emissions by 94–97 per cent. | okay |
| 12117 | 8 | 19 | 10 | 19 | 27 | Shipping - a number of strategies missing - 5) Wind propulsion systems (up to 30 per cent in larger freighters): kites can act as parafoils and provide lift and propulsion to reduce fuel consumption by 10–30 per cent, with a return on the initial US$700,000 investment of 3–5 years. (Reference at Kleiner, K. (2007) 'The Shipping Forecast', Nature, 20 September, vol 449, pp272–273) | yes kites is a good one to mention. some useful suggestions which will be separately evaluated and would be worth incorporating e.g. need more discussion of the impact of just-in-time and the opportunities of relaxing it to cut energy |
| 12118 | 8 | 19 | 10 | 19 | 27 | Shipping - Wind propulsion systems (up to 70 per cent for small freighters): highly efficient designs are emerging, capable of powering cargo freighters. Wind propulsion systems have been available for more than two decades. The Maruta Jaya, a 63m long freighter is able to rely on its indosail rig to provide up to 70 per cent of its propulsion, in combination with a diesel-electric engine. The Greenpeace schooner Rainbow Warrior II uses an indosail rig, consuming 40 per cent less fuel. (Reference at Kleiner, K. (2007) 'The Shipping Forecast', Nature, 20 September, vol 449, pp272–273) | yes kites is a good one to mention. some useful suggestions which will be separately evaluated and would be worth incorporating e.g. need more discussion of the impact of just-in-time and the opportunities of relaxing it to cut energy use and emissions. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8212 | 8 | 19 | 9 | 19 | 27 | The authors need to refer the IMO regulation, policy measures, reports, documents, etc. and use into this section (Shipping) | Agreed. More explicit reference needs to be made to recent initiatives to cut CO2 emissions from shipping (not just by the |
| 5197 | 8 | 19 | 28 | | | I have some fundamental comments on this section:<br>1. In most literature the 'new aircraft' fuel efficiency development is given by a certain percentage per year improve,ent (generally between 0.7% and 1.5% for future projections). However, most authors acknowledge that this percentage is not a constant over time, but reduces itself due to the fact that the efficiency of engines and aerodynamics are reaching physical limits (see e.g. Peeters, P. (2010), costs are increasing as wll as develoment times. Tourism Transport, Technology, and Carbon Dioxide Emissions. In C. Schott (Ed.), Tourism and the Implications of Climate Change: Issues and Actions (Vol. 3, pp. 67 - 90). Bingley (UK): Emerald). A better regression, that has no arbitrary transfer years for going from reduction per year a to reduction per year B is given in Peeters, P. M., & Middel, J. (2007). Historical and future development of air transport fuel efficiency. In R. Sausen, A. Blum, D. S. Lee & C. Brüning (Eds.), Proceedings of an International Conference on Transport, Atmosphere and Climate (TAC); Oxford, United Kingdom, 26th to 29th June 2006 (pp. 42-47). Oberpfaffenhoven: DLR Institut für Physic der Atmosphäre, which is based on the data given in the IPCC special report on aviation (Penner, J. E., Lister, D. H., Griggs, D. J., Dokken, D. J., & McFarland, M. (1999). Aviation and the global atmosphere; a special report of IPCC working groups I and III. In. Cambridge: Cambridge University Press). From this regression it also can be learned that halving the emissions of the 2000 new aircraft standard, by 2100 is about the best to be achieved with current engine cycles and fixed wing aircraft and within current constraints of cruise speed, safety, range, etc. (see also Peeters, P. M. (2000). Annex I: Designing aircraft for low emissions. Technical basis for the ESCAPE project. In ESCAPE: Economic screening of aircraft preventing emissions - background report. Delft: Centrum voor Energiebesparing en Schone Technologie and Dings, J., Peeters, P. M., Heijden, J. R. v. d., & Wijnen, R. A. A. (2000). ESCAPE: Economic screening of aircraft preventing emissions; main report. In (pp. 57). Delft: Centrum voor Energiebesparing en Schone Technologie). One reason for the slowdown of efficeincy improvement per year is the very strong increase of the aircraft development time between manufacturer launch and first delivery: from data from Boeing, Airbus, Jackson, P. (1998). Jane's All the world's aircraft 1998-1999. In (Vol. 89, pp. 847). London: DPA and several jet aicraft wikipedia sites it can be learned that the first jets (with exemption of DC-8 and B707, being new concepts and having to wait long times for launching orders of the rather conservative airlines) required 3.5 years for B727, DC9 and B737, which now has increased to nine years for the B787 and ten years for the A350. If this exponential trend continues, the last new aircraft to be launched in this century would take 30-50 years from drawing board to delivery and bring improved fuel efficeincy develoment almost to a standstil 9generally new arcraft are 10-205 at most better than the aircraft they replace.<br>2. The cost of fuel of direct aircraft operational costs ranges between 22% and 38% (Airbus. (2011). Delivering the future. Global market forecast 2011-2030. In. France: Airbus S.A.S) and might become even higher with carbon trading costs added (ETS), which means that halving fuel cost means that cost of flying will reduce by between 10-20% causing increased demand. On short-medium haul fast rail does compete with air, but reducing rail's energy consumption has much lower impact on its cost because energy is only a few percent of rail cost (Smith, S., Chan, E., & Wainwright, S. (2006). Air and rail competition and complementarity. Final Report. In. London: Steer Davies Gleave, page 38). Therebound here is that, assuming an equal energy reduction for rail and air, rail will have a competitive disadvantage with respect to air causing a shift towards air and further reducing the economic basis for (high speed) rail. Such feedbacks cause serious rebounds of efficiency measures and | Thanks for all the suggestions and possible sources, will try to reflect this in the revisions |
| 2677 | 8 | 19 | 45 | 19 | 45 | Discussion of air traffic management policies should note that these can also be aimed at reducing contrails and contrail-cirrus from aircraft, and more specifically that there are trade-offs between CO2 emissions and contrails. See, for example: Williams, Victoria and Robert B. Noland, “Variability of Contrail Formation Conditions and the Implications for Policies to Reduce the Climate Impacts of Aviation”, Transportation Research D (Transport and Environment), 10(4), (2005), 269-280. | agree |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2976 | 8 | 2 | | | | The structure of the chapter should be revised and structured according to equation in Figure 8.1.2.b.<br>1.Global and regional GHG emission trends from transport<br>2. Service demand projections, including mode shares.<br>3. Energy use and energy efficiency<br>4. Carbon intensity, and different available fuels. | Rejected. Sub-headings fixed by IPCC Plenary |
| 11146 | 8 | 2 | 1 | 106 | 50 | I am surprised that I can find no section/mention on vehicle mobile air-conditioning which is a major source of HFC emissions and under which there is EU legislation. | It is discussed in several sections. |
| 14739 | 8 | 2 | 4 | - | - | The table of content is too detailed, paragraphs with five lines only (e.g. 8.2.2.2) occur in the TOB. The chapter is too scattered - restructuring? There's also some reducdancy, 8.2-8.3 | Chapter structure set by IPCC Plenary.Contents to be standardised. |
| 8436 | 8 | 20 | | | | The use of electric bicycle is growing very fast and thus some data could be found in literature to underline the importance that this means of transport could have in the future. | Noted. Mainly in China, but worth mentioning. Especially in China, this is a |
| 11879 | 8 | 20 | 10 | 20 | 12 | The phrase "very low vehicle and fuel-production emissions" is ambiguous and confusing. It implies that vehicle production emissions are low, but that is not true. Suggest stating something like "...very low vehicle operation emission when low-carbon electricity is used for vehicle battery charging". | I agree…this is a better phrasing |
| 15821 | 8 | 20 | 13 | | | Min PHEV range is closer to Prius PHEV of only 18km (not 20) , but in reality could be lower. | yes, the EPA rating is 18 km….but 50 km is sort of low on the high side; the Volt's range is 61 km on the EPA cycle, |
| 14768 | 8 | 20 | 14 | 20 | 15 | Better to mention this before line 23 on the same page. | Rejected. Earlier is better for this. |
| 15777 | 8 | 20 | 16 | | | Comparison of drivetrain efficiencies is very misleading without also noting the significant losses associated with converting natural gas or coal to electricity, transmission losses, and charging inefficiencies. | Rejected. Nothing wrong with discussing drivetrain efficiencies, discussion here doesn't imply that this automatically yields lower GHG emissions….obviously, when emissions |
| 15865 | 8 | 20 | 16 | 20 | 17 | In general, should include more well-to-wheel life cycle analyses in Ch. 8 to help compare pathways on equal basis. Tank to wheel analysis can be deceiving: e.g., "BEVs operate at a drive-train efficiency of around 80% compared with about 20-30% for conventional vehicles". If you consider the power plant efficiency to make the electricity (30-50%), then BEVs are in the same efficiency range as ICEs. | again, well to wheel analysis IS crucial and must be discussed |
| 3822 | 8 | 20 | 16 | 20 | 17 | Note that drive-train efficiency of 20-30% probably applies to LDV and not to HDV, for which efficiency are quoted just a few paragraphs before as 45%. | Rejected. The 45% refers to engine thermal efficiency, leaves out all non-engine drivetrain losses and internal |
| 11880 | 8 | 20 | 18 | 20 | 18 | The new Ford Focus Electric charges in 4 hours…maybe removing the reference to 8-hours would be good since new technologies seem to already be reducing charge time. Though the basic issue of not being able to stop and fill up a tank of gas in 3 minutes is obviously still the big problem, and should be highlighte. | agreed that the eight hour recharge time should be modified….clearly is related to voltage and amperage levels….and rapid |
| 15822 | 8 | 20 | 27 | 20 | 28 | statement not true - if battery prices drop for BEVs, they will also drop for PHEVs so cost of PHEVs will always be cheaper than BEVs. Might speificy if cost refers to first cost of vehicle or levelized cost per mile including fuel, O&M, etc | Agree but need references |
| 15778 | 8 | 20 | 29 | | 39 | A lot of "targeted" and "expected" in this discussion. | well, yes….and how else does one talk about technologies that are at an early stage of development. I'm not |
| 16296 | 8 | 20 | 29 | 20 | 39 | I propose that the necessity of overcoming safety issues associated with Lithium-ion batteries be mentioned in this paragraph. Also, I propose that R&D activities and potential for polst Lithium-in batteries (such as all solid batteries, Li-metal batteries, Li-S batteries, and Li-air batteries) be mentioned in this paragraph. | Noted. Did not include as we were already too detailed on this given page constraints. |
| 2729 | 8 | 20 | 3 | | | Better to say "Alternative and new", since almost all alternative motive powers have a very long history, e.g. renewable methane in cars and trucks Finland since 1941 and synthetic kerosene in jet planes in Germany since 1942. | or just say "alternative propulsion systems"…I agree that not much is new under the sun |
| 5334 | 8 | 20 | 32 | 20 | 33 | Need to clarify whether energy density is specified at cell or pack level. Pack level is most informative. | Accepted. We clarified. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15791 | 8 | 20 | 33 | 20 | 33 | Add "at pack or system level" after "currently 80-100Wh/kg" | yes..at pack level |
| 15792 | 8 | 20 | 34 | 20 | 34 | Change "Improving vehicle energy efficiency" to "Improving battery energy density" | yes, though better to use "improving battery specifric energy (kWh/kg)" |
| 15793 | 8 | 20 | 35 | 20 | 35 | Add "electric vehicle lifecycle" after "a major factor affecting" | I agree |
| 15794 | 8 | 20 | 36 | 20 | 36 | Change "battery is about 1000 charges under 80% depth of discharge, typically enough for 5 years" to "battery can exceed 1000 charges under 80% depth of discharge, enough for 5~6 years or longer" | Rejected. We give a span as *average* ("typically"), adding "or longer" is not |
| 5335 | 8 | 20 | 37 | 20 | 39 | Need to clarify whether cost is specified at cell or pack level. Pack level is most informative. Not sure if targets are appropriate indicator of likely future costs as these are aspirational. Suggest reference to studies forecasting future costs e.g. Element Energy work for UK Committee on Climate Change, suggesting just over $200/kWh for BEV batteries and over $400 for PHEV batteries at the pack level in 2030. Note the higher cost of PHEV batteries. http://www.element-energy.co.uk/wordpress/wp-content/uploads/2012/06/CCC-battery-cost_-Element-Energy-report_March2012_Finalbis.pdf | Accepted. |
| 15795 | 8 | 20 | 38 | 20 | 39 | Change "...early high-volume production (e.g. 2012-2013) is expected to be about USD500-700/kWh but is targeted to drop to USD300/kWh or below in the 2015- 2020 time frame (IEA, 2010b)." to "...early high-volume production (e.g. 2014-2015) is expected to be about USD500-700/kWh but is targeted to drop to USD300/kWh or below in the 2020-2025 time frame (Bloomberg New Energy Finance 2012; IEA, 2010b). | Agreed. Will check references again and adjust if needed accordingly. |
| 13111 | 8 | 20 | 39 | | | Reference should be latest (IEA, 2012) (ETP2012, page 508) | Accepted. |
| 15820 | 8 | 20 | 4 | | | might add fleets powered by CNG and LPG which are significant in world as well | Rejected. Sentence already includes |
| 2730 | 8 | 20 | 4 | | | In addition to ICEs many other heat engines are also used in all transport modes, including ECEs (like stirling engines which in commercial applications have proven higher thermal efficiency (48 %) than diesel engines and all other ICEs) and many types of turbines. ECEs and turbines have better fuel flexibility than ICEs. Therefore, their increased use improves possibilities to use alternative fuels. | Rejected. No relevant use of stirling engines/turbines on roads. |
| 11778 | 8 | 20 | 40 | 21 | 1 | Neithir coal only nor renewable noly case is realistic condition and those may imagine the negative impact on the coal and too much expectation to the renewable energy. This kind of comparison should be calculated by using more reliable condition. Refer to FEPC estimatinon of the CO2 emssions intensity in major economics which can deploy the EV by using IEA Energy Ballances.<br>1.FEPC:[Environmental Action Plan by the Japanese Electric Utility Industry, P6], http://www.fepc.or.jp/english/library/environmental_action_plan/__icsFiles/afieldfile/2012/05/16/actionplan_E_2011.pdf | Rejected/Accepted. Rejected: While it is correct that EV electricity will rarely be from one source only, it seems reasonable to compare the effects from different individual sources. Accepted. Will add something to note that all regions use multiple electricity sources, and that there are large differences |
| 15779 | 8 | 20 | 44 | | | What's the current fraction of electricity from renewable sources and what is it expected to be in 2030? A general statement that BEVs can achieve near-zero lifecycle emissions when operating on renewable energy is not relevant unless it is put into perspective. The same proclaimation can be made for nearly anything that runs off of electricity. | again, I don't really have a problem with what's in the text….but it might be reasonable to point out that in most countries, renewable electricity is |
| 5336 | 8 | 20 | 44 | 20 | 44 | Not only renewable energy - nuclear and CCS also result in near-zero emissions | Partially accepted. Will add nuclear. But: CCS in general not yielding "near- |
| 16297 | 8 | 20 | 44 | 21 | 1 | First, the phrase "from renewable energy" should be modified to "from renewable energy, nuclear energy, and fossil fuels with CO2 capture and storage". Second, the term "life-cycle" should be deleted or modified to "well-to-wheel", because producing BEVs generate non-negligible amounts of GHG emissions. | Accepted. Will replace. But please note: CCS yields near-zero emissions. |
| 2731 | 8 | 20 | 6 | 20 | 7 | The largest share of alternative fuels in the world is found in Pakistan, where over 80 % of road vehicles use methane (currently fossil methane, but could be renewable methane). | Rejected. Methane does not qualify as alternative fuel by our definition. |
| 4339 | 8 | 20 | 29 | 29 | 39 | what does "aggressive mean? please provide actual breakdown of costs for an electric vehicle | Accepted change of language (removed "aggressive"). Rejected going further into detail due to space constaints and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4409 | 8 | 20 | 27 | 20 | 28 | This sentence implies that if battery prices were to fall, the BEV may become less expensive than the PHEV. | Accepted. As comparison is difficult between range-limited and full-range vehicles, this sentence was |
| 4410 | 8 | 20 | 35 | 20 | 37 | The 1000 charges is also dependent on the C-rate and temperature that the battery operates within. The variable currents required to satisfy a driving cycle implies different C-rates. This affects the number of total cycles which the battery can deliver and the number of driving years which can be expected from a single battery pack. | Accpeted. Rephrased the sentence to incorporate this. |
| 6482 | 8 | 20 | 40 | 21 | 2 | – On the issue of electric cars powered by coal power plants – CO2 emissions are not the main critical point but PM, NOX and associated health impacts. It has been established that such electric cars when compared to gasoline cars can have an adverse impact of 3.6 times higher. See http://pubs.acs.org/doi/abs/10.1021/es202347q | Rejected. The reference cited actually establishes the opposite…yes, PM2.5 health impacts are 3.6 times higher, but overall environmental health impacts are |
| 4411 | 8 | 20 | 42 | 20 | 44 | Is the BEV with efficiency 200 Wh/km comparable to the conventional vehicle with emissions < 150 g/km? The overall sentiment is correct that GHG intensity of electricity can lead to more WTW emissions for a BEV than the equivalent conventional vehicle. However, the example given appears weak in its lack of detail to make the comparison robust. Also, the WTW emissions from the BEV are near zero from renewable electricity sources. Life cycle emissions should be defined carefully. Life cycle emissions should include those associated with vehicle production, including battery manufacture, which may be non-trivial. Instead, WTW emissions should be used. | we definitely should be using WTW rather than "lifecycle" emissions…as for CVs with emissions less than 150 g/km, I don't find this a poor comparison….the most likely CV competitor to an EV is a hybrid. |
| 4294 | 8 | 20 | 9 | | | The external power supply(OLEV：Online Electric Vehicle) and Capacitor(CaEV) should be added in electric vehicle.<br>Capacitor is effective to reduce the weight and cost of the vehicle like delivery trucks and buses which starts and stops repeatedly.<br>External power supply(include contact and contactless) is also effective to reduce the weight and cost of the vehicle. | Noted. |
| 15796 | 8 | 21 | 1 | 21 | 1 | Change "the liquid or gaseous fuel used" to "the type and amount of fuel used" | agreed |
| 2732 | 8 | 21 | 10 | 21 | 33 | Only hydrogen fuel cells mentioned. Also methane fuel cells are in commercial transport use, currently in ship transport, but they would be suitable for other types of transport, e.g. rail, too. | Accepted. Added in 8.3.3.2. |
| 8031 | 8 | 21 | 16 | 21 | 16 | Is it possible to give data for the range of CO2/km for these conditions? | should be possible, and useful….by the way, change "lifecycle" to "fuel cycle" again…we don't include vehicle |
| 15781 | 8 | 21 | 18 | | 19 | But the vast majority of H2 is from natural gas and will be for the foreseeable future. Again, these types of pronouncements need to be balanced with a rational assessment of the likelihood that zero-GHG electricity sources will be in place specifically for generating H2 for transportation use. | we do have a large number of statements that seem to foresee huge increases in renewables….somewhere we do need to say that hydrogen and |
| 4295 | 8 | 21 | 18 | 21 | 19 | When making hydrogen by natural-power-sources + electrolysis for a fuel cell, total energy efficiency is very bad. Therefore, I think that the electricity made by natural power sources should be used by EV ( BEV, PHEV ) . | I agree with this reviewer…. |
| 16298 | 8 | 21 | 20 | 21 | 25 | I strongly recommend you to pay attention to the estimate of the current cost of the PEM fuel cell stack. I think that this value is too optimistic. The IEA Energy Technology Perspectives 2008 (IEA, 2008, p. 446) indicated that the specific cost of a mobile PEM fuel cell stack is at least US$ 500/kW in volume production. The IEA (IEA, 2009. "Transport, Energy and CO2") estimated the long term "incremental" cost of the mobile PEM fuel cell system to be US$ 4560 per vehicle. | the low cost estimates for fuel cells are quite recent, but seem widely accepted….BUT balance of system will add to costs, so I don't agree with the "almost competitive with a gasoline |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14769 | 8 | 21 | 21 | 21 | 21 | "Over the past decade, the cost of PEM fuel cells suitable for LDVs has decreased from about USD275/kW to under USD100/kW, with the possibility to reach USD50/kW by 2015 under conditions of large-scale production (DOE, 2011a)." That's wrong - these numbers refer to high volume production of 500,000 FC systems per year. Today, costs of somewhere around 1000 USD/kW at low prodcution capacties are achieved. See ETP 2012. High on board storage costs needs to be further emphasized. | Rejected. The sentence clearly states this is "under conditions of large-scale production"….I certainly would be willing to add "at production levels above 500,000 units/year," if that's the correct |
| 5402 | 8 | 21 | 22 | | 23 | a $4000 fuel cell system wouldn't be close to competitive because of the electric motors, controllers, etc required….that's why DOE target is $30/kW, not $50/kW….and the "similar output" is somewhat misleading, because generally an electric drivetrain will have lower kW than a competing gasoline drivetrain because of the torque characteristics of the motor. | Accepted. |
| 4413 | 8 | 21 | 26 | 21 | 28 | This is a very good point, analogous to battery lifetime: 2500 hours at 50 km/h does not represent the variability in power requested from a fuel cell during driving. That is, the fuel cell does not operate at one load point in a vehicle powertrain as it might in a stationary device. Therefore, the real-world lifetime of fuel cells remains unknown, to a degree. | Noted. The text does not imply that lifetime was tested at constant speed but that the average over the test cycle was 50 km/h. |
| 16299 | 8 | 21 | 28 | 21 | 29 | I strongly recommend you to pay attention to the technical maturity of compressed hydrogen on-board storage. The IEA Energy Technology Perspectives 2008 (IEA, 2008, p. 433) indicated that vehicle on-board storage of hydrogen is very expensive and is not technically mature. | we certainly need to look at complete system costs, not just fuel cell costs |
| 15797 | 8 | 21 | 3 | 21 | 3 | Change "currently" to "In 2009". What about electric buses elesewhere in the world? Might find a more updated reference. | agree |
| 15782 | 8 | 21 | 31 | | 32 | AT LEAST another 5-10 years. | agree |
| 2735 | 8 | 21 | 34 | 22 | 2 | Gas turbines are not mentioned. They are used in aeroplanes, helicopters, ships, trains, trucks and buses. LBG and CBG are suitable for them. | Noted. Turbines briefly mentioned in 8.3.3 intro, but otherwise not covered. |
| 6705 | 8 | 21 | 35 | 21 | 41 | When it comes to enegy policies, every nations must consider various aspects, for example, energy-security, influences on their economies. It is uncertain whetehr electric generation will be decarbonaized for next few decades. So, it should be noticed that "electricity generation has been depply decarbonized" isn't necessarily true. | yes we need to be clear that a lot depends on electric gen decarbonisation |
| 3824 | 8 | 21 | 35 | 21 | 35 | When talking about diesel hybrid locomotives it is worthwhile to distinguish them from diesel electric ones that are been used for long time. Thus, it is useful to explain the differences between the two types. | agree |
| 16300 | 8 | 21 | 38 | 21 | 41 | Introducing hydrogen fuel cell trains may also be attractive to decarbonize the railway sector, especially in areas where extensive electricity transmission network does not yet exist. | agree |
| 8030 | 8 | 21 | 38 | 21 | 38 | Hybrid systems (electric and Diesel), e.g. in Kassel or soon in Chemnitz are worth being mentioned | agree |
| 4414 | 8 | 21 | 42 | 21 | 43 | Onboard solar PV can only provide a portion of the auxiliary loads for a ship. Solid oxide fuel cells are well suited to heavy duty loads and operate at temperatures which do not require an auxiliary fuel reformer. | we can mention this |
| 2733 | 8 | 21 | 44 | 21 | 45 | LNG and LBG do not require on-board reformers, because they can be used in methane fuel cells. Please note that LBG (liquefied biogas) also exist in the market, not only LNG. | we can mention this |
| 2734 | 8 | 21 | 45 | 22 | 1 | Also mechanical wave power can be used. Demonstrations have been built and commercial applications have been planned. | we can mention this |
| 15780 | 8 | 21 | 6 | | 7 | Would be good to note what drove this large expansion -- I assume it was the value proposition to the consumer. Can it be replicated any time soon with passenger cars? Very, very unlikely. | yes quite a specific application |
| 3823 | 8 | 21 | 6 | 21 | 9 | The number of two-wheeler electric vehicles for China probably includes electric bikes. If this is the case make it clear. | yes its all electric bikes, will clarify. Yes, electric bikes were included. |
| 4412 | 8 | 21 | 8 | 21 | 9 | Note that many of the two-wheelers used lead acid batteries. This has created issues with battery disposal in China (problem shifting) See: C. R. Cherry, J. X. Weinert, and Y. Xinmiao. Comparative environmental impacts of electric bikes in China . Transportation Research Part D: Transport and Environment, 14(5):281–290, July 2009. | will mention if room. Agree. This aspect can be complemented to the 8.7.4 technical risks section. |
| 2678 | 8 | 21 | 18 | 21 | 19 | Claiming that H2 can be produced from electricity at very low life cycle CO2 is misleading. It is very unlikely that any marginal renewable electricity would be devoted to H2 production - it would be better used to off-set existing coal-fired electricity production. | not really a transport chapter issue. But, it does have an impact if we presume low carbon alternative fuels when the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2679 | 8 | 21 | 31 | 21 | 33 | 5-10 years seems very optimistic for FCVs to be commercially viable. I don't have access the IEA(2012) reference, but please check how this estimate of viability was done. | disagree - we did use ETP 2012 - IEA now thinks commercially viable in 2015-2020 time frame, but will take time to build the market - not many FCEVs on |
| 15824 | 8 | 22 | 10 | | | drop-in biofuels are another option | Agree. Sure, and while we're at it, butanol could be added, too. |
| 13112 | 8 | 22 | 11 | 24 | 41 | Different expressions such as "life-cycle"CO2 emission , "fuel cycle" GHG ratings, or "net" emission should be unified into (e.g.) "WTW" CO2 emissions. | agree we need a unified term, will fix this. RICH: Agreed about unifying. My preference would be to use "life cycle CO2e emissions" (or "life cycle CO2 emissions" when only that one gas) |
| 2738 | 8 | 22 | 16 | 22 | 17 | Modification needed are not significant. Methane has been used in dualfuel diesel engines commercially since 1973 and this technology is currently spreading to many transport applications. | will try to clarify this, but conversions do cost signficiant $$$ |
| 15825 | 8 | 22 | 19 | 22 | 20 | bio CNG systems will require lots of gas cleanup and heating value boosting to be practical | agree but only marginally a transport issue. yes, but not clear that needs saying here….as long as it's stated in |
| 14770 | 8 | 22 | 2 | 22 | 2 | Maybe mention EEDI and SEEMP which should be enacted by Jan 2013 (according to IMO, 2011) | As mentioned in response to comment 8717, more explicit reference needs to be made to the projected impact of EEDI and SEEMP on energy |
| 2739 | 8 | 22 | 22 | | | Otto engine is a gas engine. Therefore, conversion is needed if liquid fuels like gasoline is used, not when gaseous fuels are used. | incorrect(Otto cycle is for gasoline engines) and misses the point that the main part of the conversion is installation |
| 2740 | 8 | 22 | 22 | | | Refueling times of compressed and liquefied gases are approximately the same as with gasoline and diesel oil, i.e. minutes. It is very curious that long refueling times are attributed to gas vehicles (incorrectly), but the problem of typical 8 hour charging time of electric vehicles is not mentioned in chapter 8.3.3.2. Inhaling of toxic fumes is a health hazard of gasoline and diesel oil use. This is avoided in gas and electric vehicles. | refueling can be quite fast at high pressure stations, long times associated with home (and often depot) refueling. Long recharge times are discussed in earlier section on vehicles, so not really necessary here. Since there isn't a |
| 15784 | 8 | 22 | 23 | | 24 | Cost of storage tanks is also an issue. | well, key part of "conversion cost" mentioned here IS storage tank costs….but perhaps it makes sense to have a parethetical mention, e.g. |
| 15826 | 8 | 22 | 25 | | | many studies suggest that most economic use of NG for trasnport in US and EU is as LNG for HDVs (long haul trucks for example) | should be looked into |
| 2741 | 8 | 22 | 25 | | | Quantitative information of the Pakistan case is needed, i.e. 3.2 million vehicles and over 80 % share of road vehicles is a proof that crude oil domination in traffic fuel market can be overcome. | agree |
| 2743 | 8 | 22 | 25 | 22 | 30 | It is not mentioned that methane is the only fuel suitable for all engine types used in all transport applications: road, rail, water, air and space as well as mobile engines like agricultural tractors, street maintenance machines etc. Also it is not mentioned, that methane is considerably cheaper than gasoline and diesel oil in almost all countries. Biogas is the only biofuel that currently is cheaper than gasoline and diesel oil even if they have same tax level. There are more than hundred OEM methane LDV models available. | fair comment….although the vehicles themselves can be expensive, the fuel is fairly cheap….discussion may be too negative |
| 3826 | 8 | 22 | 25 | 22 | 30 | When discussing NG use, mainly in non-original equipped LDV it is important to consider CH4 leakage due incomplete combustion or poor control of the fuel handling system. | correct, but if NG use grows, more OEM models will become available and fewer vehicles will be conversions….not sure |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2742 | 8 | 22 | 26 | | | Australia has not so far had success in NGV use, like the other countries mentioned. i.e. it does not belong to the group. But Iran and China are big success stories. | if correct, worth revising. China has made considerable progress on NGV use, with about 1 million NGV population. But NGV use in China is still |
| 15785 | 8 | 22 | 27 | | 28 | Need to be careful with conversions. If they are done poorly, the increase in tailpipe methane emissions could negate the perceived GHG benefits of this fuel relative to gasoline. | see above |
| 4415 | 8 | 22 | 3 | 22 | 5 | For aviation, there are geared turbofans and unducted turbofans which can deliver efficiencies close to the limit. Further efficiency improvements can be obtained by fly by wire or fly by light control, recuperative cores and exhaust gas recovery. | okay can try to add mention of these if we have room |
| 2736 | 8 | 22 | 3 | 22 | 5 | Text "In aviation, no serious alternative to jet engines for propulsion has been identified" is incorrect. Currently also otto engines, gas turbines and mechanical wind power are used. Airships are not mentioned. They have large potential especially in freight transport (big energy efficiency advantage compared to aeroplanes) and they can use many types of heat engines and fuel cells, and in addition they are especially suitable for solar power use. For jet engines, the higher they fly the better liquefied gases (renewable methane and hydrogen) work, in comparison to kerosene, due to their suitability to low temperatures. Tropospheric pollutant emissions are much worse problem than ground level pollutant emissions due to their long lifetime. Therefore, renewable methane and hydrogen are the fuels of choice in aviation. Even more this applies to space tourism, which is now just in a starting phase but expected to grow. It means the use of rocket engines in troposphere and especially in stratosphere, where pollutant lifetimes are even longer than in tropospheric emissions. Therefore, renewable methane and hydrogen are needed in rocket engines, too. | will try to reflect these points - but it seems clear that commercial passenger air travel will be dominated by jet engines for decades to come. Alan: Some useful suggestions which will be separately evaluated and would be worth incorporating. Air ships have had a chequered history as a freight transport mode. This essentially a niche freight mode but may need to be re evaluated as part of a low carbon logistics strategy. Is there any data on the carbon intensity of air ship heavy freight operations? Alan: Some useful suggestions which |
| 13113 | 8 | 22 | 32 | 22 | 34 | This paragraph (At least ,,,,,,,,,countries) is not necessary. No relation with the rest of the paragraph. Please cut it for simplicity. | agree. it might not fit well in this paragraph, but it's a crucial point for |
| 16301 | 8 | 22 | 33 | 22 | 33 | It is better to modify the phrase "power plant" to electricity production and delivery". | will check on agreed terminology. a |
| 4416 | 8 | 22 | 34 | 22 | 35 | Quantify “fairly slow” and “low voltage” | agree we should do this. good |
| 15798 | 8 | 22 | 34 | 22 | 34 | Add "assuming an ideal charging pattern and without peak time charging" after countries | agree something clarifying like this would help. correct….it could be misleading to blithely assume off-peak charging, except where there is a "smart |
| 2744 | 8 | 22 | 37 | 22 | 38 | They can not provide full recharge in under an hour, at most 80 % (and they will never recharge fully). | more importantly, is it really true that lots of fast charging systems are being installed? Lots of locations are putting in "level 2" chargers, i.e. 220V (standard in Europe, but 110V is the U.S. |
| 5198 | 8 | 22 | 4 | 22 | 5 | Auxiliary power consumes a few promiles of overall aircraft fuel; suggest to remove this detail. | will check on this |
| 4417 | 8 | 22 | 41 | 22 | 42 | How much more expensive are fast charging units to the 240V/120V versions? | important to quantify….early estimates are $25K-$50K per charger vs. perhaps |
| 3825 | 8 | 22 | 42 | 22 | 44 | It is useful to make a back of the envelop calculation regarding the availability of solar energy and the amount of energy required to propel it. I suspect this proposal is almost unfeasible. | Rejected. Unclear what this comment is referring to. There is nothing on PV in |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8718 | 8 | 22 | 45 | 22 | 45 | Additional note: It is possible that inadequate charging infrastructure will delay a widespread shift to electric vehicles. Public charging infrastructure is an important means of counteracting “range anxiety”, which is the fear of being stranded due to insufficient battery capacity. Although most trips can easily be accommodated by modern electric cars, consumers prefer to buy cars that are capable of much longer distances. Source: AEA, 2012. Next phase of the European Climate Change Programme: Analysis of Member States actions to implement the Effort Sharing Decision and options for further community wide measures: Transport Sector Policy Case Studies http://ec.europa.eu/clima/policies/effort/docs/esd_case_studies_transport_en.pdf | I agree, though not clear what to say about this….at least, we might want to note that it remains unclear just how much of a problem is created by the lack of travel flexibiility caused by EV range limitations…we don't know how many consumers will be willing to put up with this |
| 6706 | 8 | 22 | 46 | 23 | 2 | When it comes to enegy policies, every nations must consider various aspects, for example, energy-security, influences on their economies. It is uncertain whetehr electric generation will be decarbonaized for next few decades. So, it should be noticed that “during which time electricity grids could be decarbonized” isn't necessarily true. | correct, but we're writing a report whose underlying assumption is that GHGs are a problem and we need to find solutions. |
| 15783 | 8 | 22 | 7 | | 9 | This does not ring true and needs to be verified. GREET says WTW GHGs for methanol from natural gas is greater than for gasoline. It wouldn't surprise me if DME was similar. | I suspect this is correct….yes, natural gas yields GHG reductions…but the conversion efficiency to get the products is not very good. My quick look at some GREET results shows that methanol from natural gas yields higher net emissions; DME is lower, but I suspect that's because the baseline vehicle is a gasoline vehicle and DME is in a |
| 2737 | 8 | 22 | 7 | | | Text "There are relatively few low-carbon fuel options for transport applications" is incorrect. There is no lack whatsoever on technical options for all transport applications, in excess of 100 are available. 23 generations of traffic biofuels have been identified. Some of these represent a group of many different feedstocks, production methods and chemical structures. In addition more than 10 other (non-biofuel) technological options for using all renewable energy forms in transport applications are available. | Accepted. The text statement has little meaning and seems overly negative. Agreed that "relatively few" isn't meaningful, but the implication in this comment that all biofuels are "low |
| 15823 | 8 | 22 | 8 | | | add LPG to methanol and DME list | agree we can mention these |
| 7488 | 8 | 22 | 9 | 22 | 12 | “Electricity, hydrogen and biofuels (including biomethane, DME, ethanol and methanol), all could provide operation with very low life-cycle CO2 emissions, but this depends on their feedstocks and conversion processes (see 8.3.3.4)”. There is ample feedstock from the existing net primary production of woody biomass and residues to provide biomethane, DME, methanol, producer gas/water gas and gengas through the dry distillation processes for converting ligncellulose to these gaseous and liquid fuels. | Noted. Certainly not enough to replace liquid fuels in transport. |
| 6483 | 8 | 22 | 13 | 22 | 30 | It has been established that such conversions may or may not have any positive impact at all. See http://www.greencarcongress.com/2011/02/reynolds-20110220.html and http://sa.indiaenvironmentportal.org.in/files/air%20quality%20policy_0.pdf. Also the fuel efficiency of diesel is better than CNG/LPG conversions. | good points, will reflect |
| 3465 | 8 | 22 | 14 | 22 | 28 | It must be mentioned as well the utilization of natural gas together with diesel | it IS mentioned, on lines 16-17 |
| 2680 | 8 | 22 | 18 | 22 | 20 | There is some evidence that methane leakage from fracking may lead to natural gas having a larger climate impact than coal. Please check the literature on this and what other parts of AR5 are saying on this issue, which is rapidly developing. | we do need a short paragraph on methane leakage, but presumably the chapter on energy production will deal |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5199 | 8 | 22 | 31 | | | No objection to discuss electricity with respect to electric cars, but please, do not forget the grid connected transport modes as electric (conventional and high speed) rail, urban rail, trolley bus. Globally these transport modes represent a much larger share than electric vehicles, have a very efficient and straight forward way to use the electricity (no batteries, etc.) and have a potential to reach very high shares by the end of this century and probably are needed to reach the 80% reductions and provide several times more transport volume as current. Another important caveat in all EV literature seems to me the cost aspect. For instance, peak shearing can be reached with storing off-peak electricity in car batteries, but the question needs to be answered why electricity producers do not use such batteries to store their electricity by themselves. The answer of course is that the cost of batteries is several orders of magnitude to high to do so. Then, the question remaining is why car drivers would be willing to pay for this high cost without heavily subsidising (or de-taxing) by governments. Actually, tax exemptions is currently the way in e.g. the Netherlands EV's are promoted. Economically this is really not efficient (batteries are far too expensive for large scale storage). | good point…..this section is supposed to deal with electric vehicles in transport, and this certainly includes rail and trolley. As for cost….cost is high today, hopefully much less so in the future. |
| 2681 | 8 | 22 | 40 | 22 | 41 | Reference to Axsen & Kurani is incorrect. This study did not survey those with Electric Vehicles - only those with potential home recharging, thus the conclusion stated in the text does not match with what this study analyzed. | also, the text implies home rechargers WILL use publich chargers….is that a correct interpretation of the source? |
| 2682 | 8 | 22 | 41 | 22 | 45 | This text strikes me as largely speculative. Would prefer to see a discussion of Israeli battery switching, see: https://betterplace.com/ | well, there's not much evidence available, so speculation is about all we have…as for battery switching (A Better Place), its president just resigned….but we shouldn't ignore the battery switching |
| 5403 | 8 | 23 | 1 | | 2 | The idea that an electric grid can be decarbonized in "at least one or two decades" seems a bit optimistic…..yes, you have the "at least," but a sweeping change of a nation's electric grid is a 40-50 year challenge, at least for developed countries. | I agree….way too optimistic |
| 2745 | 8 | 23 | 11 | | | Remove “modified”: otto engine is a gas engine, i.e. suitable for hydrogen with ease (and is already so used). And hydrogen is also used in wankel engines. | I'm not quite sure what the reviewer means by "otto is a gas engine"…it's a |
| 15799 | 8 | 23 | 2 | 23 | 2 | Add "to some extent" after "could be decarbonised" | or something like that…."decarbonized" |
| 15786 | 8 | 23 | 22 | | 24 | But it's $1 to $2 trillion more than the existing infrastructure. Unless there are significant govt incentives/mandates, this is unlikely to occur on its own. There is little value proposition for station owners to install these systems. | I think lines 17-24 don't do a bad job of describing the infrastructure problem, but we could be somewhat more forceful in explaining that fuel suppliers will NOT |
| 15827 | 8 | 23 | 25 | 23 | 27 | replace "quite high" with "very high". Also check NREL USDOE tests (CDP#15): http://www.nrel.gov/hydrogen/cdp_number.html | not sure why we should make that change….USD!/litre is about the U.S. price of gasoline today, admittedly |
| 17125 | 8 | 23 | 25 | 23 | 27 | DELETE: The current cost of hydrogen production and delivery to vehicles is quite high compared with gasoline or diesel fuel, with steam reforming at point of use estimated to be about USD 1 per litre gasoline equivalent, and electrolysis at point of use about USD 1.50 per lge (IEA, 2012).<br>REVISE TO: Hydrogen cost is not necessarily ‘quite high’, when large improvement of vehicle efficiency is considered. Vehicle efficiency of FCV is expected to be 2.5 – 3 times better than conventional vehicles. Eventually energy cost per a km of FCV may be cost competitive to conventional vehicles.<br>CONCAWE, EUCAR, EUROPEAN COMMISSION (2008). Well-to-wheels analysis of future automotive fuels and powertrains in the European context. Available at: http://ies.jrc.ec.europa.eu/uploads/media/V3.1%20TTW%20Report%2007102008.pdf | I don't agree with the 2.5-3 times stuff, because the appropriate comparison is to a hybrid vehicle, with a considerably smaller multiple….plus, although natural gas-based hydrogen produced at the station won't be super expensive, we probably need centralized production with CCS to get the GHG emissions reductions we need. Certainly, though, |
| 14771 | 8 | 23 | 26 | 23 | 27 | The mentioned 1 to 1.5 $/lge is only H2 generation. With distribution/delivery it sums up to some 3 to 3.5 $/lge. | no…..production AT POINT OF USE! |
| 3827 | 8 | 23 | 27 | 23 | 27 | Explain the meaning of "lge". It is the first time it shows up. | LITRE OF GASOLINE EQUIVALENT |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5404 | 8 | 23 | 28 | | 29 | a US 0.50/lge hydrogen price sounds like an (optimistic) "at the plant" cost….the delivered price would be MUCH higher | yes….production cost by itself is misleading…as for "much higher," that depends…if the scale is large enough for pipeline delivery, delivery costs will be |
| 15787 | 8 | 23 | 29 | | | Does the 50 cpg value include the levelized cost of the compressed fuel (including the cost of compression equipment), or is the just the cost of H2 from the reformer? The station/compression cost will be a substantial component of delivered cost and needs to be included in these kinds of comparisons. | good point, what's included in the cost estimate must be specified |
| 16302 | 8 | 23 | 37 | 23 | 38 | It has been recognized that a small percent blend of hydrogen with natural gas, called "hythane", can be transported by existing natural gas pipelines without causing problems such as embrittlement. | true, I believe….but a "small percent" won't make much of a dent….and the hydrogen can only move through NG pipelines to the delivery point FOR THE |
| 12899 | 8 | 23 | 39 | | | A reference to chapter 11 (agriculture) must be introduced in chapter 8.3.3.4 in order to refer to the tade-offs in land-use with respect to food production. Additionally, recent evidence on substantial indirect land-use changes due to feedstock production must be addressed as well as unfavourable life-cycle GHG emissions from bioenergy. Cite relevant studies, for example Leopoldina (2012), Bioenergy, Chances and Limits must be added. | I agree |
| 2446 | 8 | 23 | 42 | | | Risen fairly rapidly to 3% - this is very small scale and has made a negligible contribution to CO2 reduction | it's probably correct that contribution to CO2 reduction is negligable…but increase is interesting…the key is what fuels we're talking about….palm oil, for example, is probably not sustainable, nor |
| 7489 | 8 | 23 | 42 | 23 | 45 | However, [biofuels] production in 2012 grew little compared to 2011 possibly due to concerns regarding sustainability of feedstock production along with the slower than projected development of advanced biofuels, which are still in the development stage (IEA, 2012). There is ample feedstock from existing NPP. Also the dry distillation of biomass has been used for centuries. | Noted. |
| 2746 | 8 | 23 | 45 | | | Some, not all, are in the development stage. E.g. biogas and many types of synthetic biodiesel are commercial. | but presumably these are not |
| 11881 | 8 | 23 | 47 | 23 | 47 | The phrase "compatible with all types of vehicles" seems misleading, particularly given the discussion that follows. | perhaps we should say "compatible -- with minor modifications in some cases - |
| 15800 | 8 | 23 | 6 | 23 | 7 | Change "EV recharging can yield the benefits of "peak shaving" and "valley filling" (charging from grid when under low grid load)." to "EV discharging and recharging can yield the benefits of "peak shaving" (discharging to grid when electricity is in high demand) and "valley filling" (charging from grid when grid load is low). These power service functions, however, can shorten EV battery life due to more frequent cycling and are unlikely to be accepted by EV owners and/or manufacturers in the near future." | a good rewrite….I'm concerned about the last sentence, though….I imagine the effect on battery life depends on the degree of discharge….if small, might not be consequential. We need to check |
| 2447 | 8 | 23 | | | | There is too much reliance on one publication - IEA 2012 | it shouldn't be hard to find additional sources for some of these statements |
| 2683 | 8 | 23 | 2 | 23 | 2 | 10-20 years seems like overly optimistic timeframe for decarbonization. | Noted. |
| 2684 | 8 | 23 | 3 | 23 | 5 | This section seems repetitious. | true, this was stated in earlier |
| 2685 | 8 | 23 | 6 | 23 | 9 | V2G is still speculative; it is mainly useful for helping to manage transient load fluctuations. Would be better to discuss these issues. Good overview is provided here: Guille, Christophe, and George Gross, 2009, A conceptual framework for the vehicle-to-grid (V2G) implementation, Energy Policy, 37: 4379-4390. | agree that it is somewhat speculative, will take time to develop |
| 2686 | 8 | 23 | 35 | 23 | 35 | Deng et al 2010 is missing. | will correct |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17126 | 8 | 24 | 1 | 24 | 2 | REVISE: number 10%-15% to 5% to 10%; 10 to 20% to 5 to 7% ;<br>REVISION SHOULD BE: …to go above limits of around 5% to 10% ethanol blended with gasoline, or 5 to 7% biodiesel blended with diesel fuel.<br>Reason: The value has to be equivalent to the compatibility range of legacy fleet vehicles.<br>( Oak Ridge National Laboratory, Technical Issues Associated with the Use of Intermediate Ethanol Blends in the U.S. Legacy Fleet: Assessment of prior Studies. Available at: http://info.ornl.gov/sites/publications/files/Pub7767.pdf ) | Noted. |
| 15828 | 8 | 24 | 10 | | | biofuel infrasrcuruew costs can be high due to need for dedicated pipelines, storage tanks and dispensers, esp. for hi ethnaol or biodiesel blends. | Noted. Revised text. |
| 3828 | 8 | 24 | 15 | 24 | 16 | HDV using Diesel engines and fed with a blend of 95% ethanol and 5% additive (cetane enhancer) are being used in several countries (e.g. Sweden, Brazil, Italy). Around 1,000 of these vehicles are in operation. Please, look the BEST- Bioethanol for Sustainable Transportation site at the web. A thesis is available about the BEST Project in Brazil (in Portuguese). | Noted. |
| 16303 | 8 | 24 | 17 | 24 | 18 | The phrase "vegetable oils" should be modified to "FAME (fatty-acid methyl ester) biodiesel fuels" because biodiesel produced from microalgae can be hydro-treated to produce hydro-treated renewable jet (HRJ) fuels. If the above comment is reflected, I propose that the article "T.Takeshita, 2011 "Competitiveness, Role, and Impact of Microalgal Biodiesel in the Global Energy Future." Applied Energy 88, pp. 3481-3491." be included as a reference. | Agree that FAME is appropriate for most fuels derived from vegetable oil - but not all, will distinguish |
| 16304 | 8 | 24 | 18 | 24 | 19 | I propose that the article "T.Takeshita and K. Yamaji, 2008. "Important Roles of Fischer-Tropsch Synfuels in the Global Energy Future." Energy Policy 36, pp. 2791-2802." be included as a reference, because this article has shown the potential for biomass-derived Fischer-Tropsch synthetic fuels to be used as a fuel for aircraft. | Okay will check it |
| 2448 | 8 | 24 | 20 | | | More on this - important statement - and the comments in the next para on contention | we have a lot on biofuels sustainability in different places, but will review |
| 11643 | 8 | 24 | 21 | 24 | 30 | YES, YES, YES - it is state of art to include land-use change. Hence do it! Figures without are misleading and should not be used! | partially agree -we should show both ways. Very difficult and controversial and the group will work hard on how to represent all this for next draft. I'm fine with just making sure we repeat the land use warning whenever we discuss the figures on WTW and lifecycle emissions . RICH: the problem with that is that without land use change included, the figures may be meaningless. The |
| 15829 | 8 | 24 | 21 | | | although some biofuels like Brazilian sugarcane may have 30-90% GHG reducitons compared zero blend fuels, corn ethanol has been showing to also have positive emisisons, so range for those (dominant fuels in OECD) is more likely in the 10 to -10% range on average. Might find a paper on this | agree there is a big range and corn doesn't do great. We will get to a figure that shows all this. GREET shows a moderate GHG reduction for ethanol, disregarding land use changes….perhaps our range should be widened a bit, but my understanding is that most corn ethanol has positive reductions…exceptions are where coal powers the distillery and/or where yields are low …but, especially now, natural |
| 3829 | 8 | 24 | 28 | 24 | 30 | Add EPA, 2010 to the list of references. EPA, 2010 - EPA (Environmental Protection Agency). Renewable Fuel Standard Program (RFS2), Regulatory Impact Analysis. Assessment and Standards Division, Office of Transportation and Air Quality. EPA-420-R-10-006, February (2010). | enough references here already. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5239 | 8 | 24 | 30 | | | The following reference makes an overview of the various studies on the results concerning the EU sustainability criteria for biofuels. According to the reference, the criteria will not guarantee low ghg balance for the biofuels. Ref.: Soimakallio, S. & Koponen, K. 2011. How to ensure greenhouse gas emission reductions by increasing the use of biofuels? – Suitability of the European Union sustainability criteria. Biomass & Bioenergy 35, 3504–3513. | Will amend. but we have more than enough references here already. |
| 7490 | 8 | 24 | 31 | 24 | 35 | "All land-competitive biofuels potentially induce emissions from indirect land-use change, though the magnitude of this effect is quite uncertain ---. The production of land-competitive biofuels can also have negative direct and indirect impacts on biodiversity, water and food availability (see Bioenergy section in Chapter 7)". This is not true if existing net primary production (NPP) is used more fully. | i.e. ag wastes? True…Will amend.See remarks above about using existing NPP |
| 16305 | 8 | 24 | 34 | 24 | 35 | Takeshita and Yamaji (T.Takeshita and K. Yamaji, 2008. "Important Roles of Fischer-Tropsch Synfuels in the Global Energy Future." Energy Policy 36, pp. 2791-2802.) have shown that biofuels produced from feedstocks cultivated on excess cropland that can be used for energy purposes without conflicting with other biomass uses such as the production of food, paper, lumber, and traditional fuelwood could make a large contribution to avoiding dangerous climate change without negatively affecting food availability. | we will point this out. Agree. It's not clear what "excess cropland" means in practice with growing populations eating higher on the food chain, and with extreme weather potentially reducing crop output. All purpose-grown energy crops potentially compete with food production. In some cases the areas |
| 2748 | 8 | 24 | 36 | | | Because gene manipulation technologies are commonly used in algae fuel development (although natural algae would work), potential ecological and other risks of GM algae deserve to be mentioned. | agree but not really a transport chapter issue |
| 5337 | 8 | 24 | 36 | 24 | 36 | Algae cannot grow at sufficient volumes using atmospheric CO2 alone. Algae production therefore requires a very significant input of CO2 from a non-atmospheric source, i.e. fossil CO2 from power or industry sources. The GHG benefits of algal biofuels are therefore very limited, and only appropriate if either CCS or alternatives to the use of fossil fuels are not available in the industry or power sectors. | Noted. |
| 3830 | 8 | 24 | 36 | 24 | 37 | It looks unfair to quote sugar cane ethanol in the same place as lignocellulose crops and algae. These last crops are not yet commercial for energy production, while sugar cane ethanol is presently the only advanced ethanol commercially available. Thus, it should be treated in another sentence where its merits should be explicitly listed. | Noted. Ethanole now also otherwise mentioned in Sectin 8.3.4.4. |
| 3831 | 8 | 24 | 36 | 24 | 37 | When discussing sugar cane ethanol it is worthwhile to make reference to its significant capability of fuelling "plug-in" hybrid vehicles. This issue is discussed, starting already in pg 24 and it should make a link with the sugar cane feedstock. Please, see Pacca and Moreira, 2011 for further information, and use the words Pacca+Moreira+biofuel+2011 to see paper repercution in several sites. Please, also consider the relevance of sugar cane ethanol regarding GHG emissions, when used to feed a fleet of plug-in hybrid vehicles. - Pacca, S. and J. R. Moreira, 2011. A Biorefinery for Mobility? Environ Sci Technol. 2011 Nov 15;45(22):9498-505. | yes but true for any ethanol or drop-in biofuel. I don't see how this issue is already "started" in p.24, but the general idea is a good one…..the community has been talking about combining PHEVs with biofuels for the last few years….since the amount of liquid fuel required could be fairly low if the PHEV range was reasonably high (more like the VOLT than the Prius plug-in)…useful |
| 7491 | 8 | 24 | 36 | 24 | 38 | "Advanced biofuels from ligno-cellulose crops (e.g. grasses, short-rotation trees) and algae, along with sugar-cane ethanol, offer potentially lower life-cycle emissions than grain-based or oil-seed-based biofuels, with better opportunities to avoid large direct and indirect land-use change impacts". If existing NPP is used more fully and the lignocelluloses is broken down by dry distillation to methanol etc. then much if not most land-use change could be avoided. | Noted. |
| 2749 | 8 | 24 | 39 | 24 | 40 | Word "also" gives a very wrong impression. It should be made clear that biowastes, forestry waste and agricultural and forestry residues makes much larger GHG emission reduction possible than energy crops, including lignocellulosic energy crops. In addition, their ecological problems are much smaller and they do not require land use, i.e. no land use change problems. E.g. the source (EUCAR/CONCAWE/JRC, 2008) used in this chapter shows that GHG emission reduction of -200 % is possible when utilizing biogas made from biowaste sources that otherwise would be atmospheric methane emitters. | a reasonable point, though a bit overstated….if we're comfortable with the conclusion that waste utilization yields.lower GHG emissions, we probably should reword this. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2750 | 8 | 24 | 40 | 24 | 42 | Text "the alternative fate of wastes and residues must also be considered: net emissions can rise if waste diversion releases carbon that would otherwise be flared, sequestered, or utilized for energy" is misleading. Use of bioresource for transport does not increase emissions compared to its use in other energy production (but has a potential to decrease them because transport is now almost completely crude oil based). Use of bioresources for transport decreases emissions when compared to resource wasting flaring. Flaring should not be recommended. | well, certainly the words about flaring in our text are incorrect….if the waste would otherwide be flared, its diversion to fuel can't produce MORE carbon…flaring releases all of it….as for energy use, depends on what the biomass energy substitutes for...if it substitutes for coal, then using it as a transport fuel might indeed yield higher net GHG emissions. I do recommend we rework this a bit, agreed that the |
| 17771 | 8 | 24 | 44 | | | Biofuels - test flights by airlines Qantas, United, Boeing should be included | agree |
| 15788 | 8 | 24 | 7 | | 9 | You might be able to get the vehicles on the road, but processing the billions of tons of biomass required in such a scenario into liquid fuels would be an incredible challenge. | the reviewer is correct, but that's not what the sentence says….it only says that obtaining the vehicles wouldn't be too difficult…which is |
| 2568 | 8 | 24 | 7 | 24 | 9 | Biofuel blends higher than 5.75% face the difficult barriers posed by standards such as the World Wide Fuel Charter. Tracing back these guidelines one can see from which studies these came from. More at http://cenbio.iee.usp.br/download/publicacoes/STC_Ethanol_SEPT2005.pdf | but many manufacturers warrant vehicles to 10%, US EPA estimates 15% is safe except in quite old vehicles. Maybe the reviewer's point is to change |
| 2747 | 8 | 24 | 8 | | | Text “given slow vehicle stock turnover rates”gives a wrong impression. Vehicle lifetimes, especially road vehicles, are much shorter than lifetimes of power (5x) and heating plants (2x). Therefore, new technology, including ability to use renewable energy, can be taken into use in transport sector faster than in other energy sectors. | Noted. |
| 3418 | 8 | 24 | | | | I miss a notion in this paragraph or a previous one that urban modal choices differ among countries, regions, continents because of substantially different urban transport systems. E.g. cheap and abundant forms of private and collective transport (taxis, rikshas, motorized two- and threewheelers, minibuses) in Asia and Latin America. The volumes are such that this report needs to recognize this sub-sector (its associated efficiencies and inefficiencies, its private LDV growth mitigation potential, its pollution etc.). Making a difference between LDV and HDV is rightful when talking about vehicle and fuel technology, but it falls short when viewed from a more socio-economic and spatial angle. In 8.9.3 there is reference to this notion but it is a bit late. | seems this reviewer is referencing another text from ours….comment otherwise makes no sense |
| 2450 | 8 | 25 | | 27 | | Good succinct review | yay thanks! |
| 8432 | 8 | 25 | | | | Please specify the average emission factor considered for the reference vehicle (“a base 2012 ICE gasoline vehicle), or else change the y-axis considering not the percentage change in l/km but absolute CO2emissions (g/km) expected from the different technologies | good comment…I'd prefer the former |
| 4524 | 8 | 25 | | | | Not sure what lge is in the label on the y-axis. Should show WTW ghg emissions which for BEVs is highly dependent on the carbon emissions in power generation. It is not transparent, and therefore a misrepresentation to equate energy in electricity to energy other fuels which is perhaps done in this figure. (e.g. see NRC report on “Hidden Cost of Energy” for examples of WTW studies for BEVs) | yes, but showing WTW adds greatly to complexity…I'd stick with fuel consumption here, unless we're willing to greatly expand the number of data |
| 5405 | 8 | 25 | | | | the 2012 and 2030 values for the BEV and FCEV seem much too similar, given the very large load reductions possible in this timeframe | Agree |
| 16307 | 8 | 25 | | | | Same as above. | Agree - referring to his last comment |
| 11644 | 8 | 25 | 10 | 25 | 19 | Make a comprehensive figure including biofuel options and at the level of GHG emissions! | as above (comment no 16307) …a good idea, but you'll need lots of data bars to make it comprehensive (or the bars will |
| 11645 | 8 | 25 | 10 | 25 | 19 | Add by similar chart for HDV otherwise lack of balance. | good idea |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15830 | 8 | 25 | 10 | | | the low GHG values shown for BEVs and FCEVs are only possible if using low-carbon electricity and hydrogen. Should also consider using BTU/km, not gge/km, since the BTU would capture any electricity used in the fuel, in addition to liquid fuels. should really show totoal BTU or Joule / 100 km, not just liquids since would represent BEVs and PHEVs more accurately. | don't agree, BTU presents us with the problem that the efficiency of conversion varies widely…and what's the "efficiency" of nuclear? |
| 4296 | 8 | 25 | 11 | | | Since this section shows the analysis for reduction of fuel consumption and CO2 emission, we should also indicate comparison of the CO2 emissions in well-to-wheel in each vehicles. | same issue as comment no 15830 ….this would be nice, will take up |
| 2449 | 8 | 25 | 15 | | 19 | A very important point is made here, but this is not followed up in the rest of the Chapter. The W2W comparisons are central to CO2 estimates - as are the embedded energy and carbon in the construction of the infrastructure. | agreed, though the last sentence states we can't yet do this well |
| 16308 | 8 | 25 | 16 | 25 | 16 | The term "life cycle" should be deleted because emissions caused by vehicle manufacturing are not accounted for. | yes, we're talking about the fuel cycle here |
| 15831 | 8 | 25 | 18 | 25 | 19 | not clear about this last sentence. Many studies have been done to measure WTW emissions for many pathways, inc; biofuels. Not sure what this issue is here? | good question….it's true that some controversy remains, e.g. land use change, but certainly there are many WTW studies (GREET, for example) that are reasonably well accepted. will |
| 11882 | 8 | 25 | 18 | 25 | 19 | The statement that a "suitable comparison capturing all contingencies (including LUC for biofuels) has not yet been satisfactorily achieved and further analysis is required" needs elaboration if it is to be included. This is a sweeping statement, but the phrase "all contingencies" is vague making it difficult to understand current research/analysis needs. There are many studies that have attempted to do well-to-wheel analyses, so it seems like an explanation of which aspects need more analysis (beyond LUC) should be pointed out. | same point made again (see answer to comment no 15831) |
| 2754 | 8 | 25 | 18 | 25 | 19 | Uncertainty has not prevented showing other quantitative diagrams in the chapter and should not prevent showing lifecycle GHG emission data either, whether LUC effects are included or not. When showing the DENA bar diagramme (see my comment 28) it is advisable to mention that LUC effects have not been taken into account in energy crops (ethanol and biodiesel) shown in the diagramme, but they have been taken into account in biowaste based biomethane, because it does not need land. Therefore, biomethane WTW emissions can be compared to fossil fuels, electricity and hydrogen in the diagramme. Because fertilizer value and much of its carbon is easily recovered from biowaste, when anaerobic digestion is used for biogas production, there are very little concern over fertilizer and soil carbon loss, unlike when using forest residues (as correctly mentioned on page 24 lines 42-44 of the draft). | Noted. Introduced Figure 8.3.2 with LCA data now. |
| 3832 | 8 | 25 | 18 | 25 | 19 | I understand that some comparison is already available. Look for EPA, 2011 - EPA (Environmental Protection Agency). Renewable Fuel Standard Program (RFS2), Regulatory Impact Analysis. Assessment and Standards Division, Office of Transportation and Air Quality. EPA-420-R-10-006, February (2010). | and again… |
| 3431 | 8 | 25 | 28 | 26 | 11 | Unlike what is mentioned here, I don't think that the literature is unanimous that consumers undervalue fuel economy. Several additional references can be provided here, but pages 96-97 of the following article provide a good overview of the findings of many studies: Anderson, Parry, Salee and Fischer, 'Automobile Fuel Economy Standards: Impacts, Efficiency, and Alternatives'. Rev Environ Econ Policy (2011) 5 (1): 89-108. doi: 10.1093/reep/req021. Moreover: Even if fuel economy undervaluation is true, this does not automatically make fuel economy standards a preferred policy tool - see again Anderson et al. | Noted. Issue is complex (there are other factors involved, like power, size, industry strategy (the high fuel economy models are usually the "cheap" ones), etc), still core factors are covered. |
| 4418 | 8 | 25 | 4 | 25 | 6 | A 2012 baseline vehicle is used here compared to a 2010 baseline vehicle used earlier on p17, line 9 | this would be OK if we were simply using a graph from an existing study…but this is a constructed graph…and by the way, we used a 2005 baseline also, in referencing Bandivadekar…..although by itself this |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16306 | 8 | 25 | 4 | 25 | 6 | These sentences should clarify the definition of fuel economy, or more specifically, whether it denotes test fuel economy or on-road fuel economy. | given that the values stated are in percentages, this might be ignored…..though if one wanted to get precise, it does seem that onroad correction factors tend to be more severe for higher fuel economy vehicles. We probably could say that the percentage differences relate to test fuel economy, |
| 2753 | 8 | 25 | 5 | | | Fuel economy advances applicable to gasoline vehicles are also applicable to renewable fuel vehicles. In addition, many renewable fuels have engine technological advantages compared to gasoline (higher octane value) and diesel oil (higher setane value). E.g. biogas has an octane value of 140 making it possible to increase fuel economy of otto engines substantially compared to gasoline use. Many such examples are already in the market and there are large potential for more. | generally correct observation….though I'm not aware that OEM natural gas vehicles have gotten higher (gasoline equivalent) fuel economy than competing gasoline vehicles (VW does have a turbo/supercharged vehicle, I |
| 8367 | 8 | 25 | 21 | | | In the first part it says: 'some behavioural concepts are introduced ... ' There is nothing about how to handle the immense increases of low-cost travelling in developing countries that do not have adequate transport infrastructure. The spreading of the urban lifestyle means that there is a huge pressure for access in rapidly growing cities with only dismal infrastructure, insufficient budgets and lack of management capacity to cope with the emerging transport challenges. Far too many cities and countries have not been able to respond to the growing need for transport facilities and how will they be able to meet the travels needs and introduce reductions of greenhouse gases at the same time? In this part the structural conditions, policy approaches and different strategies to manage huge increases in demand for transport and transport energy will have to be described and discussed. Pls integrate such analysis as to increase the quality of the debate. | worth contemplating some additional discussion |
| 8550 | 8 | 26 | | | | RECOMMEND ADDITIONAL EVIDENCE TO CITE<br>"Driving rebound effects: Changes in driving in reaction to changes in the fuel cost of travel, e.g. due to fuel efficiency increases or shifts to cheaper fuel, is commonly called the (direct) “rebound effect”<br>COMMENT: The new USEPA impact analysis of the proposed 54.5 miles per gallon fuel efficiency standard finds the rebound effect to be -0.1. See: www.epa.gov/otaq/climate/documents/420r12016.pdf. This is important because it is the basis of public policy in the world's leading automobile oriented economy | I assume this comes from Small and Van Dender (2007)….worth citing. |
| 13114 | 8 | 26 | | | | Not only for conventional gasoline vehicle, but also HEVs/PHEVs/Evs/FCVs/CNGs/should be compared to mass transportation (Bus, Rail, Air,,,), if those data are available. Especially, Evs/FCVs with low carbon electricity and hydrogen. | good idea….though all modes will change quite a bit in the future….so perhaps we should focus only on |
| 8719 | 8 | 26 | 11 | 26 | 11 | Additional note: Evidence suggests that the form of the incentive is also an important factor, in addition to the total subsidy amount. Consumers are highly sensitive to upfront costs, and less influenced by total cost of ownership, which may explain why schemes which deliver up-front incentives tend to be more effective than those which offer savings post-purchase. Source: AEA, 2012. Next phase of the European Climate Change Programme: Analysis of Member States actions to implement the Effort Sharing Decision and options for further community wide measures: Transport Sector Policy Case Studies<br>http://ec.europa.eu/clima/policies/effort/docs/esd_case_studies_transport_en.pdf | useful information, but not here….should be discussed in policy section |
| 5246 | 8 | 26 | 12 | 26 | 29 | The same point as made above needs to be inserted. | It is not clear what this refers to. For this reason the comment could not be |
| 5338 | 8 | 26 | 17 | 26 | 19 | Even with generous incentives, electric vehicles are significantly more expensive than conventional vehicles. It is likely that high cost is an important driver of slow market introduction, so difficult to attribute this to negative perceptions about vehicle attributes or range anxiety. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3432 | 8 | 26 | 20 | | 29 | You may add here that the gap between test and real-world fuel economy may have increased in recent years, which is an alarming prospect. See ICCT working Paper 2012-02 "Discrepancies between type approval and "real-world" fuel consumption and CO2 values". See also TNO (2010): "CO2 uitstoot van personenwagens in norm en praktijk – analyse van gegevens van zakelijke rijders [CO2 emissions from passenger cars in standard and practice – analysis of data from business drivers]", TNO Report MON-RPT-2010-00114. | if correct, this is valuable information that should be added |
| 17127 | 8 | 26 | 25 | 26 | 29 | COMMENT: Well understood "Various studies (e.g. (IEA, 2009) suggest that a 5-10% improvement in on-road fuel economy can be achieved through efforts<br>to promote "ecodriving"; another 5-10% maybe be achievable by an "integrated approach" including better traffic management, intelligent transport systems, better vehicle and road maintenance, etc."<br>REASON: McKinsey describes:<br>In 2020, more than 50 percent of CO2 abatement potential could come from the combined impact of second-generation biofuel, traffic flow, shifts to public transportation, and eco-driving measures. Such measures are essential for near-term abatement because of the potentially shorter time and relatively lower incremental cost associated with their implementation, as well as their applicability to the entire fleet, not just new vehicles.<br>Figure: (p.3 & p.6 Exhibit1, Roads toward a low-carbon future, McKinsey&Company, 2009)<br>(Roads toward a low-carbon future: Reducing CO2 emissions from passenger vehicles in the global road transportation system, March 2009, McKinsey & Company.<br>Available at: http://www.mckinsey.it/idee/practice_news/roads-toward-a-low-carbon-future-reducing-co2-emissions-from-passenger-vehicles-in-the-global-road-transportation-system.view) | I'm not sure that the reviewer wants here….more detail? With our space constraints, perhaps we shouldn't do that. |
| 12900 | 8 | 26 | 35 | 26 | 44 | Another rebound should be mentioned here: The purchase rebound; growing engine size and mass of passenger cars have offset (and are still offsetting) parts of fuel economy improvements (if not addressed by relevant policies). Cite related literature, for example Amela Ajanovic, Lee Schipper, Reinhard Haas (in press), The impact of more efficient but larger new passenger cars on energy<br>consumption in EU-15 countries, Energy, xxx, 1-10; Meyer, Ina; Wessely, Stefan (2009): Fuel efficiency of the Austrian passenger vehicle fleet—Analysis of trends in the technological profile and related impacts on CO2 emissions, Energy Policy, 37, 10, 3779-3789. | good point…it is an oversight not to discuss how vehicle performance, size and features have shifted over time and their effect on fuel economy…this seems to be a universal trend, though especially pronounced in the U.S. |
| 5200 | 8 | 26 | 35 | 26 | 44 | Add same rebound for air transport efficiency improvements and relation with rail (see my note 16). | Covered in 8.10 |
| 16309 | 8 | 26 | 37 | 26 | 40 | This sentence should clarify the time span during which this elasticity value holds true. In other words, it should be clarified that this elasticity value was estimated in the short-, medium, or long term. | agree |
| 15833 | 8 | 26 | 45 | | | this bullet repeats point from previous bullet right above it on rebound effect. Could be merged or deleted. | I don't really agree…suggest we keep |
| 4002 | 8 | 26 | 45 | 46 | 2 | The paragraph on oil market response seems (1) out-of-place - but maybe there is no better spot for this important material, (2) a bit vague - what is the range of oil price supply elasticities, what does it depend on?, (3) does not take into account non-competitive behavior on the part of OPEC. Since oil/fuel price is a key driver in all modes of transportation, this material should be significantly expanded. Perhaps, it should be moved to it's own sub-section. | Noted. |
| 15832 | 8 | 26 | 6 | 26 | 8 | another explanation is prefernece of vehicle performance over fuel economy. See heywood et al for more references on this. | here's this issue again….it needs to be discussed |
| 4342 | 8 | 26 | 22 | 26 | 24 | need to include the "vehicle mix" as an additional factor in the overall fuel economy (on road) | agree |
| 2687 | 8 | 26 | 45 | 27 | 2 | Oil market response paragraph does not fit this section on 'behavioural aspects'. | agree |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8567 | 8 | 27 | | | | ADDITIONAL CITATIONS RECOMMENDED<br>"If rail systems achieve modal shift from road vehicles, life-cycle emissions from rail infrastructure may be partially counterbalanced by reduced life-cycle emissions of road infrastructures,<br>COMMENT: This is RE high speed rail. Two additional sources should be included and summarized. (1) Booz, Allen, Hamilton (2007), "Estimated Carbon Impact of a New North-South Line," which estimated a very long GHG payback period for infrastructure (http://webarchive.nationalarchives.gov.uk/+/http:/www.dft.gov.uk/pgr/rail/researchtech/research/newline/carbonimpact.pdf). and (2). Jean-Noel Chapulet and Jean Pierre Taroux, "Trens Ans LGV: Comparison de Prevision et Realisations," Tranports, July-August 2010. This work shows the diversion from cars to high speed rail to be modest, even in an environment with high petrol prices and expensive highway tolls. | will read those sources and consider. in developed nations at least, road infrastructure isn't growing with increased vehicle use…it's not all that clear that reducing slightly the growth in vehicle use will have much of an effect on inffrastructure development, except perhaps for repairs . Care to be taken with Booz, Allen Hamilton report - is very much grey literature and based on grey literature. Also typical UK where e.g. emissions from electric rail can be abated at a fraction of cost of e.g. air and even car. Not much technical |
| 17716 | 8 | 27 | 11 | | | Again, this sentence might be misleading. Car-oriented transport has increased with rising incomes, but this has been the result of certain policies and investment choices (eg subsidised fuels). | The sentence is not specific to car transport. the reviewer's assertion might be correct, but what's the basis for it? solved as whole section 8.4.1.1has been deleted. The authopr has a point of couse that there is no specific causal relation between income itself and car use or mobility: there are some based on |
| 10770 | 8 | 27 | 32 | 27 | 38 | It should be made clear which components that have been included in the results behind figure 8.4.1 (only Kyoto gases or short-lived forcers also?) and how the effects have been transformed to CO2-equivalents. I assume it is by GWP. Which time horizon that is used should be given. It is important to note that other time horizons and metrics would produce a different result; see figure 2 in Fuglestvedt et al., 2010: Transport impacts on atmosphere and climate: Metrics. Atmospheric Environment 44 (2010) 4648–4677. See also WGI, chapter 8, fig 8.31. | Figure will be reconsidered. it does make sense to specify such things, e.g. time horizon….as for 'noting that other time hoizons and metrics would produce a different result," we need a methodology discussion somewhere in the overall report, not in the transport section, about LCA. actually I believe we should always give both CO2 |
| 4419 | 8 | 27 | 36 | 27 | 36 | Be more specific on the statement “probably large” | Will consider more literature to specify here. the current version doesn't concern me. indeed lots of literature with contradicting results; will draft a table with this all recalculated to |
| 15834 | 8 | 27 | 40 | 27 | 42 | Calif high speed rail is a poor example / case study since this is still a very uncertain and early stage project. Why not draw from hi speed rail projects already done such in Taiwan or China or EU and compare these to non-high speed systems. Use real life example sbased on real existing operating data | Will consider according to data availability. if such project data are readily available, they might be better….but otherwise I don't have a problem using the CA example. There is lots of literature here; the Chester ref |
| 11883 | 8 | 27 | 44 | 27 | 45 | I believe the finding from Chang and Kendall was recuperation time of just over two years (not within 2 years) | This is correct and changed accordingly. |
| 18904 | 8 | 27 | 45 | 27 | 46 | recycling of rail track materials: Are there numbers to what degree this is ususally done? As I would have expected that gravel is always reused and rails always recycled. | There is some literature e.g. {von Rozycki, 2003 #797}, {Westin, 2012 #3372}, {Du, 2012 #3764}, and combining with steel literature like {Damgaard, 2009 #3765} and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2451 | 8 | 27 | | | | This section needs a clearer focus and rationale - it could again be shortened - duplication on the costs of taxiing in aviation, the iconography of the car (Unruh and Urry), and links with Ch 12 - it is unclear what this Section actually adds - yes there is a need for a systemic approach, but does this provide it as it is so compartmentalised | both shorten and sharpen it |
| 9071 | 8 | 27 | 3 | 33 | 8 | 8.4 Infrastructure and systemic perspectives can be deleted due to the limitations on the nos of pages | This is not an option, as the structure |
| 13877 | 8 | 27 | | 27 | | This section should stress the urgency to act - due to the resilience / path dependency of urban structure - expecially in developing country where the type of urban growth that cities will experience in the next three decades will determine the level of their energy consumption and GHG emissions in the second half of the century (see Lefèvre, B., 2007, Long-term energy consumptions of urban transportation: A prospective simulation of "transport - land uses" policies in Bangalore, Energy Policy, Volume 37, Issue 3, March 2009, Pages 940-953) | Potentially an interesting paper showing the basic choices by governments in infrastructure/land-use planning and the ultimate transport systems and impacts. |
| 2688 | 8 | 27 | | 28 | | This is a growing area of research. Chester & Horvath is only one study of rail impacts, suggest these results be discussed with less certainty, as their analysis is very case specific. | agreed, consider. |
| 13898 | 8 | 27 | 28 | 28 | 17 | Life cycle analysis of electric vehicle should be discussed since the production of battery is energy intensive. See French Strategic Council, La voiture de demain,carburants et électricité, Jean Syrota, Juin 2011, http://www.strategie.gouv.fr/content/rapport-la-voiture-de-demain-carburants-et-electricite-0 | interesting report of 332 pages and fully in French… will try to get the battery info from it. |
| 10773 | 8 | 27 | 28 | | | This paper could be relevant here: Peters et al. 2011: Alternative 'Global Warming' Metrics in Life Cycle Assessment: A case study with existing transportation data. Environmental Science & Technology, 45: pp. 8633-8641. | consider. |
| 7810 | 8 | 27 | 28 | 28 | 17 | Peters et al. (2011) (Peters, Glen, Borgar Aamaas, Marianne Tronstad Lund, C. Solli and Jan S. Fuglestvedt, 2011. Alternative 'Global Warming' Metrics in Life Cycle Assessment: A case study with existing transportation data. Environmental Science & Technology, 45: pp. 8633-8641.) also focus on LCA of the transport sectors, for European conditions and including also short-lived climate forcers. | consider. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5201 | 8 | 27 | 28 | | | In essence this section is important, but be careful: much is based on the Chester & Horvath 2009 reference and I am afraid this reference is not valid for the current state of the art regarding life-cycle analysis of infrastructure and based on very a-typical cases to be of general vallidity or transport in the world. it even could be misleading.<br>My objections are:<br>1. It compares apples and pears: air transport is used for trips above 100 km at least (averaging 1500) while urban rail systems are for distances to at most 35-40 kms. These are totally different markets and now the impression is created that rail is not toop efficient compared to air, while long range rail is performing much better than these specific urban rail systems (see my refs below).<br>2. I checked the basic data for the rail systems and found they stem from the 1970s, describing new rail systems build in the 1960s with very typical USA characteristics like an enormous amount of enery used by lighting the stations up to almost day-light level during nights (because of safety regulatins that do not exist in this way in other parts of the world), a low ridership and low train frequencies of a new not matured system. Actually current urban rail systems are much better (or for air transport the DC9-30 should have been used for comparing).<br>As you do refer to Akerman 2011 already, please check my rough calculation from data from that paper that infrastructure share of emissions per pkm is just about 5-7% at the 25 billion pkm prognosed for the high speed railway in Sweden. Based on data from Amos, P., Bullock, D., & Sondhi, J. (2010). High-speed rail: The fast track to economic development? In. Beijing: World Bank, the real capacity of this line could be at least double the 25 billion, halving the percentage for infra to be some 3-4%, which is substantially different from 33% given by Chester et al. My recommendation: do not use the Chester & Horvath 2009 reference but make use of the data given in e.g.the followig papers: Åkerman, J. (2011). The role of high-speed rail in mitigating climate change - The Swedish case Europabanan from a life cycle perspective. Transportation Research Part D: Transport and Environment, 16, 208-217.<br>Chang, B., & Kendall, A. (2011). Life cycle greenhouse gas assessment of infrastructure construction for California's high-speed rail system. Transportation Research Part D: Transport and Environment, In Press, Corrected Proof.<br>IWW/INFRAS. (2004). External costs of transport. Update study. Final Report. In. Zürich/Karlsruhe: UIC.<br>Milford, R. L., & Allwood, J. M. (2009). Assessing the CO2 impact of current and future rail track in the UK. Transportation Research Part D: Transport and Environment, In Press, Corrected Proof.<br>Tuchschmid, M. (2009). Carbon Footprint of High-Speed railway infrastructure (Pre-Study). Methodology and application of High Speed railway.<br>and, though not really LCA:<br>Peeters, P., Szimba, E., & Duijnisveld, M. (2007). Major environmental impacts of European tourist transport. Journal of Transport Geography, 15, 83-93.<br>As LCA has still many uncertainties, please add figures for direct CO2, direct RF, and same LCA based. | invite peters to become CA to solve this issue. |
| 8433 | 8 | 28 | | | | In this figure of this paragraph I suggest to show only the % increase in GHG due to transport infrastructure, and not all the emissions from fuel combustion that has its own variation and uncertainty | It is valuabe to have the context, but we need to recompile a new graph. Will try to develop a table/graph including all |
| 11277 | 8 | 28 | | | | It should be made clearer in the text that the figure is only showing the specific US case, not claiming representativeness of the data for other regions.<br>Furthermore, the figure might be better understood with further explanations (in the text), since the illustration - even though it refers to a particular take on GHG emissions - might convey at first glance the picture of strongly better aircraft performance over, e.g., urban diesel buses - discussed holistically, this is phrased differently on, e.g., page 30 (lines 9-11) (since flight over road transportation should probably not be recommended). | Agreed, we need to draw a new graph. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15835 | 8 | 28 | 1 | | | Horvath studies have been controversial for several reasons. This is supposed to be a study of studies so suggest showing a graph based on data from several sources. Could be an average of several studies or something like that, but don't just cut and paste from a single source. Similar chart was shown in SRREN report Chap. 8 on Integration for trasnportation sector. might check that. | agreed, problem is to find more data here. Scarcely availale. Will check SRREN Ch. 8 |
| 17717 | 8 | 28 | 12 | | | suggest a stronger word than "may": there is plenty of evidence that building roads increases VMT | accepted |
| 11646 | 8 | 28 | 16 | 28 | 17 | Delete, it's misplaced here. | Accepted. Moved to 8.9.2.1 |
| 18906 | 8 | 28 | 19 | 28 | 20 | Channels are line infrastructures for shipping - please take this into account. | Accepted |
| 11276 | 8 | 28 | 26 | 28 | 30 | The notion on airport congestion management should include a critical comment on the extension of flight operation hours into the early mornings and evenings (or even nights), resulting in environmental, social, and health repercussions on adjacent environments and settlements that might not be offset by economic and efficiency concerns. | agreed. |
| 5202 | 8 | 28 | 3 | | | Please remove this figure and replace with one based on refs given in my note 20. | consider. |
| 8886 | 8 | 28 | 30 | 28 | 32 | This is a quite old paper focusing on tourism. There are many papers out there showing that aviation demand is relatively price inelastic. | if we find better literature, we will consider. Mayor et al., is about tourism but is not the reason to not take it up as, 90% of air transport is basically tourism transport as tourism comprises not only leisure travel, but also visting friends and relatives and business trips outside ones own usual environment (UNWTO definition); where this includes same day visitors, but for 'tourists' it includes only visitors staying at least one |
| 5204 | 8 | 28 | 30 | 28 | 32 | I feel this general taxing remark belongs not in this section. | Agreed. Sentence deleted. Figure out |
| 14287 | 8 | 28 | 31 | 28 | 31 | To note that the EU now does have a price on CO2 emissions from aviation, as all flights to/from the EU are covered by the EU ETS. | Sentence deleted. |
| 11884 | 8 | 28 | 31 | 28 | 31 | I am not sure it is clear what "in contrast to a boarding tax" means in this sentence, or what is meant by a boarding tax in the first place. | Sentence deleted. |
| 18907 | 8 | 28 | 31 | | | "taxing jet fuels": Consider mentioning that most other transport mode fuels are taxed in most countries so that the current state causes market distortion | Sentence deleted. |
| 11647 | 8 | 28 | 33 | 29 | 8 | Check for analysis by Scheiner & Holz-Rau. They are very careful not to jump to conclusions. See e.g. http://www.vpl.tu-dortmund.de/cms/Medienpool/PDF_Dokomunte/Publikationen/Ursache_Wirkung.pdf | will check this paper. |
| 5247 | 8 | 28 | 33 | 30 | 7 | Of course urban systems are important, not least because the proportion of the world's urbanised population is rising, but why is there no section of the various important needs of rural dwellers? | Accept. Add key references on the rural side. |
| 11184 | 8 | 28 | 33 | | | The sections in relation to urban form are overlapped with some sections in Chapter 12. The sections in Ch.8 could be moved to Ch.12 because Ch.12 might not exist without the subject. | Noted. This is discussed in both chapters, here with details on transport not covered in Ch.12 and in Ch.12 in a |
| 5286 | 8 | 28 | 42 | | | ADD: Ecodriving has also obtained reduction of about 15% and can be maintained in time when companies offer part of the gains in energy costs to drivers (Stéphane La Branche, « La réduction des émissions de GES des entreprises dans la région de Lyon : freins, blocages et opportunités. Report for the City of Lyon, France. », 2010°. | Accept. But need peer-reviewed literature.there is like {Barkenbus, 2010 #3773}. Point here is that the 15% is for those drivers that accept the eco-driving |
| 2452 | 8 | 28 | | | | Has shipping in the title - but no mention of shipping in the text. | Accept. Change title. |
| 2689 | 8 | 28 | | | | Nothing about shipping in this section, despite sub-title. | see above (i.e. answer to comment no |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 5203 | 8 | 28 | 18 | | | The quote of 5-10% of fuel burn on the ground is a very high number and really non-typical (also it is based on a conference presentation of which the sheets seem not publicly available, but I feel it will be based on a very short flight with extreme hig taxi times). Even in heavily congested airports as JFK with average taxi times of 30 minutes, the total fuel share of this taxiing will be, at 7% power rating and assuming 75% power rating during the flight and average flight duration of some 90 minutes, give 2-3% of total fuel burn. But the JFK is rather non-typical: in most airports taxi times are generally in the order of 5-10 minutes. So please remove this and add that overall taxi fuel for the global fleet is just a few promiles (that still can be reduced in some heavily congested airports). | Need to reread the literature. add also {Nikoleris, 2011 }, {Simaiakis, 2011} and {Simaiakis, 2010}. |
| 8213 | 8 | 28 | 18 | 28 | 32 | There is very limited write up of "shipping", while the main section (8.4.1.3) is for 'aviation'. The in-port congestion (incl seaports and inland waterway ports) can be as serious as airports, which lead to heavy emissions and time lost. | Accept. Need literature. {Balkanski, 2010 ;Haites, 2009}, {Wit, 2004}, {Corbett, 2009}, {McCollum, 2009} |
| 2453 | 8 | 28 | | | | Cross reference to Ch 12 | Accept. |
| 8547 | 8 | 29 | | | | CHARACTERIZATION OF RESEARCH IS AT VARIANCE WITH THE SOURCE....<br>RE: "Both self-selection and the built environment can explain travel behaviour with slightly more emphasis on the latter" (Cao et al., 2009).<br>COMMENT: This characterization gives undue weight to one of 38 studies that were reviewed. See the following in Cao et al:<br>"The studies adopting a structural equations modeling approach (e.g.Bagley and Mokhtarian, 2002; Cao et al., 2007b) found an influence of residential selection, although the influence of the built environment appeared to be stronger than that of self-selection in the latter study."<br>They continue...<br>"Unfortunately, given the various limitations discussed throughout this paper, we are unable at this point to confidently specify the nature and extent of the causality between the built environment and travel behavior."<br>From the cited research, the following would be a far more faithful reading of the conclusions.<br>"Both self-selection and the built environment can explain travel behaviour (Cao et al., 2009)." | Reject. The reviewer is right that Cao 2009 is an insufficient reference for this statement. But see also Ewing Cervero 2010. Furthermore, there is path dependency in mobility choices (see Goetzke 2008). Need to be cited though. |
| 5205 | 8 | 29 | 13 | 29 | 14 | If we accept travel time budgets, than transport infrastructure is leading deterining the overall travel speed and urban form will follow this. I feel priority should be that every new urban develoment chooses to base itself on public transport and bicycle infrastructure and adapts to the opportunities of those, not compromising it with private car use. As far as I can follow from non-scientific literature, the Chinese made two decades the error to partly forbid cycling to make room for cars, but have found already that in that way the whole trabsport system collapses. In japan, cities like Tokyo, they do forbid cycling because urban rail systems are even more space efficient. Sorry, have not now literature available about this. | Accept. Is not really in contradiction what has been written. Will accomodate. section 8.4.2.1 has been moved to 8.6? |
| 11885 | 8 | 29 | 16 | 29 | 31 | This paragraph stands in stark contrast both in style and content than previous paragraphs/sections. On its own this is no a problem, but the paragraph seems to jump from one sweeping conclusion to another without enough information or detail for the reader to make sense of all the topics. Is there a way to make this paragraph more accessible and straightforward for the reader? | Accept. Is deleted (also space reasons). |
| 5206 | 8 | 29 | 16 | 29 | 31 | Very good section, but add here means to break the circle: the best are car ownership policies (like very high parking rates for citicens in Amsterdam) and of course limiting road investments, which will help people to choose other transport modes. The large differences in modal split between e.g. Ireland (some 2-3% public transport) and Switzerland (some 20-25% public transport) show what consistent infrastructure policies can do. | Accept. No space though for this section. Suggest to move part of this to the introduction. Add what the reviewer suggests to 8.6. if you are writing in a section about systemic aspects of infrastructure this kind of feedback |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5695 | 8 | 29 | 16 | 29 | 16 | The reviewer strongly agree with the idea. This aspect should be emphasized in other places. Especially link to activity in fig. 8.1.2.b | The idea might be to framed more shortly here. suggest to rewrite a new 8.4.2.1 about role of infrastructure, transport speed and for all modes of |
| 16310 | 8 | 29 | 27 | 29 | 31 | The two sentences "For example, … public institutions (Unruh, 2000)." are not so important and should be deleted. | Accept. |
| 5287 | 8 | 29 | 28 | | | (Unruh, 2000)… ADD: Since 2012, French Territorial Climate and Energy Plans impose on cities with over 50 000 people norms and principles aiming at reducing GHG through urban planning, land management and mobility practices and infrastructures integrated with one another. The approach that seems to be merging is the urban multifunctional, multiservices polycentric model. | Reject. Here not appropriate. But take up the idea further below. if you are writing in a section about systemic aspects of infrastructure this kind of feedback structurres is typical for it and |
| 17133 | 8 | 29 | 29 | 29 | 31 | DELETE: In turn, a transformation towards a sustainable transport system requires simultaneous changes in non-transport domains, e.g. in relevant public institutions (Unruh, 2000).<br>REVISE TO: A new set of innovations is necessary to mitigate CO2 emissions from road transportation, maintain the sustainable development of society, and achieve a higher QOL. These innovations have three aspects: Energy efficient vehicles and their collectively optimized control, Efficient traffic flows achieved by functional urban design and traffic management and Multi-modal transportation.<br>(T. Okazaki, M. Yamaguchi, H.Watanabe, A. Ohata,, H.Inoue, and H. Amano(2012), Climate Change Mitigation, Springer, Chapter 9: Technology Diffusion and Development, 210-211) □ | Reject. The whole point was to speak about institutions. |
| 17718 | 8 | 29 | 44 | | | Does the balance of "self-selection" and "the influence of the built environment" depend on the setting? In high quality environments, self-selection might perhaps play a weaker role. | Accept. Need literature. |
| 5406 | 8 | 29 | 45 | | | self selection tends to make the effect of compact development on transit use and travel seem larger than it is….since people who would prefer to travel less and use transit will gravitate to compact development…..the statement says exactly the opposite | Accept. Wording must be accurate. But there is also a dubious revealed preference assumption in the self- |
| 3414 | 8 | 29 | 7 | | | Public transit system: Check whether Frank and Pivo mean supply-driven systems here. Lower population densities may be better served by demand-driven services (e.g. On call). | check. |
| 2690 | 8 | 29 | 2 | 29 | 7 | Ewing & Cervero, 2010, is a meta-analysis of studies that evaluates elasticities of different measures; Cao et al. (2009) examines whether self-selection bias is a major problem (and concludes it is not). These key points of both these studies should be emphasized. | Accept. |
| 8368 | 8 | 29 | 6 | | | Urban sprawl is seen as a way of modernizing cities and sprawl has been strongly supported by politicians in collaboration with business communities. A heterogeneous and compact city growth will lead to changes in mobility patterns. PIs connect urban sprawl, city planning and with overall goal of equity, the MDG's and social inclusion presented elsewhere in this report. | Accept. The idea of connection urban settlement patterns with various goals is valid. Otherwise it is a little bit unclear what the reviewer want to say here. |
| 8369 | 8 | 29 | 16 | | 31 | This part can be shortened because the information is already well known. The quality of the text is fine but all this info is not really needed. | Accept. |
| 2691 | 8 | 29 | 9 | 29 | 31 | Delete this section as it is irrelevant. | well, it is certainly not irrelevant (reviewer does not show why it is). |
| 13899 | 8 | 29 | 32 | 30 | 7 | The debate on urban form and GHG emissions could be enriched by other views, which are not considering a direct/systematic link between density and sustainability. See Marcial H. Echenique, Anthony J. Hargreaves, Gordon Mitchell & Anil Namdeo (2012): Growing Cities Sustainably, Journal of the American Planning Association, 78:2, 121-137 | Accept. the reference has a point to some extent: density seems not to do really much when irt is speed dictating distances and thus transport patterns. However, the density has an impact on those speeds and to some extend on the necessity to possess a car, whicgh has definitely an impact on speed and thus distances. Might try to see if this is |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2692 | 8 | 29 | 32 | 30 | 7 | This section starts with a discussion of population density. As research has shown (Ewing & Cervero, 2010) this is probably the least important of the many urban form and design features that affect travel. These points are mentioned in this paragraph, but I would recommend that these key points be the starting point for discussion, rather than the end of the paragraph. Additional recent reference to look at: Salon, Deborah, Marlon G. Boarnet, Susan Handy, Steven Spears, and Gil Tal, 2012, How do local actions affect VMT? A critical review of the empirical evidence, Transportation Research part D, 17: 495-508. | Reject. Population density is still a proxy for the other more fine-grained things. But will consider rewording to avoid being unclear here. |
| 6484 | 8 | 29 | 33 | 30 | 7 | The issue of urban form needs more attention then what is provided in the report. For example link with urbanization and urban form. It has been established that - Asian cities are growing rapidly and another 1.1 billion people will live in the region's cities in the next 20 years (ADB). Majority of growing cities do not have proper plans promoting smart growth and hence urban form and structure can be very powerful to avoid future transport growth or shift future motorized travel to more sustainable modes. ( example – only 24% of cities in India have developed master plan (Ministry of Urban Development India). | Accept. |
| 15294 | 8 | 3 | 2 | | | I was expecting a CO2 equivalent value, rather than CO2-only statistics for transport's contribution. I believe 5 to 15% of transport's GHG contributions are non-CO2, which is not so negligible. I also wonder about all the embodied energy implications of transport (in the form of vehicles, road & port provision & maintenance ,etc.). Those probably add another 15% to 100% of GHG contributions (depending on mode: e.g., car vs. a high-end subway system, based on Chester & Horvath's published work). Is there a way to make this distinction clear early on, since the 6.4 Gt only speaks to running emissions, I believe. | Accepted. Change Fig.8.1.1 to CO2eq. Further, different sections of chapter also cover well-to-wheel emissions, etc. |
| 8552 | 8 | 30 | | | | INCORRECT REFERENCE: SHOULD BE REMOVED<br>"In Delhi, India, a transition to a bus-system would result in a decrease in energy use of 31% and a transition to metro-rail based system would result in a decrease of 61% (Khanna et al., 2011).<br>Citation is about biofuels, and not about Delhi. Khanna M., C.L. Crago, and M. Black (2011). Can biofuels be a solution to climate change? The implications of land use change-related emissions for policy. Interface Focus 1, 233–247. (DOI: 10.1098/rsfs.2010.0016). Available at: http://rsfs.royalsocietypublishing.org/content/1/2/233.abstract. | Accept. Will amend |
| 8553 | 8 | 30 | | | | UNCLEAR, POTENTIALLY MISLEADING STATEMENT<br>Urban transport is particularly susceptible to modal shift as it is subject to a prisoner's dilemma: an individual's rational choice of private car (non-cooperative behaviour) leads to CO2 emissions, congestion, air pollution and noise, whereas the use of public transport and non-motorized transport (co-operative behaviour) is comparably socially advantageous (Camagni et al., 2002)<br>COMMENT: The sentence could be wrongly interpreted to support the view that modal shift in urban transport can easily occur. The clause " is particularly susceptible to modal shift" is not supported by the balance of the sentence. The sentence should simply say:<br>"Urban transport is subject to a prisoner's dilemma: an individual's rational choice of private car (non-cooperative behaviour) leads to CO2 emissions, congestion, air pollution and noise, whereas the use of public transport and non-motorized transport (co-operative behaviour) is comparably socially advantageous (Camagni et al., 2002) | Accept. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8554 | 8 | 30 | | | | "To stay within an average daily travel time budget of 60 to 70 minutes a day (Zahavi and Talvitie, 1980; Newman and Kenworthy, 1999; Schäfer, 2000), transit requires a fast service networked to serve the majority of the city. Compact settlement structures support fast transit by reducing distances and increasing accessibility..." COMMENT: The difficulty of achieving this should be acknowledged. Indeed, there is no major metropolitan area in in North America, Western Europe or Oceania in which mass transit carries the majority of motorized travel. The difficulty of designing such a system is illustrated in Ziv and Cox, 2007 ("Megacities and Affluence: Transport and Land Use Considerations," paper presented to the World Conference on Transport Research, Berkeley, 2007: http://www.publicpurpose.com/ut-wctrs2007.pdf). The huge shortfall in mass transit access is indicated is illustrated by the fact that in US metropolitan areas of more than 1,000,000 population, the average worker can access only 6 percent of the jobs within 45 minutes by mass transit (average automobile travel time is 25 mintues). This calculated from data in Tomer, A, E. Kneebone, A. Berube, & R. Puentes, R. (2011), "Missed Opportunity: Transit and Jobs in Metropolitan America," Brookings Institution. Even in Paris, with perhaps the best mass transit system in the West, mass transit access is far below that of cars in suburban new towns served by the regional metro (RER), see: Fouchier V. & S. Michelon (1999), "Isochrones autour des villes nouvelles aux heures de pointe." DREIF & Groupe Central des Villes Nouvelles. No serious proposal has yet been tabled to establish a mass transit system that would replicate the mobility of the automobile in a modern Western metropolitan area. A fast service "networked to serve the majority of the city" has never been shown to be feasible, theoretically or in reality. The entire paragraph, beginniing on line 18 is misleading and should be deleted. | Accept the criticism and be more precise in the wording. there are a few relationships important here: (1) the longer the distance the higher the average transport speed; (2) the lower the density the lower the number of road junctions etc and the higher the speed; (3) the TTB suggests that the distances travlled will be larger in low density urban areas because the transport speeds there will be much higher on average. |
| 8555 | 8 | 30 | | | | CONTINUTATION OF LINE 11 COMMENT....The huge shortfall in mass transit access is indicated is illustrated by the fact that in US metropolitan areas of more than 1,000,000 population, the average worker can access only 6 percent of the jobs within 45 minutes by mass transit (average automobile travel time is 25 mintues). This calculated from data in Tomer, A, E. Kneebone, A. Berube, & R. Puentes, R. (2011), "Missed Opportunity: Transit and Jobs in Metropolitan America," Brookings Institution. Even in Paris, with perhaps the best mass transit system in the West, mass transit access is far below that of cars in suburban new towns served by the regional metro (RER), see: Fouchier V. & S. Michelon (1999), "Isochrones autour des villes nouvelles aux heures de pointe." DREIF & Groupe Central des Villes Nouvelles. No serious proposal has yet been tabled to establish a mass transit system that would replicate the mobility of the automobile in a modern Western metropolitan area. A fast service "networked to serve the majority of the city" has never been shown to be feasible, theoretically or in reality. The entire paragraph, beginniing on line 18 is misleading and should be deleted. | Misleading is a very strong statement. Also: the US is not really a role model here, and neither can results from the US easily transfered to other parts of the world. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8568 | 8 | 30 | | | | INCOMPLETE AND POTENTIALLY MISLEADING INFORMATION<br>Given relatively slow rates of improvement in average carbon intensity of car and air modes, a 25% reduction in car and air travel by 2050 (relative to baseline growth), with half the travel shifted to rail, bus, and non-motorised travel and half the travel eliminated through better urban planning and telematic substitution, results in an estimated 20% reduction in transport energy use and CO2 emissions (IEA, 2009; (Cuenot et al., 2012).<br>COMMENT<br>The improvement in auto carbon intensity is by no means slow. The US Department of Energy, Energy Information Administration estimates that CO2 emissions from light vehicles will decline 19 percent from 2005 to 2035, despite a large increase in driving. This is assuming the new 35.5 MPG fuel standard adopted in 2010 for 2016 ("Annual Energy Outlook: 2012). This is before the new 54.5 MPH standard just adopted. No official estimates are out yet, but I am modeling a decline of 35 percent based upon the projected experience with the 35.5 MPG standard. This is very rapid and should be cited favorably. Telematic substitution is in addition to this and has potential to increase this reduction. | Accept. Reword the beginning of the sentence. be careful as for aviation the progress is limited to some 30-40% on a theoretical basis. For automotive the progress might ber much stronger as for surface transport the laws if physics are much less ,imiting as for aviation 9in air transport you need speed to stay aloft and the same forces that create lift also create unavoidable amounts of drag). |
| 8569 | 8 | 30 | | | | IMPLAUSIBLE EXPECTATION<br>half the travel eliminated through better urban planning and telematic substitution, results in an estimated 20% reduction in transport energy use and CO2 emissions (IEA, 2009; (Cuenot et al., 2012).<br>COMMENT<br>The US studies on the potential of urban planning to replace (reduce) travel indicate much smaller potentials. The mid-point vehicle reductions in two major US reports over 45-50 years was estimated at about 5 percent, with one report (TRB) expressing doubt that its higher scenario could be achieved. Similar results from the UK See: (1) Board on Energy and Environmental Systems (2009), Driving and the Built Environment: The Effects of Compact Development on Motorized Travel, Energy Use, and CO2 Emissions, Transportation Research Board. (2) Cambridge Systematics (2009), Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions, Urban Land Institute.<br>and (3) Echenique, M. L., A. J. Hargreaves, G. Mitchell & A. Namdeo (2012), Does Urban Form Really Matter? Journal of the American Planning Association, V. 78, Issue 2, pp. 121-137.<br>□ | Accept. Cite the relevant work. There are however caveats to this literature as well: The US starts from a very low density setting, often with decentralized commuting. In such settings relative compactification is less effective than in more traditional urban forms. The Echenique paper is good but also has its shortcoming (see a discussion of the paper at Env Res Web: http://environmentalresearchweb.org/blog/2012/07/does-urban-form-really-matter-2.html). should make a clear distinction in the world between the two Americas (they have discarded almost all public passenger transport, |
| 12901 | 8 | 30 | 12 | 30 | 13 | Delete the sentence regarding CO2 co-benefits | Reject. No explanation is given for this |
| 16312 | 8 | 30 | 12 | 30 | 12 | The word "efficiency" should be modified to "energy intensity". | Accept. |
| 3433 | 8 | 30 | 12 | | 13 | The CO2 benefits depend not only on the relative efficiency of each mode (in energy use per pkm) but also on the carbon content of the energy form used in each mode. | Accept. |
| 3415 | 8 | 30 | 14 | 30 | 17 | Sentence is difficult to understand. Half the travel plus half the travel is all th travel so how does this tally with 25% reduction in travel? | Accept. Reword. |
| 8040 | 8 | 30 | 17 | 30 | 17 | It is worth to mention that already today in OECD-countries like Japan there is a modal split of 50 - 50 (cars and public transport). In other OECD countries (e.g. Germany) scenarios for diminishing the modal split of cars (80 % today to 50% in 2050 for Germany) are being discussed (see http://lowcarbon.inforse.org/files/resource_1/ENCI-Report_Scenarios_Germany_2012_EN.pdf, page 20 or http://lowcarbon.inforse.org/files/resource_1/ENCI-Report_Stakeholders_Germany_2012_EN.pdf, page 3) or http://www.germanwatch.org/klima/mt10lv.pdf | Accept. Can we cite this? PAUL P: ENCI reports are funded in FP7 research so should be OK. Germanwatch is an NGO, may be avoid if not necessary. Furthermore, there are some other strong transport scenarios |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17128 | 8 | 30 | 18 | 30 | 22 | DELETE: Urban transport is particularly susceptible to modal shift as it is subject to a prisoner's dilemma: an individual's rational choice of private car (non-cooperative behaviour) leads to CO2 emissions, congestion, air pollution and noise, whereas the use of public transport and non-motorized transport (co-operative behaviour) is comparably socially advantageous (Camagni et al., 2002) (Creutzig and He, 2009) see also 8.7).<br>REASON: Current vehicle does not contribute to air pollution anymore due to the improved catalyst and quality of fuels. Rather, old used vehicle with insufficient maintenance and pollutant emissions from the stationary source often contribute to air pollution. Public transports such as trains and buses also have noise issue for residents near public systems. Sound abatement shields could be applied along the highway as a countermeasure. | Reject. While technology proves to alleviate some of the calamaties in some countries, it doesn't change the nature of car use a prisoner's dilemma. |
| 16313 | 8 | 30 | 18 | 30 | 22 | I think that the word "susceptible" should be modified to "unsusceptible" in the light of possible lock-in. If my understanding is wrong, I propose that these sentences be modified so that readers can easily understand them. | Accept. |
| 17720 | 8 | 30 | 19 | | | Is use of the private motor car in urban settings really the "rational choice" (for the individual)? In many cities, the "effective speed" of car travel is less than that for other modes (given work-time required to cover the costs of fuel, maintenance and vehicle purchase). | Accept. the problem is that the first car user is certainly at an advantage, but as soon as the numbers of car users rise above a certain level, the road capacity fails and using a car becomes very slow; but than we have habots with status. So |
| 14289 | 8 | 30 | 22 | 30 | 22 | Not sure that modal shift from cars reduces land use - it may reduce utilisation of roads, but the roads still exist so land use is not changing. | Reject. |
| 3416 | 8 | 30 | 22 | | | reduces land use FOR CARS | The land used for cars is reduced but total land use of course is not (the world is not shrinking). So may change using ".. makes space available for other urban |
| 5407 | 8 | 30 | 23 | | | using "% of trips" as a measure of how important a travel mode is can be misleading….yes, the fraction of trips is important, but the fraction of actual person kilometers traveled may be more important…..depends on the context….yes, cars account for 33% of trips and use 94% of road space in Paris (assuming the author is correct), but cars probably account for a MUCH higher % of actual distance traveled. This chapter devotes a considerable amount of space to urban planning and other "soft" measures, which probably makes perfect sense, but it must be careful to use available statistical data in a way that doesn't appear to be putting a thumb on the scales. | Accept. In an urban context the average distance by car is certainly not much different from other motorised modes; might even be shorter than bus because it is very inconvenient to take a bus for 500 m, but cars are still used much on such short distances. an issue |
| 13241 | 8 | 30 | 24 | 30 | 27 | « to stay with average travel time budget » appears to be a deterministic formulation. We suggest to replace this sentence by "Travel time budget of 60-70 minutes a day (ref) can be only achieved if transit provides a fast service networked to serve the majority of the city". | Accept. may be this is reversing the idea; society is not so much trying to travekl as much kilometers within 60-70 minutes, but, given a certain urban density, infrastructure, etcm, the travel time is a constant so only distances are the outcome; if yopu have a dense city with a very fast transport system you will |
| 17721 | 8 | 30 | 33 | | | why will there be a "strong pull towards increasing car ownership and use"? If growing cities follow the model of Singapore, or Shanghai, rather than Chicago or Sydney, then patterns of transport growth might be quite different in the future than they have been in the past. | Accept. |
| 17719 | 8 | 30 | 4 | | | Heavy use of US examples in this section. Perhaps it would be helpful to broaden the range - there have been plenty of innovations in Europe and South America, for instance, that might be worth citing. | Accept. and certainly also in Asia. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11279 | 8 | 30 | 41 | 30 | 43 | Also worth citing here for a discussion of possible impacts and benefits of public transit and bus rapid transit systems, especially with regard to innovative cases such as Curitiba and Bogotá: UN-Habitat (2009): Global Report on Human Settlements 2009: Planning Sustainable Cities, pp. 162-163; as well as UN-Habitat (2011): Global Report on Human Settlements 2011: Cities and Climate Change, p. 100-103. [downloadable at http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2831 /// http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=3086 | Accept. |
| 15836 | 8 | 30 | 44 | | | Dehli already has a metro! Why transition? | Accept. Reconsider wording. |
| 11886 | 8 | 30 | 45 | 30 | 46 | The last clause of this sentence isn't clear - light rail capital costs are higher than which? BRT and metro, metro, or BRT? | Accept. Reconsider wording. |
| 15742 | 8 | 30 | 8 | 33 | 8 | p.30: see general statement on the chapter. | ok. |
| 15743 | 8 | 30 | 8 | 33 | 8 | On modal shifts, see general statement on the chapter. | ok. |
| 16311 | 8 | 30 | 9 | 30 | 10 | Same as the comment No. 9. | ok. |
| 8370 | 8 | 30 | 9 | | 17 | Can be deleted. The information has already been presented elsewhere. You might delete the entire paragraph line 9-17. | Check. |
| 2694 | 8 | 30 | 18 | 30 | 18 | "prisoners dilemma" is not really the correct analogy to use here. Individuals are rational in their choice of alternative modes and this has nothing to do with 'cooperative' behavior. | Reject. The prisoner's dilemma is characterized by rational chocie of individuals. suggest to simply remove "(co-operative behaviour)" because that is the problem, and also not entirely true for e.g. Cycling, which is a very individual choice not requiring co- |
| 2695 | 8 | 30 | 38 | 30 | 38 | Acharya and Morichi reference is missing. | Accept. Include. |
| 13115 | 8 | 30 | 8 | | | Personal EV/FCV vehicle with low carbon electricity or hydrogen might be lower GHG (/pkm) than public transport of Buses, Rail if average passenger occupation ratio is low. Please add comments, "if good utilzation rate and similar technology (such as electric driven) is applied to mass transportation." | Accept. agree it is always necessary to give such additional information. But there is also a more general problem in the chapter (and actually the wider literature on mitigation in transport) with notions of energy consumption, emissions and occupancy rates. For instance, a policy providing lots of rail in acountry and trains running on them but failing to give incentives to drive less cars and just investing in coal powered electric plants will cause empty trains that of course do have high emission |
| 11278 | 8 | 30 | 8 | | | In this section (or whereever suitable) the role of car sharing options should be discussed. They are already in practice in various cities and sometimes even combine the car sharing idea (behavioural change) with alternative propulsion systems (mitigation technology). | Accept. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2693 | 8 | 30 | 9 | 30 | 17 | Would be useful to examine the following work: McCollum, David and Christopher Yang, 2009, Achieving deep reductions in US transport greenhouse gas emissions: Scenario analysis and policy implications, Energy Policy, 37: 5580-5596. | This source is useful for those interested in answering the question, "what would it take to achieve a huge reduction in GHG emissions?".....but it's basically a "normative" analysis….not all that interested in the probability of actually achieving the goal, or even especially the costs....may not be a particularly useful source for us. actually I feel we should gather several of such 'normative' scenario studies in a single section because these are normative with respect to a defendable goal 980% emissions at a certain time) and not normative in a political sense, which actually the idea that something is "not probable" because of lack of policies expected to reach these goals is very |
| 8371 | 8 | 30 | 22 | | | There are some 700 million cars in the world or put differently about per cent of global population own a car. The car-owners are unevenly spread over the globe and in most places on earth there are not many cars at all. PIs take this fact into consideration when discussing space and car use as well as when focusing on the mobility of the roughly 90 per cent of global population (roughly 6 billion persons) that do not have a car. | Accept. |
| 4691 | 8 | 30 | | | | The connections to traffic accidents (in the 'Spillover' section) didn't make sense to me. Perhaps it needs further clarification to avoid misinterpretation and confusion by folks like me. | Accept |
| 8548 | 8 | 31 | | | | OPINION IN SOURCE RESEARCH NOT SUPPORTED BY DOCUMENTATION<br>High-speed rail, combined with strong land-use and urban planning, has the potential to restructure urban development patterns, and may help to alleviate local air pollution, noise, road and air congestion (McCollum et al., 2010).<br>COMMENT: The basis of the above sentences is the statement in McCollum et al. The following statement appears in the work, but is not documented and must be dismissed as opinion.<br>In addition, high speed rail may provide other benefits compared to air travel, such as reductions in local air pollution, noise, and air and roadway congestion; moreover, combined with strong land-use and urban planning policies, P22<br>The "potential to restucture urban development patterns" is particularly speculative, and, at a minimum should be removed from the sentence. □ | Reject. It is well know that long-distance transport infrastructure reshapes development patterns. That is also true for airports. The impact of the railway infrastructure on urban development in China is significant. I certainly agree with the first comment….this is not a useful "source material," given it's normative nature. again do not agree aboiut this normative discussion, see my comment at ID 2693. |
| 8566 | 8 | 31 | | | | INVALID SOURCE<br>Source for Table at the top of the page is incorrect. No such data. Moreover, direct CO2 should not be used. Indirect should be added if this chart is not deleted (electricity generation and transmission losses) | Reject. The source is correct. Double check. I suspect that generation and transmission losses are in there…it would be strange if they were not. But it seems to me the numbers are rather low |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8570 | 8 | 31 | | | | IMPORTANT POINT OMITTED<br>McCollum et al (2010) also say....<br>A rigorous study by Jamin et al. (2004) shows that if high speed rail systems were to connect major metropolitan areas throughout the United States, the energy and emissions benefits would be relatively modest due to insufficient traffic volumes in many cases: less than a 3 percent reduction in total U.S. domestic air traffic volume would be achieved, with consequently modest reductions in energy use and emissions. On the other hand, recognizing that connecting major downtowns is not the only potential market for HSR....<br>COMMENT<br>objectivity requires citation of this point. | Reject. That is a right observation. But most of the world is not the US. is Mcollum et al. Not the 2009 report (not 2010)? The point with jamin is they keep the travel pattern itself constant and assume that just offering HSR does the trick, while it ius known that such model studies of new modes are generally not performing too well... (e.g. the Madrid Barcelona railway line performed several times better than envisaged in model studies |
| 14290 | 8 | 31 | 18 | 31 | 21 | Potential for emissions reduction from modal shift from air to high-speed rail may be limited. Although a significant number of passengers may shift, the impact of this in emissions terms may not be large due to the relatively short distances involved (the majority of aviation emissions are long-haul flights which cannot be substituted by rail). For example, in the UK modal shift to high-speed rail could reduce passenger demand by up to 8% by 2050 but this would only reduce emissions by around 2%. See Committee on Climate Change (2009), "Meeting the UK aviation target - options for reducing emissions to 2050", Chapter 3 p77-78 (http://downloads.theccc.org.uk/Aviation%20Report%2009/21667B%20CCC%20Aviation%20AW%20COMP%20v8.pdf). | Accept. Reword. entirely true except: there is much scope for changing destinations, certainly in the leisure tourism market where a beach is the central thing to achieve, not the exact kilometrage to the beach (if tourism is a section in Ch 8 or 10, then this will be covered in that section). The idea is that modal shift should also be accompanied by shorter distances thus increasing its |
| 11648 | 8 | 31 | 18 | 31 | 29 | The shift from short-haul flight to HSR only saves GHG if the liberated airport slot is not filled up again. However in fact it is often substituted by a more profitable and more polluting long-haul flight. Hence from the total system perspective the shift without a backstop is a bad idea. Please add this caveat! See e.g. Clewlow: Impacts of high-speed rail on air transportation in Europe: an analysis of demand and emissions. ETC 2011 https://etcproceedings.org/paper/impacts-of-high-speed-rail-on-air-transportation-in-europe-an-analysis-of-dema | Accept. also this is an example of inconsistant policies by expanding airport capacity and aiming with new HSR development at less short haul air transport. On the other hand: the substitution is only true if currently long |
| 5207 | 8 | 31 | 18 | 31 | 29 | It might be interesting to consider through backcasting what might be necessary in long distance (tourism, i.e. leisure, visiting friends and relatives and business all is tourism; see UNWTO definition) travel to achieve 70% reduction of GHG at increased numbers oftrips by 2050. From our research it appears there will be a systemic limit to aviation's growth at current levels, but under the condition that about 80% of car trips is replaced by train, or the projected growth of car can be kept, but then at a strong reduction of current aviation volumes to the level of about the 1970s (see Peeters, P. M., & Dubois, G. (2010). Tourism travel under climate change mitigation constraints. Journal of Transport Geography, 18, 447–457). This may set the challenge for the modal shift policies proposed (which will be hard to achieve anyway). | Accept. |
| 16315 | 8 | 31 | 18 | 31 | 29 | First, this paragraph should clarify whether or not comparisons of GHG emissions and energy intensity between high-speed rail and air travel were made from a life-cycle perspective, or more specifically, whether or not GHG emissions and energy consumption associated with high-speed railway network are taken into account. Secound, it is better to mention the potential and future prospects for Maglev in this paragraph. | Accept first part, Reject second part: no good literature on Maglev, costly concept. agree magLev seems not a really viable option due to e.g. The necessity to have all trrains on a certain track driving exactly the same speed thus stations need to be separated at |
| 8434 | 8 | 31 | 2 | 31 | 17 | I suggest to better underline the importance of NMT (non-motorized transport), expanding the 15 lines written in this paragraph. If we consider the whole world, and not only industrialized countries, cycling and walking are still today the most frequent way people use for moving in the everyday life. Maybe a specific paragraph could be created. | Accept. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13116 | 8 | 31 | 2 | 31 | 17 | Do not give too much explanation for cycling and walking issue in "modal shift" paragrapph. Modal shift from personal vehicle to cycling and walking may decrease energy use, however, it does not play important role of global modal shift. Please cut most sentences for simplicity. | Reject. See example comment above. and there is a systemic link here: a cycling/walking based city requires less car possession and thus less car use also indiirectly on longer distances. |
| 16314 | 8 | 31 | 2 | 31 | 17 | This paragraph should clarify whether or not such increases in cycling and walking could restrain the growth in automobile ownership and the modal share of automobiles. | Accept. |
| 3417 | 8 | 31 | 20 | 31 | 21 | Correct, but new infra induces new use, new demand for it. Creating the high-speed railway city to city connections in Europe certainly has generated a lot of new travel that would otherwise not have been there at all. Worth to check whether there is literature on this, probably considerable, rebound effect. | I would reject this argument, because every investment in transport causes mobility that would not have been there without it. So a shift in investment always will cause that mobility at one hand is reduced and other mobility is generated. the idea of this is that some form of mobility is necessary to keep the economy going. If such a new mode trip is a new trip is actually not relevant. The |
| 3595 | 8 | 31 | 30 | | | There is no need for emphasis on modal shift solution for freight. All trials and intermodal projects have had limited impacts so far, since rail have at best maintained its market share, and shipping and aviation have no serious competitor. Other solutions are far more sucessful in terms of ghg reduction per tonne delivered and far more cost-efficient if considering external costs internalisation (Leonardi and Baumgartner 2004; SUGARLOGISTICS.EU; Piecyk&McKinnon 2008; McKinnon et al: Green Logistics 2012). | include more caveats about the likely impacts of particular measures. Some useful suggestions which will be separately evaluated and would be worth incorporating e.g. need more discussion of the impact of just-in-time and the opportunities of relaxing it to cut energy use and emissions. Clearly mode shift is only one of a series of 'decarbonisation' options for freight transport. Greater |
| 13428 | 8 | 31 | 33 | 31 | 36 | We need to mention about the "Just in Time system". | Needs a reference. |
| 6485 | 8 | 31 | 18 | 31 | 29 | The table misses one critical point which was discussed in the section GHG emissions impacts of transport infrastructure . LRT and Metro since grade separated and thus the infrastructure provision involves high emissions when compared to systems like BRT. More good discussion can be found @ http://www.adb.org/sites/default/files/EKB-REG-2010-16_0.pdf. Discussions on High Speed rails in 18 to 29 statements in page 31 also need to provide link with infrastructure construction and cost especially for developing countries and cities. | Accept link with infra. |
| 12121 | 8 | 31 | 18 | 31 | 29 | Video-conferencing as an alternative to air-travel completely ignored. Discussion of passenger model shift from air travel to very fast trains completely ignores another major alternative to air travel - video conferencing. A six hour videoconference can save<br>some 99 per cent of energy and material resources that would be consumed by<br>the transatlantic trips required to hold the same meeting in a single location. Ref von Weizsäcker, E., Lovins, A. B. and Lovins, L. H. (1997) Factor 4: Doubling Wealth,<br>Halving Resource Use, Earthscan, London | it is mentioned in table 8.8.1 and on p 43 of the original draft. May be add it here as well. Interestingly the recent financial crisis did impact on business flights and vid-conf, e.g. {Smeral, 2010} though not well founded in empirics.. |
| 12119 | 8 | 31 | 2 | 31 | 17 | Modal shift opportunities for passengers - excellent section - missing key point that suggests there is a huge potential here - REF see IPCC AR4 2007 Transport chapter "As the IPCC has stated, “While the trend has been away from non-motorised transport (NMT), there is considerable potential to revive interest in NMT as more than 30% of trips made in cars in Europe cover distances of less than 3 km and 50% are less than 5 km ." | accept. As in other comments above; direct impact on emissions not high (only short distances0 but indirect impacts on car ownership and shorter overall distances might have a |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12120 | 8 | 31 | 2 | 31 | 17 | Car sharing Schemes do not seem to be discussed at all in this transport chapter. Yet they compliment and help enable passenger modal shifts and help reduce the costs to citizens of transport services overwell, whilst also reducing GHG emissions. Now there are car sharing schemes in operation in some form in over 600 cities. | Accept. |
| 4297 | 8 | 31 | 30 | | | As the example of modal shift opportunities for freight, I propose adding electric cargo train system or external power supply convoy. Low-carbon investment in freight transport can be less than the railway. | Not clear what is being proposed here. A large proportion of railfreight already |
| 2696 | 8 | 31 | 35 | 31 | 36 | Provide evidence for statement that deregulation has favored road transport. | This sentence will need to be reworded. The intention was to argue that trucking operations have benefitted from the liberalisation of freight markets around the world over the past 40 years. There |
| 12902 | 8 | 32 | 16 | 32 | 19 | Does the faster rate of incremental technical innovation and faster vehicle replacement rate of HDV compensate for higher emissions/tkm with respect to rail? What is the situation when full life-cycle analysis is applied, including infrastructure? | This comment poses interesting questions that will require further investigation. On the long term the replacement rate is not the factor determining the outcome but mainly the |
| 4420 | 8 | 32 | 33 | 32 | 36 | Check on inconsistency in earlier part of the chapter re last mile freight | Rather vague. Not clear what this relates |
| 8028 | 8 | 32 | 4 | 32 | 6 | The White Paper 'Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system' is the reference for the contents of this sentence. Why not refering to it? | Agreed. Need to add a reference to this EU White Paper |
| 6486 | 8 | 32 | 26 | 32 | 29 | This may not be entirely true from developing cities perspective (shift to better modes not exactly roads to rail but inefficient trucks to better modes is possible). The last mile vehicles are often the most polluting i.e. vehicles which are very old and cannot be used for longer distance and thus load from such vehicles could be shifted to more efficient vehicles and non motorized transport modes. Many Chinese cities over last two years have used sticker concept to prevent old inefficient vehicles from accessing urban space. To reduce air pollution in cities, the diesel trucks are labeled green and yellow in China. Green labels are applied to diesel vehicles which correspond to China National III emission standards or above (new), whereas yellow labels are for diesel vehicles below China III standards (old). By restricting the entry of yellow label vehicles, the authorities are trying to reduce pollution (black carbon emissions) in some big cities by allowing only cleaner vehicles inside the cities. Nearly 20% of vehicles are "yellow-label vehicle" . The other important factor in securing better urban freight is the urban form and structures. By having better landuse policies, freight movement can also be impacted. | Makes a good point about the relative energy / CO2 efficiency of long haul and local delivery ('last mile') trucks, which clearly varies around the world. Efforts in Chinese to raise the efficiency of delivery fleets may merit a mention. HAO: Agree. Freight transport mode shift can be promoted by banning inefficient trucks, as China has implemented.<br><br>Alan: include more caveats about the likely impacts of particular measures. Agreed, but this partly reflects the |
| 4262 | 8 | 32 | | | | Recent research shows that increased active travel can avert costs to the National Health Service from seven major conditions that are related to sedentary lifestyle. Jarrett J, Woodcock J, Griffiths UK, Chalabi Z, Edwards P, Roberts I, Haines A. Effect of increasing active travel in urban England and Wales on National Health Service costs. Lancet 2012; 379:2198-205 | Accept. Thanks for the reference. |
| 14291 | 8 | 33 | 3 | 33 | 5 | Slow steaming has not necessarily widened the time gap between sea and air. The purpose of slow steaming is to utilise spare capacity in the fleet and save fuel costs (since slowing down uses less fuel). Although journeys take longer, there are more ships being used on routes. Therefore, service levels are maintained even though individual journeys are slower. | Unclear comment. It concedes that sea journeys are taking longer as a result of slow steaming. Assuming that air freight is moving at its previous speed, the time gap must be widening. In practice this issue is much more complicated that this comment and the current text in the chapter suggest. The |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14292 | 8 | 33 | 7 | 33 | 8 | Last sentence beginning "This merger of..." - is there any evidence to cite in support of this argument. Not convinced, in the absence of any evidence, that this would lead to "substantial cost and CO2 savings". | This is surely self-evident. Airfreight service all the way from China to UK will be likely to generate significantly more CO2 per tonne than a service involving |
| 2454 | 8 | 33 | | | | Missing theme of flooding - transport is susceptible to flooding - metros and other systems - and also not designed for the intensity of rainfall - so it acts as a barrier. There have also been examples of railway track buckling as a result of high temperatures. The general missing issue in this Section is that of redundancy and resilience of the transport system - bearing in mind that after an event any rescue etc is dependent on the transport system actually working. | Accept. We touch on this point, but should make it more explicit. |
| 9072 | 8 | 33 | 9 | 35 | 19 | 8.5 Climate change feedback and interaction with adaptation can be deleted due to limitations on the nos of pages | Reject. It is a required section for all sector chapters. |
| 2698 | 8 | 33 | 9 | 35 | 19 | I would recommend this section not be included as part of this chapter. There is too much uncertainty regarding regional and localized impacts to say much here at this stage. It really goes beyond the scope of what this chapter should be addressing. | Taken into account.There is indeed a high level of uncertainty for some aspects (e.g. 8.1.2 Relocation of production, international trade and global supply chains), but there is also a significant amount of certainty (e.g. 8.1.1 Accessibility and feasibility of |
| 11280 | 8 | 34 | 29 | 34 | 31 | For discussion on climate change adaptation and mitigation in urban planning, see: Kehew, Robert, et al. (2013): Formulating and Implementing Climate Change Laws and Policies in the Philippines, Mexico (Chiapas), and South Africa: A Local Government Perspective. Local Environment: forthcoming. | Could not find the reference yet, but will incorporate it when available |
| 11281 | 8 | 34 | 31 | 34 | 33 | For discussion of the interdependencies between urban vulnerability and climate change adaptation and resilience, see: Bulkeley, Harriet, and Rafael Tuts (2013): Understanding urban vulnerability, adaptation and resilience in the context of climate change. Local Environment: forthcoming. | Could not find the reference yet, but will incorporate it when available |
| 15837 | 8 | 34 | 34 | | | Have you cross checked this section on adaptation with WG2? | Yes. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3261 | 8 | 34 | | 59 | | 1. 8.4.2. Urban forms of mobility is good indicator of global divide. This section may address the specificities of African countries for instance dominated by informal transport systems with huge implication in GHG emission. In the same section urban structure imposed some special transportation systems such as bikes and motorbikes (a new market for Indonesia and India) and not a cultural behaviour such as in Scandinavian countries.<br>a. In 8.4.2.2 implications of urban growth in GHG emission include land cover changes (positive? e.g. Las Vegas or negative e.g. Dakar, Ouagadougou, etc). Positive means greener cities compared to baseline or greyer-browner cities when vegetation is cleared for buildings. It can relate to the energy needed to build new cities or extend new ones depending to emerging use of new technologies and new materials.<br>b. 8.4.2.3. Apart from emerging economies (India, Brazil, China), modal shift did not happen in Africa because cities and urban population have not been prepared for that (shanty towns, twisted and tiny roads). NB. Denmark is regretting the removal of tramway in its transportation system, a new behavioral need for an old practice.<br>2. 8.10.1. Also needs some African (LDC) perspectives with another concept of common transportation influenced by poverty, urban structure (working areas in one location), road systems, aging vehicles park (a huge proportion of transportation systems are used cars from developed countries). In particular the change of behaviour in Europe and US, gave new opportunities to import cheap used cars that have some implications in air pollution, health and GHG emission… Unfortunately there are no clear statistics on imported second (sometime fourth hand) car in Africa. In Some countries with improved wealth imported used cars are declining (Latin America, EAU, etc.)<br><br>4. Statistics of imported (new and used) cars in Senegal from 1980 to 1997 (source, Ministry of Transport-Republic of Senegal) no update of these data, but we could try to have global picture of used car export in Developing countries<br>a. In Kenya at 2008 a total of about 30000 used cars have been imported from Japan alone (http://www.autoassista.com/import_guide/japanese_used_car_import_statistics.html)<br>5. At the same time new changes are occurring because of changing legislations (the use of non CFA fridge after Montreal Protocol, the change in regulation of used equipment imports in Africa including cars). This underlines how international binding agreements have depicted in national regulation, and therefore a change in decision making and behaviour.<br>6. 8.10.5. It might be good to bring in the picture the raising “second chance” in the African urbanization through emerging new cities (new development platforms such as the transition in Asian Dragons in the 1970ties). In Gonza City for Kenya, Diamniadio for Senegal, Ouaga-2000 for Burkina Faso, etc.<br>7. Finally Africa has the highest economic growth during the last 5 years, this pulls down many investors who are generally established in cities for their business. The change in behaviour related to this influence of GLOBALIZATION can be addressed as well. | Related to 8.5? Useful comments though some dated. Will incorporate where relevant if room in text. |
| 14294 | 8 | 35 | 14 | 35 | 19 | This is really only an issue to the extent that surface transport is not decarbonised. | Taken into account |
| 12338 | 8 | 35 | 14 | 35 | 19 | This paragraph might also include some considerations as regards the cooling agents used in air-conditioning systems. | Taken into account. This would be more an additional mitigation factor, rather than an aspect that relates to linkages between adaptation and mitigation. This point here relates to the relative energy |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15867 | 8 | 35 | 2 | 35 | 5 | This paragraph indicates that global warming will increase vehicle emissions. This is statement is questionable because some emissions increase with colder weather (for example, unburned hydrocarbon, particulate, and CO emissions in vehicles), and the potential GHG-driven changes in ambient temperatures and humidity are in general not enough to really change the combustion processes. Also vehicles operate in wide ranges of temperatures (summer, winter) so not clear how you could differntiate climate chnage impacts from seasonal variation in engine performance and also fuel formulation (winter, summer fuels) | Accepted. Will need to follow up. |
| 12903 | 8 | 35 | 20 | | | Change headline to: Mitigaton costs and potentials | Reject. Thanks for the comment but this first-level heading cannot be changed. |
| 3434 | 8 | 35 | 28 | | 30 | A nice phrase, with a strong policy message, is one said by Lee Schipper ( I don't have a reference but I am sure he would like it to be included): "Transport matters a lot for CO2, but CO2 matters little for transport. High CO2 emissions are only one of the symptoms of poor urban transport in most developing cities". Therefore, the polycentric approach mentioned elsewhere in Chapter 8 makes very much sense in the case of mitigationg GHG emissions from transportation. I think that this is worth mentioning at this point. | Reject. Thanks for the comment but only if the reference was provided this could be included. |
| 16316 | 8 | 35 | 45 | 35 | 46 | The sentence "Optimizing ~ a reduction of 8 Mt CO2/yr" shoul clarify where and when this level of reduction was estimated to be achieved (in Beijing?). | Accept. We will amend text. |
| 2455 | 8 | 35 | | | | The missing element is the subsidisation of fuel - for road transport, but also for rail and aviation - any form of subsidy or exemption from taxation means that people and firms are shielded from market forces and from paying the real social costs of the carbon (and other costs). | Accept. We will amend text. |
| 17773 | 8 | 35 | | | | consider changing the title to "Costs and potentials for GHG reduction" | Reject. This heading cannot be changed according to IPCC rules. |
| 13878 | 8 | 35 | | 39 | | This section need to be linked with chapter 16 "cross-cutting investment and finance issues" in order to avoid overlapping between chapters | Accept. We will amend text. |
| 13060 | 8 | 35 | 20 | 40 | 3 | On the Costs & Potentials issues it is difficult for the reader to access the bigger picture of the cost & potential information. Each sector has its own approach to costs and potentials, which is appropriate as each sector has its own unique qualities and considerations. Nonetheless, the information that will be most relevant to take-away for policy-makers is overarching cost information that brings these different pieces together. To help policy-makers access this information, it should be important to highlighting market realization, but also the policy aspects of cost (by policy it is meant institutional frameworks and/or market frameworks and/or capacity building arrangements, etc...). In both developing and developed countries policy can have a strong impact on cost. Simply looking across the costs & potentials sections of the sector chapters, the reader could miss this message, although the information on policies and measures is there in the chapter. Therefore it could be important to make sure that these informations are put in perspective appropriately. | Accept. Thanks a lot for this very useful comment. We will amend text to try to address this very important issue. |
| 2699 | 8 | 35 | 20 | 40 | 3 | This section is very poorly written and is poorly structured. Is the intent to discuss costs and benefits of policies? Or is it simply describe potential policies? I would suggest dropping what is very confusing terminology: 'activity effect component', 'structure effect component', etc. Instead I would structure this section by grouping specific policy approaches into sections. 1. Pricing and taxes, 2. Subsidies for transit, 3. Urban form and design, 4. Non-motorized, 5. Other TDM (parking, carpooling, telecommuting, etc.), 6. Technologies (vehicle and fuel), 7. Need for synergies and integration of all policies for maximum impact. | Reject. Thanks for the comment. However, it has been agreed that the Kaya identity should, somehow, provide a storyline for the different sections of the report. In this case, since this section is about Costs and Potencials, it has been agreed by the authors that this |
| 11275 | 8 | 35 | | | | This section reads very much economic (see remarks in No.1 above), what about people and their (real) behaviour (and, thus, needs and activities)? | Accept. We will amend text provided there is literature to support it. |
| 16319 | 8 | 35 | 27 | 36 | 20 | I propose that estimates of the long-term price elasticities of transport activity demand be mentioned in this section to point out the price-inelastic nature of the transport sector. | Accept. We will amend text provided there is literature to support it. |
| 13879 | 8 | 35 | | 37 | | These two sections focus on potentials without dealing with cost. Cost-effectiveness is key to be policy relevant. See Sweeney, J., Weyant, J., 2008, Analysis of Measures to Meet the Requirements of California's Assembly Bill 32, Precourt Institute for Energy Efficiency, Stanford University | Accept. Thanks a lot for this very useful comment. We will amend text to try to address this very important issue. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8551 | 8 | 36 | | | | TEXT INDICATES - ALSO CRITICIZED COST METHODOLOGY<br>Any change in benefits associated with modal shifts must also be factored in. An Australian study showed redevelopment around transit and walking reduced GHG emissions by 4.4 t CO2-eq per household per year compared with developing a car dependent suburb (Trubka et al., 2010) . Cost savings for each new transit-oriented household were for infrastructure savings (non-transport), USD85,000; for public and private transport savings, USD250,000 over 50 years; for GHG emissions, USD2,900 assuming USD25/tCO2-eq or USD24,990 at USD 215/tCO2-eq (social cost); for health savings, USD4230 from reduced obesity; plus USD34,450 from increased productivity due to increased walking.<br>COMMENTS:<br>(1) This paragraph does not accurately reflect the Trubka et al research. Trubka et al reaches its 4.4 CO2-eq per household per year by comparing urban development within 3 km of the CBD to fringe development 60 or more kms from the CBD. The finding is not about "redevelopoment around transit and walking" but rather redevelopment within 3 km of downtown.<br>(2) The costs cited (from " Cost savings for each new transit-oriented household were for infrastructure savings ...") are not in the cited work but are consistent with previous work by the same authors. Considerably lower costs have been developed for the Sydney area by Center for International Economics (2010), which also includes comparisons to the Trubka, et al. costs. See: The benefits and costs of alternative growth paths for Sydney: Economic, social and environmental impacts<br>http://www.metroplansydney.nsw.gov.au/Portals/0/pdf/AlternativeGrowthPaths.pdf<br>(3) The cost methodology (under subpoint 2 above) is from Trubka, R., Newman, P. and Bilsborough, D., 2008. Assessing the costs of alternative development paths in Australian cities. Fremantle: Curtin University Sustainability Policy Institute., which is criticized in the New Zealand Productivity Commission "Housing Affordability Inquiry." The exception taken to these costs by the Commission should be cited<br>http://www.productivity.govt.nz/sites/default/files/Summary%20Version%20-%20Final%20Housing%20Affordability%20Report_0.pdf | Accept. Thanks a lot for this very useful comment. We will amend text. |
| 3833 | 8 | 36 | 10 | 36 | 10 | Define ICT the first time it appears. | Accept. We will correct text. |
| 11187 | 8 | 36 | 13 | 36 | 20 | To keep higher density in urban areas of developing countries is also important. In reality, once low-density development prevails, it is quite difficult to densify the area. | Accept. We will amend text. |
| 5408 | 8 | 36 | 16 | | 17 | what does it mean to say "compact neighborhoods use cars a third as much as……suburbs"? Actually a third of the PKT by private vehicles one sees in the suburbs? If so, say so. | Accept. We will amend text. |
| 18910 | 8 | 36 | 18 | | | "10 Gt CO2": Are these annual emission reductions? If so, for what year? Please clarify. | No. These are accumulated emission reductions for the period. |
| 3435 | 8 | 36 | 19 | | | When using the term 'polycentric policies' in this chapter, I think it would be appropriate to cite the Economics Nobel Laureate Elinor Ostrom for using the term. E.g.: Ostrom E., A Polycentric Approach for Coping with Climate Change. Background Paper to the 2010 World Development Report, Policy Research Working Paper 5095, The World Bank, Washington, DC, 2009. | Accept. We will try to amend text to reflect this, although we may end up with a problem of having to cite "grey" literature, which IPCC is trying to avoid. |
| 8215 | 8 | 36 | 24 | 36 | 25 | High-speed rail in China is controverisal, esp. on the safety issue. Moreover, high-speed rail sometimes do not have many stops in certain distance, it connects mainly first and second tier cities in China that are remoted from each other. Shifting short-medium haul air trips to high-speed rail cannot satisfy travelers in 3 or 4 tier cities. Therefore, I suggest to delete the half sentence 'particularly high-speed rail including in China (Akerman, 2011).' | Disagree. Although it is true that not all short-medium air trips could be shifted to high speed rail (as the reviewer stated), a considerable shift has been achieved. See Xiaowen Fu, Anming Zhang, Zheng Lei, Research in |
| 5409 | 8 | 36 | 32 | | 34 | I would think that the average reader would draw virtually nothing from knowing that each household used 4.4 t CO2 less…..it would be much more useful, I think, to talk about percentage reductions in emissions, since most people haven't a clue how much carbon is actually emitted by the average household. | Accept. We will amend text. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 7399 | 8 | 36 | 39 | 36 | 45 | use comprehensive measure to assess cost. The statement of negative costs based on the cited study can't be generalized. | Reject. Text is very clear on refering to India and in not generalizing it. |
| 17129 | 8 | 36 | 46 | 36 | 48 | DELETE: Taking into account the total societal cost of vehicles, fuels and infrastructure, a significant cost reduction could occur from a shift away from growth in car and air travel and toward mass transit and non-motorised travel, along with changes in urban form and increased use of ICT (IEA, 2009).<br>REASON: This language is not appropriate because terrible impacts of personal mobility demand reduction on economies is not clarified. | Accept. We will amend texto to better reflect this. |
| 7398 | 8 | 36 | 5 | 36 | 20 | Need to use comprehensive measures to assess costs. For example, densifying suburbs negatively impacts propoerty values. | Accept. We will amend texto to try to address this. |
| 16317 | 8 | 36 | 5 | 36 | 7 | Same as the comment No. 9. | Reject. Comment could not be found. |
| 17722 | 8 | 36 | 5 | | | The examples here are almost all from Australia and the US. What about cities elsewhere in the world, where the majority of population growth will occur in the 21st century? What studies are there from Africa, for example? | Accept. We amend text provided that we can find literature. |
| 16318 | 8 | 36 | 9 | 36 | 13 | This fails to constitute a sentence due to grammatical mistake(s). | Accept. We will amend text. |
| 5208 | 8 | 36 | 21 | | | In general all elemenst are mentioned within this section, but what I miss is the overarging impact of infrastructure policies: if we do not manage to significantly reduce investing in airport and road capacity and increase investing in high speed rail, than there will be no cost or other measure effective enough to avoid further growth of air an dcar and stand still or even decline of rail; based on logics, not so much the scientific literature (though many show the inability of prices to reduce growth so there is an urgent need to follow different policies, see e.g. aviation, see Mayor, K., & Tol, R. S. J. (2007). The impact of the UK aviation tax on carbon dioxide emissions and visitor numbers. Transport Policy, 14, 507-513.<br>Mayor, K., & Tol, R. S. J. (2010). Scenarios of carbon dioxide emissions from aviation. Global Environmental Change, 20, 65-73.<br>Pentelow, L., & Scott, D. J. (2011). Aviation's inclusion in international climate policy regimes: Implications for the Caribbean tourism industry. Journal of Air Transport Management, In Press, Corrected Proof. | Accept Thanks for the comment and for the references. We will amend text. |
| 8372 | 8 | 36 | 22 | | | A simplistic view is put forward here because most likely the consequences of climate change will be very different in the Global North and the Global South. Heat and/or rain impede on walking and bicycling and the same goes for cold, wind and rain in the Global North. In larger cities distances and time spent on roads are also growing A considerable group of (some 2, 5 billion individuals) cannot afford to take a BRT bus or travel with a gentrified system of transport. Also because they do not run to places that women have to go. | Reject. It is not clear what exactly is the suggestion here. |
| 3419 | 8 | 36 | 42 | | | Especially systems that truly integrate public transport and cycling have a lot of potential. | Accept. We will try to amend text. |
| 5288 | 8 | 37 | 14 | | | ADD: But, information is not enough: in a qualitative and quantitative study on mobility in Lyon, hte publci interviewed considered itslef to be well informed (81% said that CC was the number one challenge of the 21st century, 81% also said that the best way for an individual to fight CC was to stop using the car, yet, 56% used their car for all activities on a daily basis (96% had a public transport accessible within 400 meters). Thus, information related to climate change did not lead to changes in mobility modes (Stéphane La Branche. « La gouvernance climatique face à la mobilité quotidienne. Le cas des Lyonnais ». Revue Environnement Urbain/Urban environment. 2011). | Accept. We will try to amend text to reflect this. |
| 3420 | 8 | 37 | 21 | | | While this is right, you may consider to show a notion of mobility careers here; i.e. trying to influence groups to postpone or abstain from the next step in their mobility career. | Accept. We will try to amend text to reflect this. |
| 5410 | 8 | 37 | 21 | | 23 | asserting that something is a "critical part" of a package is probably too strong for an IPCC report, but besides, I suspect there's little evidence that "broad public and institutional education initiatives" do lots of good. | Accept. We will amend text. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3596 | 8 | 37 | 24 | 37 | 33 | This section is not on structural effects, but on system efficiency and sustainable goods transport management. This section should include comments and list all business/public sector efficiency measures leading to a better use of existing capacity and to less CO2 per unit delivered (night deliveries, increased load factor, multi-use lanes, delivery windows etc); and an indication on how to promote them in order to increase the market uptake. | Accept. We will amend text to try to incorporate these important suggestions, particularly relating to the loading of freight vehicles which needs elaboration. |
| 4298 | 8 | 37 | 30 | 37 | 33 | Just-in-time delivery has also caused small lot size of distribution and aggravation of the load factor. It is regarded as one of the important issues. As solution, there are downsizing of vehicles, formation of cooperative transportation, and ICT practical use (logistic information system). | Accept. But we would need literature to amend text. |
| 15838 | 8 | 37 | 49 | | | Do the $/tCO2 values include capex and fuel costs? Negative numbers suggest improvements cost less than current technology which is not very probable. Again, more data would be useful - IEA has done $/tCO2 analyses too. Might include some of that. (ETP, WEO) | Accept. We will try to amend text. |
| 4061 | 8 | 37 | 24 | 37 | 33 | Section 8.6.2. These sentences discuss the cost-effectiveness and benefits of "just-in-time" logistics. However, just-in-time logistics may suffer from climate change impacts when disruptions occur. What is the net benefit of changing to just-in-time logistics? | Accept. We will amend text if we can find literature. |
| 8373 | 8 | 37 | 38 | | | Yes, especially in cities in emerging economies. Therefore, pls map out 4-5 different kinds of urban areas and clarify the conditions and possibilities in cities with different political and economic systems. | Accept. We will try to amend text provided we can find literature to back it. |
| 8720 | 8 | 37 | | | | Note: Comparison of mitigation options for US and European HDVs is available in this recent report(Table 3.9) Cost reductions for each technology for each vehicle category in Table 4.22<br>AEA & Ricardo, 2010. Reduction and testing of Greenhouse Gas Emissions from Heavy Duty Vehicles http://ec.europa.eu/clima/policies/transport/vehicles/docs/ec_hdv_ghg_strategy_en.pdf | Accept. We will amend text to better reflect this. |
| 4421 | 8 | 37 | 39 | 38 | 30 | Could much of section 8.6 be combined with the earlier section vehicle technologies? The consequence of separating the cost of powertrain improvements from the technology is that much of the earlier discussion is repeated to allow costs to be discussed. Additionally, costs of technological improvements for shipping, rail and air have been omitted. | Accept. We will amend text. The reviewer has a good point, although we must stick with the agreed outline. |
| 11649 | 8 | 38 | | | | Add also the cost analysis in Lutsey 2009, and Borken-kleefeld 2010: http://webarchive.iiasa.ac.at/Admin/PUB/Documents/XP-10-014.pdf | Accept. We will amend figure. |
| 5339 | 8 | 38 | 1 | 38 | 1 | increases in efficiency ARE possible | Accept. We will try to amend text. |
| 2456 | 8 | 38 | 16 | | 24 | Lots of data here, but there is no comment on the potential for any combination of migitation measures and the total costs that this would result - over what sort of time period. | Accept. We will try to amend text to better reflect this. But in fact there is a table for this in the earlier section, though it can be greatly improved. An issue with figure 8.6.1 is that we do not |
| 2759 | 8 | 38 | 16 | 38 | 24 | Mitigation cost may be negative. E.g. biogas vehicles may be cheaper than corresponding diesel vehicles and their fuel is also cheaper. In addition, octane value of 140 makes substantial engine efficiency increase possible reducing energy consumption per km. | Accept. We will amend text and find literature to better reflect this. |
| 5340 | 8 | 38 | 16 | 38 | 24 | Need to clarify what modes this para refers to: all LDVs? Cars? References to "short term" and "long term" need to be defined. Time frame not specified for EV costs, so not clear what "in the same timeframe" refers to for FCVs | Accept Thanks for the comment. We will improve text. |
| 16320 | 8 | 38 | 16 | 38 | 21 | CO2 mitigation costs for ICEs, ICE-hybrids, and plug-in hybrids must differ by fuels, so fuels used in vehicles in question must be clearly described, such as advanced gasoline ICEs. | Accept. We will modify/clarify text.However, the authors doubt this is |
| 3834 | 8 | 38 | 17 | 38 | 17 | Explain in a footnote what advanced spark-ignition ICE means. | Accept. We will clarify. |
| 3835 | 8 | 38 | 18 | 38 | 19 | I recommend to consider the PHEV coupled with sugar cane ethanol as a low cost and high intensity GHG emission mitigation alternative. See Pacca and Moreira, 2011 and consider that the technology is already in the market. - Pacca, S. and J. R. Moreira, 2011. A Biorefinery for Mobility? Environ Sci Technol. 2011 Nov 15;45(22):9498-505. | Accept. We will try to ammend text. |
| 15840 | 8 | 38 | 21 | | | add "low cost and" before "low carbon" | Accept. We will ammend. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15841 | 8 | 38 | 21 | 38 | 22 | $80-120/tCO2 look like very long term costs, not near term (i.e., cheap batteery prices). Might clarify assumptions | Accept. We will clarify. |
| 5341 | 8 | 38 | 22 | 38 | 22 | Depends on battery cost. UK Committee on Climate Change analysis suggests cost could be near-zero by 2030 if charged off-peak with low-carbon electricity. See CCC (2012) International Aviation & Shipping Review Technical Report http://hmccc.s3.amazonaws.com/IA&S/CCC_IAS_Tech-Rep_2050Target_Ch4_Transport.pdf | Accept. The problem is that one can always find a very high and very low cost with the right assumptions about battery costs. That's the key, and we probably |
| 16321 | 8 | 38 | 25 | 38 | 25 | This sentence should be modified to "~ achieve a reduction in fuel consumption per km of 38-51% from XXXX (2015?) to 2020". | Accept. We will clarify. We.need to look at the NRC report. Probably 2010 at the |
| 15839 | 8 | 38 | 7 | | | Might add a chart showing $/tCO2 vs. tCO2/km, or $/passenger km traveled vs L/km charts to capture full life cycle costs (vehicle capex + fuel + opex). Also not clear if same vehicle class assumed (mid sized LDvs? Compact cars? Keep consistent | Accept. We will try to improve figure. |
| 4340 | 8 | 38 | 8 | 38 | 11 | legend is missing "G-adv" label? What does it mean?? | Accept. We will clarify (advanced |
| 13881 | 8 | 38 | 16 | 38 | 24 | If discount rate is discussed in page 25, mitigation cost for electric vehicle are provided without any indication on the discount rate hypothesis used. It seems that IEA (reference provided) takes a quite low 3% discount rate, which could explain the relatively low mitigation cost. It could be useful to discuss the effect of high discount rate on deployment | Accept. We will try to improve text. |
| 13897 | 8 | 38 | 16 | 38 | 24 | Only one reference is provided for EVs and PHEVs mitigation cost. Here is another reference, with much higher costs: Oscar van Vliet, Anne Sjoerd Brouwer, Takeshi Kuramochi, Machteld van den Broek, André Faaij, Energy use, cost and CO2 emissions of electric cars, Journal of Power Sources, Volume 196, Issue 4, 15 February 2011, Pages 2298-2310, ISSN 0378-7753, 10.1016/j.jpowsour.2010.09.119 | Accept. We will try to incorporate new, authoritative references. |
| 17774 | 8 | 39 | | | | retype the table; also there is another table with the same table number | Accept. We will correct this. |
| 15842 | 8 | 39 | 11 | | | why have efforts been usuccessful? Important to know | Accept. We will clarify. |
| 2760 | 8 | 39 | 12 | 39 | 14 | In addition to black carbon, diesel engine emission problems include other particles etc. These are not solved by liquid biofuels, i.e. biodiesels, synthetic biodiesels and pure plant oils, even if they can reduce lifecycle GHG emissions. But these problems can be solved by using gaseous fuels (renewable methane and bio-DME) in the diesel engines. Those fuels also reduce lifecycle GHG emissions compared to biodiesels, synthetic biodiesels and pure plant oils. | Accept. We will try to improve text if we can find good references for it. |
| 2458 | 8 | 39 | 15 | | 23 | This is almost a repeat? | Accept. We will amend text to improve it. |
| 3837 | 8 | 39 | 15 | 39 | 23 | This is another place where the technology discussed in Pacca and Moreira, 2011 could be considered for analysis. - Pacca, S. and J. R. Moreira, 2011. A Biorefinery for Mobility? Environ Sci Technol. 2011 Nov 15;45(22):9498-505. | Accept. Thanks for the reference. |
| 16322 | 8 | 39 | 15 | 39 | 15 | The phrase "renewable- and non-renewable-electricity based" seems redundant and shall be deleted. | Accept. Will amend text. |
| 2761 | 8 | 39 | 17 | 39 | 19 | Here the 20 % limit means liquid biofuels. The EU expert group on future transport fuels has estimated (in January 2011) that biogas (BG) and synthetic biogas (SBG) resources in the EU are larger than transport energy consumption in the EU. And still biomethane resources are very small part of all renewable methane resources. Solar and wind methane are much larger: their use also solves the storage problem of intermittent renewable energy sources (also Chapter 7 issue, see comment 59). In Finland 40 % share of renewable methane in transport energy consumption in 2050 has been proposed in a sustainable development path. Most would be wind and solar methane because they have crucial contribution to sustainable energy system. BG has been used commercially in transport in Finland and Sweden since 1941. SBG use in transport has been demonstrated in Austria since 2009 and wind methane use in transport has been demonstrated in Germany since 2009. Commercial SBG production for transport will begin in Sweden in 2013 and commercial wind methane production for transport will begin in Germany in 2013. | Accept. We may try to amend text but we really need literature to back this. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 5342 | 8 | 39 | 17 | 39 | 18 | ~20% is in IEA scenario but this is not indicative of what is likely or desirable. If ILUC is ignored there could be much more biofuels, but if ILUC is addressed there could be much less. Also UK Committee on Climate Change analysis indicates over the longer term bioenergy should be prioritised in other sectors, and zero-emission vehicles deployed to decarbonise road transport. See CCC (2011) Bioenergy Review. http://www.theccc.org.uk/reports/bioenergy-review | Accept. We will try to improve text. |
| 12904 | 8 | 39 | 17 | 39 | 18 | This number might be outdated due to recent scientific findings on the non-sustainability of biofuels. | Accept. We will try to find more recent |
| 16323 | 8 | 39 | 17 | 39 | 18 | This sentence should clarify the region where it holds true, e.g., at the global level. | Accept. We will clarify. |
| 16338 | 8 | 39 | 17 | 39 | 18 | Takeshita (T. Takeshita, 2009. "A Strategy for Introducing Modern Bioenergy into Developing Asia to Avoid Dangerous Climate Change." Applied Energy 86 (Suppl. 1), pp. 222-232) estimated that the amount of biomass feedstocks that can be used for energy purposes without conflicting with other biomass uses such as food production would decrease significantly in the second half of the century because of the growth of food demand, particularly in now-developing regions. Therefore, it is likely that the share of biofuels produced from plantation-based feedstocks will not be so high in the long term. | Accept. We will improve text. |
| 3836 | 8 | 39 | 2 | 39 | 4 | Please, explain the meaning of all vehicles classes. | Accept. We will clarify. |
| 16324 | 8 | 39 | 24 | 39 | 24 | The phrase "varies across regions and raw materials" should be modified to "varies across regions, raw materials, conversion processes, and final products". | Accept. Thanks. We will modify. |
| 13117 | 8 | 39 | 31 | 39 | 34 | This paragraph (Emissions from EVs ,,,,,,,,,ICE-based vehicles) is not necessary. Similar paragraph is seen line 40 page20 . Please cut it for simplicity. | Accept. We will try to improve text. But a reference to electric vehicle is important here since this section is |
| 4422 | 8 | 39 | 32 | 39 | 34 | The point of WTW emissions from EV being linked to the carbon intensity of power generation was said earlier in p 20, line 42. | Accept. We will cross-reference with there. But it is important to have this in here, as this subsection is about carbon |
| 2457 | 8 | 39 | 5 | | 9 | With statements like this, it is very hard to see transport making any substantial contribution to CO2 stabilisation targets - if 2% fuel efficiency is set against a growth of 4.8% in aviation - these inconsistencies need to be reconciled if the document is to have any credence. | Reject. There seems to be no inconsistency here, as this part of the text only refers to aviation. We are |
| 17723 | 8 | 39 | 8 | | | does this mean that there must be a reduction in air traffic to meet climate change targets, even with the most optimistic scenarios for efficient technologies? | Accept. Thanks for the comment. In fact there are other possibilities as well, as low/zero carbon fuels that could be used |
| 6487 | 8 | 39 | 11 | 39 | 14 | One of the main reasons why dieselization of fleet is happening in Asia is the availability of subsidies which keeps the price of diesel less than gasoline. This has a negative impact on carbon emissions due to rebound effects and black carbon emissions. | Reject. Thanks for the comment but it does not conflict with what is already in the text. |
| 2459 | 8 | 40 | | | | This table is important - and perhaps needs some sort of commentary on risks and returns | Accept. We will try to incorporate that. |
| 16325 | 8 | 40 | | | | For the upper left cell (raw 2, column 2), hydrogen should be included in fuel switch options. | Accept. We will amend. |
| 16326 | 8 | 40 | | | | For the cell (raw 3, column 2), the assumption that electricity can account for 100% of the global transport fuel demand is clearly unrealistic. As described in the IEA Energy Technology Perspectives 2008 (IEA, 2008), long-haul trucks, international shipping, and aircraft are unlikely to operate on electricity. | Accept. The same way as we have amended the text already we will amend table. |
| 16327 | 8 | 40 | | | | For the cell (raw 4, column 2), it should be confirmed that 17.3% share holds for the entire transport sector or the specific transport subsector (e.g., the road transport subsector) in Brazil in 2010. | Accept. It is for the entire transport sector as indicated in the table. |
| 16328 | 8 | 40 | | | | For the cell (raw 3, column 3), the phrase "50% improvement by 2050" should be modified to "50% improvement from XXXX to 2050". | Reject. This is a rough number. It is up to 50% as compared to today. But table |
| 16329 | 8 | 40 | | | | For the cell (raw 4, column 3), the same comment as No. 58 is applied. | Reject. This is a rough number. It is up to 51% as compared to today. But table will be improved anyway. and, in NEW |
| 17724 | 8 | 40 | 16 | | | what is meant by "consciousness"? | Accept. We will modify/clarify text. We will change to "environmental awareness" |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4423 | 8 | 40 | 17 | 41 | 2 | This paragraph on externalities should join the earlier discussion on externalities. The sentences on p41 could be removed as they repeat the information given previously with regard to externalities from road transport. | Accept. |
| 15843 | 8 | 40 | 2 | | | mitigation options: missing H2 as a fuel. also add smaller/lighter/aerodynamic vehicles as another efficiency option. For Potential: Electric vehicles could only be used for LDVs - not practical for HDVs. 100% of global demand is very unlikely. | Accept. We will amend table. |
| 4299 | 8 | 40 | 3 | | | We should also add the potential about carbon intensity (percentage of GHG emission reduction) to the table8.6.2. Also, please add the potential of GHG reduction by comprehensive four columns. | Accept. We will amend table. |
| 5248 | 8 | 40 | 5 | 40 | 16 | clear reasons for wishing to change existing habits … adapt lifestyles and transport behaviour? What do the authors think rural dwellers do, faced as so many of them are by high transportation costs to meet their basic needs of food, etc? Again, an urban mentality seems to override all in this chapter. | Taken into account |
| 2700 | 8 | 40 | 4 | 40 | 17 | The sub-header 'socio-economic effects' does not fit and neither does the first paragraph of 8.7.1 I would recommend that this introductory paragraph basically focus on externalities, as this is what the following sections are about - not about socio-economic effects. | To take into account. |
| 17888 | 8 | 41 | | | | Transportation affects every aspect of our lives and daily routine, including where we live, work, play, shop, go to school, etc. It has a profound impact on residential patterns, industrial growth, and physical and social mobility. However, uUnsustainable transport leads to an increase in the burden of disease in the short and in the long-term due to air and noise pollution, consequences of reduced physical activity, social disruption, and climate change. | Agree. |
| 17725 | 8 | 41 | 12 | | | Perhaps this section could be reviewed and re-written with input from public health colleagues. There are plenty of recent, primary references on the health effects of vehicle emissions that would be worth citing, for instance. The list reported here of symptoms associated with emissions is a little confusing, and may be inaccurate. Costing the impacts of air pollution, compared with those of congestion, rests on judgements, necessarily arbitrary , about the value of human life. And there is a host of references on the health gains resulting from more active transport, apart from Woodcock and Trubka. | Taken into account |
| 4038 | 8 | 41 | 14 | 41 | 15 | suggested wording: "lead particles in few countries (UNEP 2011) and particulate matter (PM) that includes, among others, black carbon". UNEP 2011=Global Status of Leaded Petrol Phase-Out. United Nations Environment Programme, Nairobi. http://unep.org/transport/pcfv/PDF/leadprogress.pdf (accessed 26 May 2011) | Accept. We will amend. |
| 17726 | 8 | 41 | 34 | | | What has happened historically is that the incidence of road crash injury rises with increasing motorized traffic, but only to a point, and then injury incidence diminishes with further increases in traffic. The peak occurred in Australia around 1970, for example. | Taken into account |
| 8026 | 8 | 41 | 35 | 41 | 35 | Not every year 1.27 mio people are killed - please specify the year for which this was valid | Accept. We will clarify. |
| 8027 | 8 | 41 | 4 | 41 | 4 | For some scientists (e.g. Rothengatter) the costs from congestion are no externalities because they are internalised - the drivers who cause them have the 'damage'. | Accept. We will modify/clarify text. |
| 16330 | 8 | 41 | 6 | 41 | 10 | This sentence should clarify the time point where it holds true, e.g., in 2000. | Accept. We will clarify. |
| 2460 | 8 | 41 | | | | Issues relating to quality of life are mentioned, but not picked up in the text - and there is very little on substitution of trips by technology or through doing many different things on one trip (chaining) - or on the need to keep distances as short as possible - this again relates to the travel time budget where people have substituted faster modes for slower ones - and they can travel further - but the costs are that more CO2 and energy is used. | Reject. Beyond the scope of the section. Refer to sections 8., 8.4, 8.10. |
| 2461 | 8 | 41 | | | | These figures are very dated - can newer ones be used - or a note that most are over 10 years old - there is also dispute over how they have been calculated and whether any transport system allows congestion free travel - what are society's expectations? | Accept. To take into account |
| 8205 | 8 | 41 | 3 | 41 | 10 | The average percentage of traffic time lost accounded to GDP in the world as whole is lacking. | Reject. Out of the scope of this Chapter. |
| 13882 | 8 | 41 | 4 | 41 | 10 | it would be interesting to present in parallel the costs (or benefits) -for individuals and for an economy/society - associated with slower transport modes (walking, cycling, bus, 30 km/h urban zones) | Reject. This is outside the scope of the section |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2462 | 8 | 41 | | | | See latest WHO (2012) paper on transport and health | Accept. Thanks for the reference. |
| 8206 | 8 | 41 | 11 | 41 | 32 | I do not think there are enough literature reviews in this section (8.7.1.2 Public Health). There are much more other literatures that have not been well exmined. | Reject. It is not the purpose to cover a public health review. We seek to providesome examples of cobenefits of |
| 8374 | 8 | 41 | 11 | | | The impact of road transport on public health in emerging urban areas is not studied much and the impact of cutting emissions on people's health is still under researched. The side-effects of noise and vibrations on human health and the fauna is another area with knowledge gaps. | Reject. This is outside the scope of the section |
| 17956 | 8 | 41 | 25 | | | Are these numbers based on scenarios rather than experience? If yes, simple past is not the appropriate tense. | Editorial |
| 8375 | 8 | 41 | 47 | | | About 10 per cent of global population have a car so there is another 90 per cent that are not car owners (not only the poorest ones). Many of them perhaps some 75 percent are women, children, elderly and so on. PIs re-write this phrase. □ | Noted |
| 2463 | 8 | 41 | | | | Note this is particularly important for young people | Noted |
| 4424 | 8 | 41 | 36 | 41 | 37 | Road traffic injuries kill more people than those who die from those three diseases combined or individually? | Noted |
| 2464 | 8 | 41 | | | | Part of this is the availability of space (in cities) for transport - often very limited (under 10% in most Chinese and other Asian cities) and how this is used - for people, for traffic, for work, for markets, for open space etc - it is an allocation and ownership question - the availability of space is cities for traffic is not mentioned here (cp Ch12). | Adress to coord Ch 12 |
| 4425 | 8 | 41 | 42 | 41 | 47 | I appreciate that the costs associated with land use in car-dominated cities are externalities. However, this section may be placed better when discussing the urban form more generally. | Accept |
| 2701 | 8 | 41 | 42 | 43 | 8 | Note that rail can be a barrier also, but is normally less intrusive than high-speed roads. Airports also consume very large quantities of land. I would recommend a discussion of the land take associated with parking (see the work of Donald Shoup for more on parking). | Noted |
| 15844 | 8 | 42 | 10 | | | why don't more cities use congestion charges? | Refer to 8.10 |
| 4426 | 8 | 42 | 15 | 42 | 21 | The benefits of reducing congestion on human health in general and in Australia in particular were given earlier on p 41, line 31. Most of this paragraph discusses congestion which could be placed with 8.7.1.1. | Accept |
| 16331 | 8 | 42 | 17 | 42 | 21 | The two sentences "Beyond time saving, … due to greater walking (Trubka et al., 2010)" should be deleted or moved from this section, because these sentences don't have a relation with climate change mitigation as a co-benefit and because the latter sentence already appears in Section 8.7.1.2. | Accept |
| 16332 | 8 | 42 | 28 | 42 | 34 | The four sentences "Strategies that target … exacerbated in them (Lindley et al., 2006)" should be moved to Section 8.7.2 because they mention climate change mitigation as a co-benefit. I propose that the co-benefits of climate change mitigation on transport-derived local environmental issues and health effects be mentioned in this section (Section 8.7.3) in the following manner: Takeshita (T. Takeshita, 2012. "Assessing the Co-Benefits of CO2 Mitigation on Air Pollutants Emissions from Road Vehicles." Applied Energy 97, pp. 225-237) concluded that the co-benefits of climate change mitigation on local air pollutants emissions from road vehicles would certainly exist. He estimated that global cumulative emissions of SO2, NOx, and PM from road vehicles during the period 2020-2100 in the 400 ppmv CO2 stabilization scenario would be reduced by 22.1%, 10.8%, and 14.4%, respectively, compared to the no climate stabilization scenario. | Accept |
| 2465 | 8 | 42 | 30 | | | Is this PM25? | Editorial |
| 4039 | 8 | 42 | 31 | | | after "black carbon" add "(UNEP and WMO 2011)". Reference: UNEP and WMO (2001). Integarted Assessment of Black Carbon and Tropospheric Ozone. Available at http://www.unep.org/dewa/Portals/67/pdf/BlackCarbon_report.pdf | Accept |
| 7401 | 8 | 42 | 35 | 42 | 38 | These lines shoul belong to section 8.7.4 discussing transport technologies. | Accept |
| 6388 | 8 | 42 | 35 | 42 | 38 | This paragraph could use editing, both for readability and for content: it's not clear what this paragraph is trying to convey. Also, it seems out of place here. It might be more at home in a section on risks and uncertainties (w.r.t. mitigation options) | Accept. We will rewrite |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16333 | 8 | 42 | 35 | 42 | 38 | The two sentences "To evaluate … and implementation (Larsen et al., 2009)" should be moved to Section 8.7.4 because this section focuses on the potential risks of biofuels deployment. | Accept |
| 16334 | 8 | 42 | 40 | 42 | 42 | The two sentences "Improving vehicle efficiency … mobility problems (Steg and Gifford, 2005)" should be moved to Section 8.7.3 because they mention environmental effects. | Accept |
| 2466 | 8 | 42 | 41 | | 42 | Word missing here? 'create' | Editorial |
| 8207 | 8 | 42 | 7 | 42 | 7 | Limited literature review: "Creutzig and He, 2009" is highly and sololy refered in this section to discribe China's case. Please review and refer more literature to avoid risk. | Accept. Thanks. We will modify. Agree. MAYBE HAO CAN PROVIDE |
| 8208 | 8 | 42 | 7 | 42 | 7 | "7.5% to 15% of GDP". This number is big. Please refer other literatures (studies) to avoid mistake. | Accept. We will rewrite |
| 13883 | 8 | 42 | | 42 | | This section seems not to fit well. Main points already presented in other well structured sections. | Accept. |
| 2702 | 8 | 42 | 22 | 42 | 34 | This section is repetitive of other parts of the report, suggest it be deleted. | Noted |
| 17959 | 8 | 42 | 23 | 42 | 31 | This paragraph has to my mind rather introductory character to 'climate change mitigation as a co-benefit' and might be placed at the beginning of section 8.7.2. | Accept |
| 8389 | 8 | 42 | 26 | | 27 | This phrase is feeble and will have to re-phrased. Passengers often have to go by buses that are old, insecure and poorly maintained. | Accept |
| 17960 | 8 | 42 | 32 | 42 | 34 | This paragraph has to my mind rather introductory character and would be well suited to be placed before section 8.7.1.1. | Noted |
| 17961 | 8 | 42 | 35 | 42 | 38 | This paragraph rather belongs to the assessment of biofuels and seems somehow misplaced here. | Accept. Agree |
| 2703 | 8 | 42 | 39 | 42 | 46 | This section is not needed. Please delete. | Reject but we will rewrite. Agree |
| 6489 | 8 | 42 | 40 | 42 | 42 | suggest rewording following statement – “Technological solutions, improved fuel efficiency, reduction in noise levels, may improve environmental quality but mobility problems (Steg and Gifford, 2005). “ - to - “Technological solutions, improved fuel efficiency, reduction in noise levels, may improve environmental quality but would increase mobility problems ". and the para needs editing. | Editorial |
| 5289 | 8 | 43 | 17 | | | ADD: Some modern anthropological works suggest strongly that permanent modal change is caused by a rupture (induced or accidental such as car engine failure) in habits, followed by positive reinforcements (from pleasure reading in the TC). Permanent change seems more difficult to achieve without both factors. (A. Rocci. De l’automobilité à la multimodalité ? Analyse sociologique des freins et leviers au changement de comportements vers une réduction de l’usage de la voiture. Le cas de la région parisienne et perspective internationale. Dec. 2007. PhD thesis, INRETS ; S. Vincent. « L’altermobilité : un geste écologique ? » In S. La Branche, Le changement climatique dans tous ses états, Presses universitaires de Grenoble, 2008. | Reject. Out of the scope of this Chapter. |
| 17775 | 8 | 43 | 2 | | | any reference for this statement? | Accept. We wil delete the sentence |
| 6389 | 8 | 43 | 2 | | | It's unclear what this sentence means, and in any case, it's doubtful this claim can be supported as written. | Accept. We will delete the sentence |
| 12905 | 8 | 43 | 31 | | | This paragraph does not seem to be related to the subject of the subsection (8.7.5 Public perceptions) and could thus be deleted or moved to another subsection. | Accept. We will rewrite |
| 2704 | 8 | 43 | 1 | 43 | 36 | The premise of this section is that people face barriers to altruistic voluntary actions to reduce climate change. People do respond to economic incentives, and this should be the focus of any discussion, not bemoaning the fact that people are not altruistic in their behavior. | Accept. We will rewrite |
| 17963 | 8 | 43 | 2 | 43 | 10 | This paragraph discusses structural and psychological and should thus be placed in the barrier discussion in section 8.8.3. | Accept. We will rewrite |
| 8377 | 8 | 43 | 31 | | 33 | Food security and access to medical care and other of the human basic human needs is a core issue in most countries of world. Conditions of life are rapidly changing and the sector of transport will have to respond to the human basic needs of the growing population such as access to food, work, medical care and clean air. Given the importance of the issue and it should be stressed earlier on. | Noted |
| 17964 | 8 | 43 | 31 | 43 | 36 | According to the classification of different types of risks provided by Section 6.7, this paragraph could be moved to the risk section 8.7.4. | Accept. We will rewrite |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9912 | 8 | 44 | 1 | | | An analysis of 104 empirical studies of innovation to change showed the following barriers, that could refine and structure the discussion of barriers:<br>Issues of resourcing (76%), for instance, “not enough resources” (Post and Altman 1994), “lack of adequate resources such as time and staff” (Adams and McNicholas 2007), limited or no budgeting (e.g. Harris 2000 and Anumba et al. 2006), access to capital and lack of time (Rohdin and Thollander 2006).<br>Issues of capabilities (75%), for instance, “low technology literacy” (Stewart, Mohamed and Marosszeky 2004), “ill-equipped in terms of training and expertise” (Whitaker 1987), “employees are not trained” (Tamimi and Sebastianelli 1998), “lack of understanding” (Waldron 2005), “lack of technical skills” (Rohdin and Thollander 2006), “lack of skill, knowledge and expertise” (Kirkland and Thompson 1999), etc.<br>Issues of communication (64%), for instance, “communication barriers” (Heide, Grønhaug and Johannessen 2002), “communication overload and distortion” (Allen 2002), “lack of communication within the team” (Attaran and Nguyen 1999), “lack of communication among those sharing responsibility for different aspects” (Kunda and Brooks 2000), “poor communication practices that damaged employee commitment to projects” (Jacobs et al. 2006), “tension among departments arising from the incompatibility of actual or desired responses” (Aggarwal 2003), etc.<br>Issues of organizational structure (62%), for instance, bureaucracy (e.g. Molinsky 1999; Borins 2000; Abdul-Hadi, Al-Sudairi and Alqahtani 2005), “salary structure” (Al-Qirim 2007), “complexity, centralization, and formalization”(e.g. Allen 2002), “rigid organizational boundaries” (Butler 2006), “departmental fortresses” (Cicmil 1999), and organizational structure (e.g. Scarbrough and Lannon 1988; McGaughey and Snyde 1994; Yauch and Steudel 2002).<br>Abdul-Hadi, N., Al-Sudairi, A. und Alqahtani, S. (2005): Prioritizing barriers to successful business process re-engineering (BPR) efforts in Saudi Arabian construction industry, In: Construction Management \& Economics, Vol. 23, Nr. 3, S. 305-315.<br>Adams, C.A. und McNicholas, P. (2007): Making a difference: Sustainability reporting, accountability and organisational change, In: Accounting, Auditing and Accountability Journal, Vol. 20, Nr. 3, S. 382-402.<br>Aggarwal, N. (2003): Organizational Barriers to Market Orientation, In: Journal of Management Research, Vol. 3, Nr. 2, S. 87-97.<br>Allen, R.Y.W. (2002): Assessing the impediments to organizational change: A view of community policing, In: Journal of Criminal Justic, Vol. 30, Nr. 6, S. 511-517.<br>Al-Qirim, N. (2007): The adoption and diffusion of E-commerce in developing countries: The case of an NGO in Jordan, In: Information Technology for Development, Vol. 13, Nr. 2, S. 107-131.<br>Anumba, C.E.H., et al. (2006): Understanding structural and cultural impediments to ICT system integration: A GIS-based case study, In: Engineering Construction & Architectural Management, Vol. 13, Nr. 6, S. 616-633.<br>Attaran, M. und Nguyen, T.T. (1999): Design and implementation of self-directed process teams, In: Management Decision, Vol. 37, Nr. 7, S. 553-561.<br>Borins, S. (2000): What Border? Public Management Innovation in the United States and Canada, In: Journal of Policy Analysis and Management, Vol. 19, Nr. 1, S. 46-74.<br>Butler, J.C. (2006): Ten Lessons Learned: Data Warehouse Development Project, California Department of Fish and Game, In: CrossTalk: The Journal of Defense Software Engineering, Vol. 19, Nr. 10, S. 16-20 | Accept. We will rewrite |
| 2771 | 8 | 44 | 4 | 44 | 6 | Many developing countries have showed example on how to decouple crude oil based mobility from wealth generation. Natural gas based traffic in Pakistan (> 80% share in road transport) and Bangladesh (>60%) are two examples. Of methane used in transport over 60 % in Sweden and 100 % in Iceland is renewable. | Noted |
| 16335 | 8 | 44 | 5 | 44 | 5 | Significantly less increases in what? It should be clearly described. | Accept. But we would need literature to |
| 13884 | 8 | 44 | | 51 | | This section need to be linked with chapter 16 "cross-cutting investment and finance issues" in order to avoid overlapping between chapters | Noted. Section has been significantly restructured and rewritten. Section 8.8.2 |
| 13885 | 8 | 44 | | 51 | | Methodological barriers should be discussed: lack of harmonized / standardized methodologies to assess transportation GHG emissions; lack of "Measurable, Reportable, Verifiable" (MRV) procedures; lack of methodology to assess cost-effectiveness of transportation (+land use) package (see Lefèvre, B., 2012, Incorporating cities into the post-2012 climate change agreements, Environment & Urbanization, vol 24(2) ) | Useful reference if transport infrastructure included |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13886 | 8 | 44 | | 51 | | This section could mention that there are already existing relevant decision-helping tools to take up the climate change challenges in the transportation (+land use) sector : LUTI models (see Wegener, M., Furst, F., 1999, Land use transport interaction : State of theart, Deliverable 2a of the project TRANSLAND of the 4th RTD Framework Programme of European Commission; Masson, S., 2000, Les interactions entre le systeme de transport et systeme de localisation en milieu urbain et leur modelisation, These pour le doctorat de sciences economiques, Mention economie des transports, Dir. Bonnafous, A., Universite´ Lumiere Lyon 2, Faculte de Sciences Economiques etde Gestion; Lefèvre, B., 2007, Long-term energy consumptions of urban transportation: A prospective simulation of "transport - land uses" policies in Bangalore, Energy Policy, Volume 37, Issue 3, March 2009, Pages 940-953) | Agree. It could go in here or in 8.4 |
| 13887 | 8 | 44 | | 51 | | The rebound effect (and the lack of knowledge on its determinants) should be discussed here. See Schipper, Lee & Grubb, Michael, 2000. "On the rebound? Feedback between energy intensities and energy uses in IEA countries," Energy Policy, Elsevier, vol. 28(6-7), pages 367-388, June; Small and van Dender, 2007, Fuel Efficiency and Motor Vehicle Travel: The Declining Rebound Effect, Energy Journal, vol. 28, no. 1 (2007), pp. 25-51. | Agree. Helpful references provided. |
| 3165 | 8 | 44 | 1 | | | Section 8.8 is complicated and unfocused and the table uses a lot of space. It has lots of info but little analysis. integrate with table 8.10.1 | Disagree. Cannot merge with a table just on Integration. Words not ticks are needed to explain Barriers and |
| 2467 | 8 | 45 | | | | This is important - but it gives the impression that options are discrete alternatives - needs more on complementarity, the use of policy packages, and the phasing of implementation. More also needed on the 'soft' measures - car sharing, renting bikes and cars, use of technology for timetables and real time information, company plans, and involvement of all stakeholders in debates over low carbon transport. Also more needed on regulations and standards. | Agree. But this is not the place for 'complementarity', apart from mentioning it perhaps. These comments are also really about Policy section. All actions suggested are in the Table. |
| 6491 | 8 | 45 | | | | 8.8.1 Table , Page 45, Barriers in deployment of electric vehicles and even in discussion 8.3.3.2 Electricity and 8.3.2.1 Electric-drive road vehicles – please do consider the availability of limited electric supply in many developing cities. The blackout is very severe. A good example for this is the battery powered vehicles in Kathmandu. The movement of promoting electric vehicles started in early 1993. However even with great support from the government, the promotion of electric vehicles could not result in huge impact due to load shedding. There is a severe shortage of electricity and though electric vehicles low in number may or may not influence grid calculations (though vehicles are generally charged in night where the peak requirement is high..) but the charging becomes difficult. The other problem is the disposal of lead batteries. | Agree. Will add something. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17130 | 8 | 45 | | | | COMMENT: Current Table8.8.1 contains technology and practice<br>-Fuel carbon Intensity: Fuel switching<br>3 items (EVs and PHEVs, CNG, Biofuels)<br>-Intensity: Energy Efficiency of Technology<br>1 item (Improve fuel efficient)<br>-Structure: System infrastructure efficiency<br>9 items (6 Modai shift, 2 Urban planning,<br>1 System optimize)<br>-Activity: demand reduction<br>3 items (1 Mobility service substitution<br>2 Behaviour change)<br><br>This table describes many items of modal shift in 'Structure', but just 1 item in 'Intensity'.<br>There should be more practice items such as eco-driving, road infrastructure to improve traffic flow, to improve on-road fuel efficiency as a stock-base of vehicles, but it only refers to new (sales-based) vehicles.<br><br>ADD: Proposed texts in the table will be sent to comments@ipcc.ws3 | Disagree. The items mentioned like Eco Driving are in the Behavior Change section and the road infrastructure to improve fuel efficiency is a highly contentious policy which we have proved to be a myth. Will amend |
| 4064 | 8 | 45 | | | | Item 1. BEV and PHEVs. "Rapid increase in use likely over next decade…" This statement about "rapid increase…" is too optimistic given the significant barriers. | Disagree. It is very rapid so already toned down but Chevron may want it |
| 4065 | 8 | 45 | | | | Item 2. CNG and LNG. "Infrastructure available in some cities can allow a quick ramp-up of CNG and LNG vehicles." This is an optimistic statement. At best, the statement should be restated as "Infrastructure available in some cities can allow a quick ramp-up of CNG and LNG vehicles in the same cities. | Agree. Will change. |
| 4066 | 8 | 45 | | | | Item 3. "Advanced and drop-in biofuels likely to be significantly adopted around 2020, mainly for aviation." We are already in 2012. For aircraft engine manufacturers to accept these new fuels, more testing will have to be done. | Unsure - will need to ask the team. |
| 3589 | 8 | 45 | | | | It is almost impossible to read this table. Introduction in text would be better. Instead of separating the different policies it would be better to show a more pragmatic, realistic approach and to try integrate them. | Disagree. Its not the Policy section. |
| 3838 | 8 | 45 | | | | Last row, 3rd. Column - Check wording. | Seems OK wording to me. |
| 16336 | 8 | 45 | | | | Hydrogen fuel cell vehicles should be included in fuel switching options. Renewable electricity should be modified to low-carbon electricity because BEVs and PHEVs based not only on renewable electricity but also on nuclear-generated electricity and fossil-generated electricity with CCS can be viewed as effective fuel switching options. | Agree. Have changed in 1. |
| 16337 | 8 | 45 | | | | The word "pof" might be "of". | Agree. Fixed. |
| 4300 | 8 | 45 | | | | The external power supply(OLEV : Online Electric Vehicle) and Capacitor(CaEV) should be added in No.1 line (based on renewable electricity). | Noted. Not covered due to space constaints and limited role. |
| 15845 | 8 | 45 | 1 | | | In general this tabel is too long. Also, there is a disconnect between content and text in previous sections. Some content not discussed in text and vice versa, also several hand-waiving statements. Might combine tables 8.6.2 and 8.8.1 and streamline. Specific comments pertain to (row#, column #): (3,2): rapid increase in BEV and PHEV likely only in some OECD countries and China, not rest of world. Be more specific. (3,4) Another barrier are high carbon grids, (4,1): CNG infrastructure is not discussed in text. should add this; (4,5): opportunitie salso include low NG prices in US, HDVs | Disagree. Costs are not the same as Barriers and Opportunities. Will see if more on CNG infrastructure in text is needed. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5290 | 8 | 45 | 1 | | | To: BFs displacing gasoline, diesel and jet fuel; ADD TO BARRIERS: AND may increase inequalities due to impacts on food prices (the case of corn in Mexico)…<br>To: MS by public transport displacing private motor vehicle use; ADD TO BARRIERS: AND time of transport + public perception of transportation modes<br>To UP by reducing the distances to travel within urban areas, ADD TO BARRIERS: lack of diversity of services and high density centres with low density suburbs;<br>To UP by reducing the distances to travel within urban areas, ADD TO OPPORTUNITIES: Favouring multifonctionality and polycentric urban lay out. | Agree. All suggestions added. |
| 2705 | 8 | 45 | | | | Row 1: Under barriers for BEVs/PHEVs, emphasize the need to decarbonize electric sector. Row 2: CNG/LNG barriers, emphasize potential leakage of CH4 | Agree. Both changed. |
| 15846 | 8 | 46 | | | | (1,3): drop in fuels possible for road too, not just planes | Will check with team. |
| 10771 | 8 | 46 | | | | Which paper by Fuglestvedt et al. 2009 is referred to? I cannot find it in the list of references. | Will find. |
| 3839 | 8 | 46 | | | | 1st. Row, 2nd column. Take care with first generation biofuel market share. Here it is stated as 2%. In the text it is 3% and in Chapter 7 - Energy Systems it is quoted as 5%!!! | Will check and fix. |
| 3840 | 8 | 46 | | | | Please, consider also the possibility of using biofuels and bioelectricity produced from the same feedstock and at the same site. This is the case of sugar cane ethanol. See Pacca and Moreira, 2011. - Pacca, S. and J. R. Moreira, 2011. A Biorefinery for Mobility? Environ Sci Technol. 2011 Nov 15;45(22):9498-505. | Agree. Added this. Agree |
| 17966 | 8 | 46 | | | | According to SRREN, the global share of biofuels on total road transport fuel was 3% in 2009. Has it dropped since? | Will check. Will amend |
| 2706 | 8 | 46 | | | | Row 3: BF barriers, instead of 'environmentally poor', state indirect land use impacts and affect on food prices. Row 4: ICE technology, under barriers list problem of on-road performance not matching test results on fuel economy. | Agree. Added. |
| 13889 | 8 | 46 | 1 | 46 | 1 | Concerning EV technology, no mention is made of emerging new business models, especially those based on sharing (and not on private ownership). It could represent a way to facilitate their deployment. See: Thomas Budde Christensen, Peter Wells, Liana Cipcigan, Can innovative business models overcome resistance to electric vehicles? Better Place and battery electric cars in Denmark, Energy Policy, Volume 48, September 2012, Pages 498-505, ISSN 0301-4215, 10.1016/j.enpol.2012.05.054; Fabian Kley, Christian Lerch, David Dallinger, New business models for electric cars—A holistic approach, Energy Policy, Volume 39, Issue 6, June 2011, Pages 3392-3403, ISSN 0301-4215, 10.1016/j.enpol.2011.03.036; Alessandro Luè, Alberto Colorni, Roberto Nocerino, Valerio Paruscio, Green Move: An Innovative Electric Vehicle-Sharing System, Procedia - Social and Behavioral Sciences, Volume 48, 2012, Pages 2978-2987, ISSN 1877-0428, 10.1016/j.sbspro.2012.06.1265. | Agree. Have added. |
| 15847 | 8 | 47 | | | | (2,4) and (3,4): weather (e.g., cold climate?) and urban vs country environment can affect cycling and walking as well | Agree. Added climate. |
| 3421 | 8 | 47 | 6 | | | system infrastructure, cycling infrastructure: cycling requires physical measures to create perceived cycling safety and to take these measures in a coherent, integrated way to show that cyclists are being taken serious. This comprises more than infrastructure; it is about creating a cycling system, a network that is safe, direct, comfortable, correctly signed and contains parking facilities. Linking to/integrating with public transport certainly is an opportunity to be mentioned in order to create a serious alternative to private car use. See the Cycling-Inclusive Policy Development - A Handbook. Interface for Cycling Expertise, GTZ, April 2009 http://www.bikepartners.nl/index.php?option=com_content&task=view&id=166&Itemid= | Agree. Added. |
| 3422 | 8 | 47 | 7 | | | the same requirements of safe, direct, comfortable, correctly signed and short waiting times apply to walking. Also, tapping the potential of integration with public transport is an opportunity. Www.livingstreets.org.uk/expert-help/resources/ | Agree. Added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2707 | 8 | 47 | | | | Row 6: Opportunity for cycling, source of growth is rapid deployment of city-bike sharing systems. Row 7: Walking, long-term, I would not say 'significant' displacement of MV trips, much of this depends on transit availability and is very dependent on car ownership levels (reference: Sehatzadeh, Bahareh, Robert B. Noland, and Marc D. Weiner, "Walking frequency, cars, dogs, and the built environment", Transportation Research A: Policy and Practice, 45, (2011), 741-754.) | Agree. Added bikeshare. Disagree on walking, it can be significant. |
| 5209 | 8 | 48 | | | | In line 10: why not add that high speed rail also competes with private car, which is does efectively and would, if high speed rail is well integrated in conventional rail and urban public transport, offer a door-to-door alternative for private car use. | Agree. Changed. |
| 4301 | 8 | 48 | | | | As the transport technology or practice of modal shift of freight, I propose adding electric cargo train system or external power supply convoy. | Agree. Added. Like 1072 not clear what is being proposed here. A large proportion of railfreight already moves on |
| 2708 | 8 | 48 | | | | Row 8: Success of TOD highly dependent on good quality transit. Row 9: Parking, barrier is that planning codes typically require too much parking (see Donald Shoup). Row 10: Plane vs. Rail: there was no discussion of safety as a barrier in text - what evidence is there that HSR has a safety problem? | Agreed to all three. All fixed. |
| 15848 | 8 | 49 | | | | (5,2):show some data on traffic density or at least a reference | Agree. Added eg London. |
| 2709 | 8 | 49 | | | | Row 13: Freight opportunity - note that private sector welcomes efficiency improvements. Row 14: Communications, note that instead of communciations substituting for transport it can induce new trips (see work or Mokhtarian and colleagues). This issue was not discussed in text. | Agreed. Changed. Point about private sector welcoming efficiency improvements hardly needs stating. Links between communication and transport could be elaborated. need |
| 2432 | 8 | 5 | | 6 | | A general point on the executive summary and Ch8 is that scale of the problem being faced in transport with respect to CO2 - the growth in travel that is taking place, the time needed for real reductions, the lack of progress made so far (the tenor is too optimistic about the future, particularly when past progress is reviewed), the inertia and huge costs sunk in the current mobility system, and the difficulty of implementation due to institutional problems - lack of powers and too many intrerested parties. | Good point for 8.1 |
| 16266 | 8 | 5 | 10 | 5 | 12 | Schafer & Victor (A. Schafer and D.G. Victor, 2000. "The Future Mobility of the World Population." Transport Research Part A 34, pp. 171-205) projected a continuous increase in transport demand in all OECD regions through to 2050. The phrase "be reversed" might be overstatement. | Useful comment but reference too old. |
| 8863 | 8 | 5 | 14 | 5 | 20 | It is not clear how the list achives 'Transport mitigation measures' . New technologies etc can achieve reductions in emissions via policies that enforce them. I think this phrase should be replaced by 'mitigation of GHG emissions in the transport sector' or similar. Also, point 1) 'deploying new technologies for low-carbon fuels' seems to exclude just low-carbon fuels and just new carbon fossil fuel based technologies. It might be better to say 'deploying new technologies AND/OR low-carbon fuels' | Will amend |
| 11597 | 8 | 5 | 14 | | | delete: "measure" | Accept |
| 3985 | 8 | 5 | 14 | 5 | 21 | Add "GHG" in between "Transportation Mitigation" otherwise is sounds like transport demand reduction | Accept |
| 15763 | 8 | 5 | 15 | | | There is a general over-confidence by low carbon fuel standard supporters and advocates that low carbon fuels are just around the corner. On a global basis, one can't assume that Brazilian sugarcane ethanol will be available for everyone. | Low C fuels can also include green electricity and hydrogen |
| 14740 | 8 | 5 | 15 | 5 | 17 | Please order measures along impact/viability: 1st efficiency and technology switch, 2nd fuel switch | Accept |
| 17120 | 8 | 5 | 18 | 5 | 20 | DELETE: modal shift and the reduced need for motorized transport relative to a reference case. [High agreement; robust evidence]REVISE TO: well harmonized multi-modal transport. | Declined. Phrase does not include reduced demand |
| 11598 | 8 | 5 | 2 | 5 | 13 | I think it would be fair to highlight as follows: "The biggest emitters of GHG in the transport sector are LDV, trucks, aircraft and marine ships." | Re-ordered |
| 15803 | 8 | 5 | 2 | 5 | 3 | statement of doubling is too vague. Should give range based on say 10-50-90% probability | Details in main text. Usage of doubling is |
| 6473 | 8 | 5 | 2 | 5 | 4 | The argument on emissions becoming double by 2035 has not been provided in the chapter | Agree. Text modified |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2258 | 8 | 5 | 2 | 5 | 4 | There is no evidence that emissions of greenhouse gases hav any harmful effect on the climate. This information is thus not a cause for concern so the whole Chapter is unnecessary. It is also surprising that while the supposed, unproven theory relies on changes in the atmospheric concentioin of greenhouse gases. you seem here to be exclusively concerned with emissions. which are not necessarily related to concentrations | Rejected. This comment refers to content that is covered by IPCC Working Group I. |
| 14741 | 8 | 5 | 21 | 5 | 41 | The distinction in demand and supply is a bit odd. I would recommend to follow the scheme: 1) Vehicle technology (i.e. efficiency improvement, technology switch - reducing energy intensity); 2) Fuel switch (i.e reducing carbon intensity) 3.) Avoid/Shift strategies (i.e. behavioural measures to reduce activity) | Will amend to match ASIF structure |
| 5182 | 8 | 5 | 22 | 5 | 35 | Transport behaviour is very much shaped by infrastructure, transport system speeds and prices. Supply indeed needs to become more efficient with energy and using lower carbon energy sources, but the main challenge is to change the infrastructure. If you want people to use rail on medium distances than invest in rail and not in additional slots on airports. Strong example is the fast change from air to rail on the Madrid-Barcelona route, that went far beyond scientific prognoses of an absolute maximum of 35% between rail in rail+air market (Roman, C., Espino, R., & Martin, J. C. (2007), Competition of high-speed train with air transport: The case of Madrid-Barcelona. Journal of Air Transport Management, 13, 277-284) (while it reached already 60% by 2011 just after opening of the line (McWhirter, A. (2011). No pain by train. Available at: http://www.businesstraveller.com/archive/2011/may-2011/special-reports/no-pain-by-train#). So it really is important to add supply on the level of infrastructure choices as well. The very large investments in high speed rail in Japan, China and Europe have strong impacts on modal split and carbon emissions. Furthermore there is an important link between electric rail and supply of electricity, which means that sustainable energy production directly affects the emission factors of rail (e.g. see Åkerman, J. (2011). The role of high-speed rail in mitigating climate change - The Swedish case Europabanan from a life cycle perspective. Transportation Research Part D: Transport and Environment, 16, 208-217). | Agree Modal shift driven in part by investment |
| 3986 | 8 | 5 | 23 | 5 | 24 | The suggestion of CNG as a lower carbon transportation fuel needs qualifying. CNG from hydrofracturing may not be significantly lower than gasoline. | Amended |
| 17124 | 8 | 5 | 24 | | | ADD: Good quality of fuel (e.g. lower sulphur in the fuel) is critical for advanced powertrain with aftertreatment system. High sulphur level in the fuel may penalize fuel economy penalty to regenerate the catalyst.<br>INBETWEEN: redece emissions. & New technologies<br>(UNEP. The Role of Low Sulphur Fuels. Available at: http://www.unep.org/transport/pcfv/PDF/SulphurReport.pdf) | Too detailed or Exec Summary. Add to 8.3.3 |
| 16267 | 8 | 5 | 24 | 5 | 24 | It is better to modify the phrase "such as to compressed natural gas (CNG)" to "such as to biofuels" because substitution of biofuels for petroleum products is easier to implement and can reduce larger amount of GHG emissions from the transport sector. | Some debate on biofuel emissions covered elsewhere - but CNG should be mentioned. Agree. |
| 15764 | 8 | 5 | 26 | | 31 | Some of these technologies are currently very expensive. When the business model for developing countries is the Tata Nano, it's hard to envision a lot of expensive, advanced technologies for non-OECD countries. This is especially true for areas that have price controls on gasoline and diesel. | Too detailed for Exec Summary. Add to 8.3.3 - fair comment. |
| 17121 | 8 | 5 | 26 | 5 | 28 | ADD: Reduced energy intensity on road can be achieved by eco-driving and improved traffic flow. AFTER: "Reduced energy intensity can result from 26 improved designs of internal combustion engines, power trains and vehicles, including the use of 27 new lightweight materials and better aerodynamics." [8.3.5] | Point included |
| 2725 | 8 | 5 | 28 | 5 | 31 | It is better to say: "Sustainable renewable energy based propulsion systems (such as battery electric, hydrogen and methane fuel cell, and various heat engine drive-trains) coupled with low-CO2 energy carriers (electricity, methane and hydrogen produced from renewable energy sources) can reduce lifecycle greenhouse gas emissions almost to zero." All these already exist in the market. | Not only renewable energy for low C carriers. |
| 18898 | 8 | 5 | 28 | 5 | 29 | It is my understanding that with the e-bikes in China this is actually not anymore a matter of the future but already practiced today. Please consider changing taking this into account. | Agree. Reworded. I think the original sentence "in the longer-term..." is a |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16268 | 8 | 5 | 29 | 5 | 29 | It is better to modify the phrase "coupled with low-CO2 energy carriers (electricity, methane and hydrogen produced from low GHG sources)" to "and/or low-CO2 energy carriers (electricity and hydrogen from low GHG sources and biofuels)". | Agree. Amended |
| 16264 | 8 | 5 | 3 | 5 | 3 | According to the IEA Energy Technology Perspectives 2010 (IEA, 2010, p. 73), the share of the transport sector in the global CO2 emissions is projected to be almost unchanged from 2030 to 2050 in the Baseline scenario, although it is projected to increase from 2030 to 2050 in the Blue Map scenario. A further explanation should be added to this view. | Agree. Reworded. Scenarios covered in Ch 6. |
| 15862 | 8 | 5 | 32 | | | "iso-butanol drop-in fuel for aircraft" – hard to see this happening since isobutanol has a lower energy density than jet fuel | Agree, But not necessarily for aircraft |
| 15765 | 8 | 5 | 32 | | 33 | Is iso-butanol truly a drop-in fuel for aircraft? Seems like there would have to be a lot of work done before that would be approved for use. Plus, the lower energy density relative to jet fuel would likely be considered a significant disadvantage. | Deleted, |
| 17122 | 8 | 5 | 32 | | | DELETE: such as iso-butanol ;<br>REASON: Iso-butanol is not drop-in fuel. A researcher has indicated that blend of ethanol (component in existing fuel) and butanol may cause dry corrosion of aluminum parts in the fuel line. (Takashi Tchida (2004), Corrosion Engineering, Sangi Co. Ltd. 53, 44-49) | Deleted, |
| 5243 | 8 | 5 | 32 | 5 | 32 | Conventional biofuels are already straining the global food system and prices. Do not encourage. | Noted. There are different positions on this. The role of biofuels is covered thoroughly in Ch.11 respective the annex |
| 2803 | 8 | 5 | 32 | 5 | 32 | The perspective regarding biofuels is a very controversial issue (as discussed in page 24 line 26-27) and does not seem to be relevant to be discussed under [High agreement, robust evidence]. | This high agreement statemrnt was just for first paragraph - but point taken. |
| 5391 | 8 | 5 | 32 | | 35 | variations always exist; statement lacks information without some qualifier | Agree, Reworded |
| 16269 | 8 | 5 | 32 | 5 | 32 | It is better to modify the phrase "including "drop-in" fuels such as iso-butanol" to "including microalgal biofuels and "drop-in" fuels such as iso-butanol". | Accept |
| 11599 | 8 | 5 | 36 | 5 | 41 | You mention only costs, but e.g. infrastructure provisions (e.g. cycle paths) as well as non-provisions (e.g. no parking spaces) has also decisive impact. Please add and balance. | Accept |
| 11600 | 8 | 5 | 36 | 5 | 41 | Please add demand side measures on freight transportation. | Already included. in the ASIF framework that we have adopted, A stands for avoiding transport, but I would agree that the chapter does not adequately explore the various ways in which companies and economies decouple freight demand from output. Reference should be made, for example, to the |
| 5244 | 8 | 5 | 36 | 5 | 41 | Here, as elsewhere, there is no mention of the challenges for rural populations. Nor is there any recognition of the challenges of rural dwellers in those latitudes (or heights) where inclement winter weather conditions require for safety reasons 4X4 vehicles or the additional costs of winter tyres. One gets the impression that the authors are all from comfortable urban situations. | Accept |
| 16272 | 8 | 5 | 36 | 5 | 37 | Schafer & Victor (2000) indicate that modal shares are determined by non-political factors, such as fixed travel time budget, path dependence, and land-use patterns. Furthermore, Schafer & Victor (A. Schafer and D.G. Victor, 1999. "Global Passenger Travel: Implications for Carbon Dioxide Emissions." Energy 24, pp. 657-679) indicate that if policy advanced or retarded the natural selection of modes, the transport system would recover its natural dynamics over time. Therefore, I doubt if policy interventions in modal choices could bring about a significant reduction in GHG emissions from the transport sector, especially from a short- to medium-term perspective. | Accept but too old references |
| 8864 | 8 | 5 | 38 | | | (number of journeys (km or t-km))' - this needs to be corrected. As it stands it has almost no meaning. | Accept |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5183 | 8 | 5 | 38 | 5 | 38 | There is ample evidence that we should not aim at reducing the number of trips, but at reducing average distance per trip. So please replace "(number of journeys (km or t-km))" with "(p-km and t-km)". In most transport modes the amount of emissions is equivalent to amount of p-km and t-km not the number of trips itself (only in aviation shorter distances might increase average emissions per pkm/tkm). Furthermore, reduction of the number of trips would directly affect the mobility of people and have strong negative impacts on economy and social aspects, while the distance at which we do our shopping, have our holidays and choose to live from our work depend very much on the speed of the transport system and to a lesser extend the cost of travel. See e.g. Banister, D. (2011). The trilogy of distance, speed and time. Journal of Transport Geography, 19, 950-959.<br>Hupkes, G. (1982). The law of constant travel time and trip-rates. Futures, 14, 38-46.<br>Peeters, P., & Landré, M. (2012). The emerging global tourism geography – an environmental sustainability perspective. Sustainability, 4, 42-71.<br>Schäfer, A. (1998). The global demand for motorized mobility. Transportation Research - A, 32, 445-477.<br>Schäfer, A. (2000). Regularities in travel demand: an international perspective. Journal of Transportation and Statistics, 3, 1-31.<br>Schäfer, A., & Victor, D. G. (1999). Global passenger travel: implications for carbon dioxide emissions. Energy, 24, 657-679.<br>Zahavi, Y. (1976). The Unified Mechanism of travel (UMOT) model. report to Mr. Harold B. Dunkerley. Available at: http://www.surveyarchive.org/Zahavi/TheUMOTModel.pdf.<br>Zahavi, Y., & Lang, P. J. (1974). Traveltime budgets and mobility in urban areas. In. Washington DC: US Department of Transportation. | Accept. Some evidence trips being avoided due to combining trip objectives, internet shopping, video conerencing ,use of social media. |
| 8039 | 8 | 5 | 38 | 5 | 38 | please add after '(...) of journeys (km or t-km)': "by making them more attractive through infrastructure improvements and improving their quality". | This wouldn't reduce distance travelled. |
| 17706 | 8 | 5 | 38 | | | I suggest the balance of the executive summary deserves re-thinking. To my eye, the influence of the transport environment on how people get around is under-sold. There is mention of infrastructure elsewhere in the summary, but the sentence on behaviour change does not mention what is obvious - what people choose will depend on what is available. Price signals are important, and might be applied in the short-term, but operate at a superficial level. If radical changes are required, then surely substantial changes will be needed in urban design, land use and regulation. | Accepted. Reworded |
| 18899 | 8 | 5 | 38 | | | "t-km": Please define. | Accept |
| 15766 | 8 | 5 | 39 | | | Education can only do so much. If there is not a tangible value proposition for the consumer, it's not going to happen. | Agree |
| 12879 | 8 | 5 | 39 | | | Not the costs of transport tend to be inelastic, but transport demand tends to be inelastic with respect to variations in costs. Change formulation. | Accept |
| 5392 | 8 | 5 | 39 | | 39 | it is the demand for transport, not its costs, that are inelastic | Accept |
| 8360 | 8 | 5 | 41 | | | Price signals, demand management fixes and so on will not be enough to manage travel demand. Infrastructure for non-motorised and other modes of mobility will have to be built as well. | Accept |
| 2804 | 8 | 5 | 42 | 6 | 15 | This paragraph only highlights "short term and cost effective mitigation strategies (p5 line 42-44). However, also important in this section are "the technologies which require RD&D investment but also expenditure on infrastructure" - which we can call "long-term measures". Statement on the long-term measures should be also highlighted in bold. | Accept |
| 17761 | 8 | 5 | 44 | | | before suggesting mitigation measures, indicate how much reduction are we talking about | Accept |
| 7397 | 8 | 5 | 45 | 5 | 46 | This statement is very critial to be included in the excutive summary and the evidence provided in the chapter does not really support the statement. | Accept. I agree….we haven't done a great job of establishing $/ton values in |
| 15767 | 8 | 5 | 45 | | | What is considered "substantial"? Short-term will be easier than long-term, barring a significant breakthrough in technology (batteries, fuel cell technology, etc.) | Accept |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15861 | 8 | 5 | 45 | 5 | 47 | “The potential is substantial" what does this mean? Quantify! | Accept |
| 17123 | 8 | 5 | 45 | 5 | 46 | DELETE: and at relatively low mitigation costs ($/t CO2).<br>REVISE TO: however, incur additional costs and might not be a viable in every county.<br>(McKinsey & Company (2009). Roads toward a low-carbon future: Reducing CO2 emissions from passenger vehicles in the global road transportation system, p.10 -11. Available at: http://www.mckinsey.it/idee/practice_news/roads-toward-a-low-carbon-future-reducing-co2-emissions-from-passenger-vehicles-in-the-global-road-transportation-system.view) | Accept |
| 17762 | 8 | 5 | 46 | | | how much is "low mitigation cost" | Will quantify. good question |
| 11601 | 8 | 5 | 46 | 5 | 46 | What's a low carbon price? | Will quantify "low mitigation costs". good |
| 16270 | 8 | 5 | 46 | 5 | 46 | The phrase "at relatively low mitigation costs ($/t CO2)" should be deleted. This is because the IEA Energy Technology Perspectives 2008 (IEA, 2008, pp. 80-82) estimated that the marginal CO2 emission reduction costs might be higher for the transport sector than for the other sectors, and because the IEA World Energy Outlook 2010 (IEA, 2010, pp. 54) indicated that the transport sector is more costly to cut CO2 emissions than in most other sectors. | Will amend accordingly. Because of the high price of transport fuel, much mitigation can be accomplished at low cost IF one uses a low discount factor to account for fuel savings….but things get pretty uncertain at higher levels of |
| 16271 | 8 | 5 | 46 | 5 | 46 | The phrase "Incremental developments" should be described more clearly. I can't understand what this means as it is. | Amended. |
| 13210 | 8 | 5 | 6 | 5 | 6 | Are not some mechanical actions also energy consuming, e.g. for crushing ? | Not on page quoted. Not clear |
| 16265 | 8 | 5 | 9 | 5 | 9 | These transport sub-sectors were also major emitters of NOx, a precursor of ozone (T. Takeshita, 2012. "Assessing the Co-Benefits of CO2 Mitigation on Air Pollutants Emissions from Road Vehicles." Applied Energy 97, pp. 225-237). | Section 8.1 to be amended |
| 15859 | 8 | 5 | 1 | | | The Exec Summary should be more quantitative and succinct. For example, include some quantitative results, via a table or chart, such as $/tonne CO2 mitigation costs, well-to-wheel gCO2/MJ or gCO2/passenger km-traveled intensities (e.g., results from sections 8.6.3, 8.6.4). Might consider using the “bullet point” format used in Chap. 10. | Agree needs to be more quantitative but data limited. Format of exec summaries to be determined. Tables not usually included. probably one of the reasons we |
| 2651 | 8 | 5 | 2 | 5 | 2 | The doubling of transport emissions by 2035 is presumably absent any mitigation policies beyond what is currently in place. It should be noted that this growth trajectory is absent future policy intitiatives. | Amended. |
| 2652 | 8 | 5 | 23 | 5 | 24 | CNG may be a bad example to use, given some recent suggestions that methane leakage from fracking is potentially quite bad. Suggest the example of CNG not be highlighted in the text of the executive summary. | Amended. handle this with an "if fuel cycle emissions can be appropriately |
| 2653 | 8 | 5 | 39 | 5 | 39 | "costs of transport tend to be relatively elastic". It is not the cost response rather the response of consumers to price. Suggest rephrasing as: "response to price change is relatively inelastic". | Amended. |
| 2806 | 8 | 5 | 1 | 7 | 21 | Several terms are used after "mitigation", such as, "mitigation measures", "mitigation strategies", and "mitigation actions." Please make sure if they are properly defined and consistently used throughout the chapter. | Noted. |
| 3461 | 8 | 5 | 5 | 5 | 9 | Include the annual growth rate observed from AR4 and AR5 regarding the GHG transport emissions | Will quantify |
| 2710 | 8 | 50 | | | | Row 16: Does this education include eco-driving initiatives? | Yes |
| 12906 | 8 | 51 | 11 | | | The section on Financing low carbon transport looks rather short and is mainly dealing with funding - and not with financing. The latter may include transport- and energy-realted taxes | Disagree. Value capture is financing. Could be longer…. |
| 6492 | 8 | 51 | 12 | 51 | 20 | The section needs to describe the local government financing for good low carbon transport instead of only looking at international mechanisms. By promoting cobenefits, the low carbon transport can be financed by the same means as traditional financing of transport projects. For promoting low carbon transport, not only projects which reduce emissions needs to be promoted but the projects which increase emissions when built needs to be stopped. | Agree. Added a sentence. |
| 2468 | 8 | 51 | 16 | | 18 | These figures need updating - there are more transport CDM projects now (still mainly BRT). | OK |
| 13697 | 8 | 51 | 16 | 51 | 16 | Share of CDM projects in transport sector should be updated according to UNEP Riso Centre: CDM pipeline, download at www.cdmpipeline.org, updated monthly | Have looked them up and changed text. Still very low % |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11185 | 8 | 51 | 16 | | | Now more than 3 transport CDM projects are registered. | OK |
| 5411 | 8 | 51 | 16 | | 20 | It is hard to argue that the Global Environment Facility and the World Bank's Clean Technology Fund have played a crucial role in climate change mitiation…..so it seems a bit of overkill to argue that, unless these specific funds start to focus on transport, then transport uniquely will not reduce its carbon emissions and will become the major carbon emitter while the other sectors benefit from these terrific initiatives. Tone this stuff down. | Disagree. CDMs have saved 1 billion tones of ghg and the others all matter. |
| 15849 | 8 | 51 | 20 | | | 80% transport-related GHGs seems too high. Cross check reference with others (e.g., IEA) | Will check. |
| 13906 | 8 | 51 | 21 | 51 | 22 | Regarding NAMA for Transport, see Lefevre, B., 2012, Incorporating cities into the post 2012 climate change agreements, Environment & Urbanization, Vol 24(2): 1–21; Bakker, S., Huizenga, C., 2010, Making climate instruments work for sustainable transport in developping countries, Natural Resources Forum, Vol 34, Issue 4, pages 314 - 326; Huizenga, Stefan Bakker, S., 2010.<br>NAMAs in the Transport Sector: Case Studies from Brazil, Indonesia, Mexico and the People's Republic of China,IDB Publications 8603; Dalkmann, H., Binsted, A., Lefevre, B., Huizenga, C., Avery K., Bongardt, D., 2011, Cancún can, can land transport?, Bridging the Gap, GIZ; | Added Lefevre reference. Thanks. |
| 5412 | 8 | 51 | 26 | | 30 | Revenues around a rail station may well go up, but this means little unless the TOTAL land value goes up….otherwise, it's just a redistribution…..welcome, but the local governments don't get a windfall. | Disagree. They are extra value due to agglomeration economies. |
| 15850 | 8 | 51 | 28 | 51 | 30 | Not clear why owners would want to pay higher taxes to live right beside a rail system that generates more noise and congestion in their backyard???? Seems like this would decrease property values. Unless you are referring to urban homes served by rail within a walking distance of say 1-2km? | Added 'near to' instead of 'around'. Can be very close as well. |
| 4427 | 8 | 51 | 3 | 51 | 6 | The technology-based solutions may face barriers of availability of capital and unwillingness to pay. These barriers exist in both developed and developing regions. Key examples are the slow adoption of HEV and dithering on EV rollout in developed world LDV fleets. | Agreed. Added. |
| 11186 | 8 | 51 | 30 | | | Land adjustment also contributed to capital investment to support mass transit in Japan (Tsukuba Express Rail). | Agreed. Added. |
| 5413 | 8 | 51 | 35 | | 38 | this list is a list of solutions, not barriers | Disagree. They are policies which illustrate institutional barriers. |
| 5291 | 8 | 51 | 38 | | | ADD: Also included sectorial, are a non transversal approach to urbanism as well as economic and political perceptions of the costs of reducing car mobility. | Don't understand the english. |
| 4068 | 8 | 51 | 42 | 51 | 43 | This new world economy is described in glow terms but seems more like a scenario. | Disagree. Widespread acceptance |
| 5414 | 8 | 51 | 42 | | 47 | this is far too promotional, esp. the OECD cite | Ditto (i.e. as in comment answer no 4068). Have added ADB new report. |
| 2469 | 8 | 51 | 48 | | | The decoupling argument is central to sustainable transport - and seems only to occur here. | Agreed. |
| 7402 | 8 | 51 | 11 | 51 | 33 | Note that in the context of green growth and greening the transport sector emphasis has to be on low emissions rather than only low carbon | Agreed. Changed. |
| 13893 | 8 | 51 | 11 | 51 | 33 | This section schould emphasis the key importance of redirecting investments (instead of looking for new money). See Dalkmann, H., Sakamoto, K., 2011, Transport, Investing in energy and resource efficiency, UNEP Green Economy Report | Agreed. Added a sentence. |
| 13904 | 8 | 51 | 11 | 51 | 33 | On current state of (Public + Private // National + International) financial flows see Sakamoto, K., Dalkman, H., Palmer, D., 2010, A paradigm shift towards sustainable low-carbon transport. Financing the vision ASAP, ITDP | Grey literature. |
| 13905 | 8 | 51 | 11 | 51 | 33 | This section should emphasis the necessity 1) to analyse the impacts of financing decisions, 2) to reallocate budget and redirect investments (instead of looking for new money) towards sustainable transportation. See Sakamoto, K., Dalkman, H., Palmer, D., 2010, A paradigm shift towards sustainable low-carbon transport. Financing the vision ASAP, ITDP | Ditto. |
| 2711 | 8 | 51 | 11 | 51 | 33 | Discussion is very much focused on developing countries. Would be good to say something about how US, EU, and Japan finance more sustainable transport - what are political difficulties?, etc. | Disagree. Value capture section is developed world. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13888 | 8 | 51 | 24 | 51 | 24 | "ADB and eight other big banks pledged to invest $175billion for the creation of sustainable transport worldwide" needs reference | Agreed. Added. |
| 2712 | 8 | 51 | 38 | 51 | 39 | Where is the evidence that 'auto dependence' is built into a culture? I see this much more as being an outcome of economic incentives. | Huge evidence. Just look at TV ads. |
| 2713 | 8 | 51 | 42 | 52 | 4 | This paragraph and discussion of a 'Sixth Wave' strikes me as highly speculative, suggest this be deleted in the name of brevity. | Disagree. Its critical. |
| 17776 | 8 | 52 | | | | there is a loose sentence at the end | Line is in 8.9 should be fixed. |
| 2471 | 8 | 52 | 18 | | 27 | There are two sets of figures here - one the 4x increase and the other a total decarbonisation of transport by 2070 - both need very careful presentation as it is not clear how they have been arrived at - and whether they both encompass the expected increase in travel over that period - or whether the numbers are based on current levels of travel - I have not seen any figures to suggest that transport can be decarbonised by 2070 - even if we just consider the use of carbon in fuel - let alone the embedded carbon in the system and vehicles and the carbon costs of manufacturing the fuel to be used. Do these figures include aviation (and shipping)? | Text says sector "could be practically decarbonised by 2070", but comment is accepted, a more direct language will be attempted and clear specification that this is a conclusion obtained from top-down scenario analysis. Should be considered |
| 4069 | 8 | 52 | 20 | 52 | 26 | The assessment that 2 degree C is no practical to achieve in this century should be made clear here and in Chapter 6. | Reject. Both Chap 6 and 8 are working on the assumption that a stabilization |
| 18911 | 8 | 52 | 23 | | | "the sector could be practically decarbonised by 2070": Looking at the ranges in Figure 8.9.1 it seems that there are only very few sceanrios that show decarbonization at that time, so it seems that it would be good to put this statement in context - particularly as other parts of the chapter state that decarbonizing the transport sector is more challenging that other sectors. So increasing the coherency would be good. | Accepted text will be revised. ….the path to total decarbonization of this sector is pretty hairy….especially from a full lifecycle view…you have to do things like adding CCS to biomass fuel production, getting electricity completely off even natural gas, etc…..and make amazing progress in a variety of fields…..quite unlikely, I suspect. of course it does, just from simple |
| 4070 | 8 | 52 | 25 | 52 | 26 | Also, this should be a key message. "Top-down scenarios analysis demonstrates that a transformational pathway to achiee a stabilization at 2 degrees Celsius relies heavily on transport sector mitigation. | Agree. No stabilization path to 2C can be envisioned without major mitigation from transport (proportion will need to be |
| 15851 | 8 | 52 | 27 | | | dangling sentence… | Accepted. Will be corrected. |
| 5343 | 8 | 52 | 27 | 52 | 27 | Sentence incomplete. | Accepted. Will be corrected. |
| 11650 | 8 | 52 | 5 | | | Whole section. Uherel et al, AtmEnv 44, 2010 made a good summary of transport scenarios and impact on GHG. Please take note and reference. | Accepted. Thank you for this reference. |
| 7403 | 8 | 52 | | | | Add a subsection on synergies related to transport impacts on other sectors growth and mitigation opportunities | Interesting suggestion.Several cross-cutting discussions between chapters are attempting this type of discussion (e.g. Impacts of Tourism) potentially seeking to understand synergies. Some key results may be reflected in here but most likely in the other chapters/sectors. No separated section is planed for |
| 7406 | 8 | 52 | | | | Assess consistency between top-down and bottom-up results and how down-scaling is achieved in the reported results from the IAM models | Accepted. This work is under way should be reflected in SOD |
| 2470 | 8 | 52 | | | | This Section is too weak as the scale and speed of change needed in transport to meet (or help meet) CO2 targets is not here - the approach suggested is too dirigiste - it needs a strong introduction | Accepted. Introduction can better reflect on the scale and needed speed of |
| 3164 | 8 | 52 | 1 | | | I though section 8.9 could be compressed and put up front with other discussions of drivers. | Rejected. Section 8.9 cannot be replaced within the Chapter. Under |
| 2714 | 8 | 52 | 5 | 52 | 6 | Title of sub-section: I found this type of terminology confusing and loaded with jargon. Please simplify title of sub-section. How about simply: "Pathways to Sustainability". | Rejected.Section 8.9 Title is fixed for all Chapters. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2472 | 8 | 53 | | 54 | | The 3 key figures here are also confusing - are they linked or independent of each other? The first 2 seem to relate to the 3 scenarios, but the 3rd talks only about transport futures (high technology, high efficiency and the middle pathway). The credibility of this chapter is reliant on this section and it needs to be totally transparent in what it is saying. Also there is the question of the relative contributions (to what target) that can be made by less travel (not really discussed), shorter journeys (not really discussed), urban form and modal shift (discussed to some extent) and technological change. | Accepted. A renewed discussion on existing and top down scenarios is to be approached for the SOD. Agree new info should be added. important comment….how credible are these scenarios…are the scenarios from the first two figures simply normative, i.e. |
| 15852 | 8 | 53 | 8 | | | 2011? Did you mean 2100? | Accepted. Typo it should be 2100. or 2050…clearly one or the other, probably |
| 3841 | 8 | 53 | 8 | 53 | 8 | Replace "kilometers travelled by 2011" by "kilometers travelled by 2050". | Accepted. It should say "by 2100" |
| 5210 | 8 | 54 | 1 | 54 | 3 | Suggestion to make a separation between physically impossible solutions, economically unlikely ones and pure political choices. I feel that building certain infrastructure is 90% a political choice, a choice that can not really be substantiated by economic or social research. Why chose Switzerland to go for its highly efficeint rail system and did Brazil braek it down? Why is China investing heavily in high speed rail and USA not at all? Seems mainly politically founded, not environmentally or even socio-economically. | Interesting suggestion. A wild card type of scenario, maybe possible as scenario methodologies evolve. However, difficult to see it in practice for this report. Agree. a terrific thing if we could do it….but the |
| 11652 | 8 | 54 | 20 | 55 | 10 | Uherek et al, AtmEnv 44, 2010 made a good summary of transport scenarios and impact on GHG. Please take note and reference. | Accepted. Thank you for this reference. OK |
| 3842 | 8 | 54 | 26 | 54 | 26 | Replace "switching on a massive scale from liquid fuel to " by "switching on a massive scale from fossil liquid fuel to". | Accepted. |
| 3843 | 8 | 54 | 26 | 54 | 26 | Switching from liquid fuels to gaseous fuels is a well known technology and usually cost-effective, already used in many countries. Why shall it require long time to be deployed? | Reject. Comparatively the infrastructure system for gas for vehicles is not as advanced as liquid fossil fuels even in the places where currently distribution is more advanced. even natural gas might not be cost-effective in most places, given the cost of the tanks, but for large |
| 15854 | 8 | 54 | 30 | 54 | 33 | Might consider a chart showing impact of sectoral analysis on GHGs so it does not get lost in text | Accepted. This willl be done. |
| 5415 | 8 | 54 | 30 | | 31 | The 20% seems, in context, to be 20% of total demand….is it?....or is it 20% of a portion of total demand? | Accepted. This percentage will be reviewed and better supported with |
| 7404 | 8 | 54 | 31 | 54 | 33 | Model shifts and behavioral changes are represented in top-down models through elasticities -- so their impacts on transport demand might have already been included. | Not clear what the reviewer suggest to do. |
| 13118 | 8 | 54 | 31 | | | Fig.8.9.4 is from IEA2012, (not IEA2009). | IEA 2012 not then published?! Since |
| 15853 | 8 | 54 | 8 | | | Not clear what GEA scenarios refer to? Are these used elsewhere? Consustent with IPCC? Might inckude link or explain. Also what does "fossil liquids" refer to? LPG? LNG? Be clear on this. | GEA Scenarios refer to the bottom-up pathway development exercise published as Global Energy Assessment in 2012. Parallel with ETP 2012 |
| 8379 | 8 | 54 | 20 | | 25 | This has already been said and can be removed. | Accepted. Repetition will be avoided in |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8380 | 8 | 54 | 32 | | 33 | The enormous growth rates in Indian cities means that there are important uncertainties about what to expect in the future. For instance the Nano car was believed to be a big hit for millions of Indian families and now it seems that it will not. There are simply too many unknown aspects and this will have to be discussed up-front such as mentioned on line 37. One of the uncertainties is the role of public transport; trains, buses and so on. Trips by public transport are forecasted to be cut by half – what means of transport is likely to replace busses and trains in growing cities in India? The reduction of travel on public transport is a global trend and as such a reality that should be discussed in chapter 8 in relations to emission and sustainable transport.<br><br>The various processes of gentrification of public space and of systems of transport by means of expensive BRT's and metros bring about more of marginalisation and social divide. The phenomenon of peak car use is still very limited and taking place in a certain socio-political setting. So far, peak car, is a small trend with limited impact and not a global trend. The reduction of public transportation is a global and significant trend. | The scenarios or pathways for transport transformation in this session will be further elaborated in SOD. Some of the uncertainties described by the reviewer wiill be further discussed. |
| 2473 | 8 | 55 | | | | Issues of path dependence and lock in need a higher profile - they need discussion earlier in the Chapter, and whether any technology should be looked at as a replacement or a niche - the future will probably have many elements - there is no replacement for the car and the best option is probably for a super efficient ICE? But issues relating to transition from one well established technology to another new one are not covered, nor the potentially huge costs of such a transition. | Accepted. The reviewers rasises some important issues that will be addressed in the reivew of pathways in SOD. |
| 3844 | 8 | 55 | 13 | 55 | 15 | This chapter is being prepared by scientific-minded people that traditionally have their major interest in new technologies. The discussion in section 8.9.2.1 has only 3 lines dealing with mitigation technologies already in commercial use, while more than one page is dedicated to second generation biofuels, electric and hydrogen powered vehicles. Readers will be very much interested in the ones that are already available (first generation biofuels and hybrid cars) | The priority depends on whether we should be focusing on moderate GHG reductions or on large ones |
| 2775 | 8 | 55 | 21 | 55 | 36 | But Pakistan has achieved over 80% share (3.2 million units) for methane vehicles in less than 20 years. Reasons are: 1) road vehicle lifetime is very short compared to power and heat plants, b) conversion into methane capability is very easy and fast, c) technology is mature and widespread, with over 16 million vehicles now globally, d) almost all major manufacturers offer OEM methane vehicles, e) fuel is obtainable globally. Therefore, with political will transformation can be done quickly. Technology is mature and affordable. No need to allocate time for research, development, innovation or reaching large cumulative production volumes. Transition requires proper policy only. | Well, perhaps, but given limits on how much natural gas is available, and the problem with proliferation of coal fired generation plants, the best use for gas is likely to be replacement of coal-based generation |
| 5211 | 8 | 55 | 21 | 55 | 23 | This long development time for new technology again necessitates to consider to use more current low carbon technology by investing in it. E.g. in stead of trying to make the global car fleet fully electric, switching to zero carbon rail transport can be done right from 2012 onwards, as all technology is there and existing infrastructure is underused. Same for trying to get complicated technical and bio-fuel solution for air, while high speed zero carbon rail is an existing and proven technology. | I can't agree…..massive mode switching seems highly unlikely….it's worthwhile to get what we can get, but I don't see this as a real substitute for developing major new technologies. will amend |
| 4071 | 8 | 55 | 22 | 55 | 23 | "It can take 25-60 years from the start of research and development until an innovation achieves wide spread use, such as in the road vehicle fleet." This is one of the more sobering, realistic statements I have read in this chapter. How does this historical analytic fact play out in the rest of the section 8.9.2 sectoral transformational pathways - implications from a bottoms-up perspective? This seems to be a disconnect with the "New World Economy" scenario on page 51, lines 42-48. | Noted. Section has been significantly restructured, now covered in Section 8.9.2.1. Section covering Sixth Wave rephrased. For assumptions of IAM scenarios see mainly Ch.6. |
| 5344 | 8 | 55 | 24 | 55 | 26 | Not sure sunk investments applies to EVs. Electricity production and delivery infrastructures are well-established given potential for home charging, and PHEVs will make use of existing petrol/diesel infrastructure. | Reject.It does apply to public charging. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5416 | 8 | 55 | 5 | | 7 | The McCollum and Yang study is normative….it asks, what would have to happen to achieve an 80% reduction. It doesn't spend a lot of time (or any time?) trying to ask, how likely is this? (Not meant as a specific criticism of this study….virtually none of these studies ask such a question, at least explicitly). However, it becomes a bit tricky how to use this type of study.....do we really want to imply that somebody has done an analysis that this is a realistic possibility, when that question has hardly been asked? | Accepted. Uncertainties will need to be highlighted. |
| 11653 | 8 | 55 | | | | Appears like a duplication of 8.3.1. Delete redundancies | reject.It is not normative.It presents a |
| 13890 | 8 | 55 | | 57 | | Public budget reallocation from non-sustainable transport funding to climate-friendly transportation funding should be discussed here. | Accepted. |
| 8381 | 8 | 55 | 36 | | | At the end of this chapter on page 57 one of the most important issues is finally formulated. The challenge that this chapter will have to deal with is presented but it is far too late to do this on page 57. This is what you should present at the beginning so pls, introduce this part at the beginning and outline the chapter accordingly to answer this question. | Structure fixed. Section will be reviewed and placement considered but also covered in the revised storyline |
| 2776 | 8 | 56 | 1 | 56 | 5 | The cost of North African unrest in 2011 on EU transport was equal to building cost of 130.000 methane filling stations. It is multiple times the amount needed for a comprehensive filling station network. | Not clear what the reviewer suggest to do. |
| 2475 | 8 | 56 | 18 | | 19 | BRT does not mimic metros - it is a very different concept. | Accepted. Will be rephrased. Yes we can write a few lines to explain this |
| 11282 | 8 | 56 | 18 | 56 | 25 | Also worth citing here for a discussion of public transit and bus rapid transit systems in various countries and cities: UN-Habitat (2009): Global Report on Human Settlements 2009: Planning Sustainable Cities, pp. 162-163; as well as UN-Habitat (2011): Global Report on Human Settlements 2011: Cities and Climate Change, p. 100-103. [available for download at http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2831 /// http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=3086 | Accepted. Thank you for this reference. Discussions from these docs could be included |
| 2474 | 8 | 56 | 3 | | | The evidence cited here is not convincing - needs to be more specific - based on one study? | Accepted. More references will be |
| 5292 | 8 | 56 | 31 | | | ADD: A study for Lyon shows that the car's major advantages over TCs are its speed and flexibility in complex itineraries. Hence, indirect measures which 'pressure' without coercing may be more political feasible and yet efficient in creating a modal transfer: reducing car speed limits – but not TCs'-; increasing the number of lanes reserved for TCs and bikes; decreasing number of parking places increases travel time through research for parking place; pedestrian friendly traffic lights…) (Stéphane la Branche. « La gouvernance climatique face à la mobilité quotidienne. Le cas des Lyonnais ». Revue Environnement Urbain/Urban environment. 2011). | Accepted. Reference willl be included. |
| 2778 | 8 | 56 | 32 | 56 | 34 | Electric cars may create a modal shift away from public and non-motorized transport, since they are appropriate in urban light traffic only. Also, they may not replace ICE cars for the same reason, but instead lead to additional car demand in households. | Accepted. No disagreement on this. |
| 3590 | 8 | 56 | 43 | 56 | 45 | This sentence is another illustration of far too ambitious expectations, showing the need to come back closer to reality when making recommendations to policy makers. | Disagree with reviewer. No action suggested by reviewer. .I think the statement is obvious and perhaps a bit |
| 2777 | 8 | 56 | 8 | 56 | 10 | Text "The lead time for transport infrastructure development is considerable, which makes swift changes in the capacity of for example, public transport hard to achieve" is incorrect. Very many cities (both industrial and developing) have shown that diesel buses can be replaced by methane buses within a few years. Some cities (both industrial and developing) have shown that also diesel taxis can be replaced by methane taxis within a few years. These have been achieved using many different kinds of policies. | Reject. The text referst to infrastructure leading to increasing capacity. The reviewer's comment refers to fuel switching feasibility. Different points. I don't think the term "capacity" is about |
| 13891 | 8 | 56 | 22 | 56 | 25 | Indeed, TransMilenio has been successful in many ways, but the absence of integrated land use has also lead to minimize its positive impacts (see Lefèvre, B., 2008, Visión a largo plazo e interacciones "transporte-urbanismo", los excluidos en el éxito del SBR TransMilenio de Bogotá, CIUDAD Y TERRITORIO Estudios Territoriales, XL (156)) which is a pity given the . The nowadays situation is far to be idyllic. It is one of the reasons why Bogotanos are voting against BRT and why the last two mayors were elected to build a metro . | Accept. It will be considered. Either add the need of integrating NMV and land use plans or drop this. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2716 | 8 | 56 | 42 | 57 | 35 | Section 8.9.2.2 is very speculative, suggest this be shortened significantly. | Entire section will be reviewed in SOD. |
| 17780 | 8 | 57 | | | | "Massive GHG increase" - how much increase? | Accept. More precision in next SOD |
| 8565 | 8 | 57 | | | | CITED STUDY NOT IN REFERENCES<br>"For example, a detailed survey in<br>the US has shown this phenomenon to be as much a cultural change as the result of rising fuel prices<br>(David et al., 2010).<br>COMMENT:<br>should be deleted...<br>ADDITIONAL COMMENT: The US Department of Energy, Energy Information Agency does not anticipate a "cultural shift," and is projecting an increase in light vehicle travel of 37 percent from 2012 to 2035. | Accepted. Will be considered. New references are available. |
| 2476 | 8 | 57 | 20 | | | More needs to be made of this - it is now quite a widespread phenomena in many developed countries - including many in Europe | Accepted. Will be considered. |
| 5345 | 8 | 57 | 26 | 57 | 26 | Developed nations of Asia is very small % of Asia. Not clear you can generalise the experience of Japan, South Korea, Taiwan and small city-states (HK+Singapore) and apply to China, India, and elsewhere. | Accepted. Will be considered. |
| 3423 | 8 | 57 | 5 | | 17 | a very vital alinea for this chapter | Agree. |
| 2717 | 8 | 57 | 23 | 57 | 23 | David et al reference is missing. I'm skeptical of the conclusion that US culture has changed; what was the basis for the research in David et al? | Accepted. Will be considered. David et al is a large survey of young population. Other studies are available Florida R (2010) The Great Car reset……..the only culture shift I can see is some signs that young people are not so quick to learn to |
| 2718 | 8 | 57 | 28 | 57 | 29 | EKC does not predict how wealth (or income) affects environmental policy. Rather it is an association and is critically dependent on democratic procedures. For example see the following reference:<br>Mariano Torras, James K Boyce, 1998, Income, inequality, and pollution: a reassessment of the environmental Kuznets Curve, Ecological Economics, Volume 25, Issue 2, May 1998, Pages 147–160 | Accepted text will be revised. |
| 2719 | 8 | 57 | | | | This section could be shortened. You really just need to state key points, i.e., that climate policy must take into account the development needs of poorer countries, but these policies could lead to better outcomes on all sustainbility critiera if implemented now. | Accepted Will be considered. |
| 4072 | 8 | 58 | 27 | 58 | 31 | This statement is very close to being policy-prescriptive - "… follow clear political vision and agenda …" Instead, I recommend using words like "Assessment of effective strategies show…" | Accepted Will be considered. |
| 4073 | 8 | 58 | 38 | 58 | 40 | "The efforts for building and reinforcing regional networks and links to disseminate the various strategies … remain of paramount importance." No reference to this statement. This statement borders on being a policy-prescription, almost a policy recommendation. | Accepted Will be considered. |
| 15855 | 8 | 58 | 4 | | | "live" not "leave" | Accepted. Will correct. |
| 8022 | 8 | 58 | 4 | 58 | 4 | this should be 'will live in 2050' | Accepted. Will correct. |
| 3593 | 8 | 58 | 41 | 65 | | This chapter is incomplete. There is a need for an integrated policy sub-chapter, targeting organisational solutions, public private partnerships, supply chain solutions, customer purchasing behaviour changes, etc. | Will refer to Policy chapters |
| 8382 | 8 | 58 | 4 | | 19 | Pls develop further. GOOD! Up front -State of art is described but not what should be done to reverse this development. Pls go ahead and develop this part! | Under consideration |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13892 | 8 | 58 | 4 | 58 | 11 | "Urban areas where 70% of the population will leave in 2050 have a central role to play in global efforts for climate mitigation". Yes and what should be discussed here is if yes or not cities have the capacity to act (competences, funding, legal right to innovate etc.) which is often not the case. (See C40, ICLEI lobby; HAMMER, Stephen, Kamal-Chaoui, Lamia, and Alexis Robert. Cities and Green Growth: A Conceptual Framework. OECD Regional Development Working Papers 2011/08. Organization for Economic Cooperation and Development. December 2011. ; Lefèvre, B., 2012, Incorporating cities into the post-2012 climate change agreements, Environment & Urbanization, vol 24(2) ) | Accepted. Will use reference and expand discussion within limits of space. Thank you for reference. |
| 8383 | 8 | 58 | 40 | | | In this final paragraph a crucial phrase is formulated that underlines magnitude of the challenge of IPCC to deal with. Why is it hiding back here? Important points should be mentioned much earlier according to academic practices. | Accept. Some text in session will inspire some of the key summary for policy makers. |
| 15744 | 8 | 59 | 19 | 61 | 32 | Wrong titles: section 8.10.1 is labeled “Road transport” but is only addressing cars, section 8.10.2. is labeled “Rail transport” but also addresses light-rail and buses. | Will amend but HDVs also covered in 8.10.1 and light-rail comes under rail. there is one paragraph on HDVs, but |
| 3424 | 8 | 59 | 26 | | | if integration of services is possible. This is not clear enough for me. The statement is followed by policy examples that, in my understanding, do not really serve as examples of integration of services. | Will amend. it's not clear if the author intended the next sentences to be examples of integration of services….I |
| 4074 | 8 | 59 | 26 | 59 | 30 | Does the reference Hao et al 2011 describe and quantify the "significant co-benefits"? | Yes, the paper quantifies the energy saving (which can be easily converted to GHG reduction) from vehicle purchase |
| 6707 | 8 | 59 | 3 | 59 | 12 | Adding to market-based mechanisms, it should be noticed that voluntary CO2 emission reduction approaches are effictive for the transport sector. Recent studies show that voluntary CO2 emissions reduction schemes and, in particular focuses on the voluntary plan by the Japanese airline industry. Econometric analysis identifies statiscally significant improvement of 3-4% in CO2 emissions intensity (CO2/PRK) subsequent to initiation of the voluntary plan in 1998.<br><br>See:Katsuhiro Yamaguchi ( 2010 ) Voluntary CO2 emissions reduction scheme: Analysis of airline voluntary plan in Japan<br>Transportation Research Part D: Transport and Environment, Volume 15, Issue 1, January 2010, Pages 46-50<br>http://www.sciencedirect.com/science/article/pii/S1361920909000856 | worth looking at, but remember that Japanese culture is quite different from Western cultures….."voluntary" might not mean the same thing…might have quite a bit of societal pressure |
| 10008 | 8 | 59 | 3 | 59 | 5 | This part should include "voluntary target scheme" because there are successful examples of "voluntary target scheme" in the world. Each industry in Japan has voluntary target and the voluntary target scheme has played a big role, as described in (Yamaguchi, 2012, page35 and 154), (Manuel, 2010, page 6 and 13), and (Yamaguchi, 2010, abstract). In addition, there is also a successful example of "voluntary target scheme" in Netherlands, as shown in (Martijin, 2002, page162). These reference sources are same as for No63. | To be amended. worth looking at, but remember that Japanese culture is quite different from Western cultures….."voluntary" might not mean the same thing…might have quite a bit of societal pressure |
| 6708 | 8 | 59 | 31 | 59 | 36 | Adding to market-based mechanisms, it should be noticed that voluntary CO2 emission reduction approaches are effictive for the transport sector. Recent studies show that voluntary CO2 emissions reduction schemes and, in particular focuses on the voluntary plan by the Japanese airline industry. Econometric analysis identifies statiscally significant improvement of 3-4% in CO2 emissions intensity (CO2/PRK) subsequent to initiation of the voluntary plan in 1998.<br><br>See:Katsuhiro Yamaguchi ( 2010 ) Voluntary CO2 emissions reduction scheme: Analysis of airline voluntary plan in Japan<br>Transportation Research Part D: Transport and Environment, Volume 15, Issue 1, January 2010, Pages 46-50<br>http://www.sciencedirect.com/science/article/pii/S1361920909000856 | To be amended. worth looking at, but remember that Japanese culture is quite different from Western cultures….."voluntary" might not mean the same thing…might have quite a bit of societal pressure |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 14299 | 8 | 59 | 37 | 59 | 39 | Fuel efficiency standards in the EU have made a significant difference to reducing road transport emissions, and the role they have played should be acknowledged as one of the areas where regulation has made a large contibution to reducing carbon intensity. For example, in the UK the distribution of new car CO2 has significantly moved to lower levels. See Committee on Climate Change (2011), "Meeting Carbon Budgets - 3rd Progress Report to Parliament", Fig 4.12, p155 (http://hmccc.s3.amazonaws.com/Progress%202011/CCC_Progress%20Report%202011%20Single%20Page%20no%20buttons_1.pdf). | To be amended. well, "widely used effectively" is pretty strong already….but concrete examples always help. |
| 5417 | 8 | 59 | 37 | | 39 | Compromised is a bit too strong…..a 10-20% rebound effect is important, but too many critics of standards use the rebound effect as an excuse to say standards are not worthwhile. | Rebound effect covered in chapter. Differs between OECD and LDCs |
| 9167 | 8 | 59 | 37 | 61 | 31 | I am curious with the cost consequence of the efficiency standards - are there any alanlyses available? | Most studies of standards provide some idea of effectiveness, but this is ambiguous because lots of other things affect fleet fuel economy…like gasoline and diesel prices. most studies of standards provide some idea of effectiveness, but this is ambiguous |
| 7405 | 8 | 59 | 6 | 59 | 12 | From economic perspectives, unless there are seious market failures, market-based mechanisms will outperform vehicle efficiency and fuel standards on controlling GHG emissions in the transport sector. | Needs supporting references |
| 15856 | 8 | 59 | 6 | 59 | 9 | other options include fee-bates and fuel taxes | Amended. these are discussed….we can ignore this comment |
| 11003 | 8 | 59 | 3 | 59 | 4 | It is indicated that emission trading or carbon tax is effective in transporting sector, but emission reduction by voluntary approach must be also effective. | True where it works - eg Japan. Needs references. apparently so in Japan, but I wouldn't think they'd be that effective |
| 8722 | 8 | 59 | | | | Additional reviews of implemented policies (if required) can be found in this document for completeness: AEA, 2012. Next phase of the European Climate Change Programme: Analysis of Member States actions to implement the Effort Sharing Decision and options for further community wide measures: Transport Sector Policy Case Studies http://ec.europa.eu/clima/policies/effort/docs/esd_case_studies_transport_en.pdf | Accept. if appropriate, this could be added to citations |
| 4075 | 8 | 59 | | 61 | | Section 8.10.1. Road transport. Reduce page length by making a table, brief description of policy types: Demand Reduction; Energy Intensity; GHG Intensity; Short-Lived GHG Species. | Accept |
| 8385 | 8 | 59 | 24 | | 36 | This part is simply not good enough and it needs to be strenghened. | Agree but space constrained. Link to Policy chapters. perhaps, but would require more space…I do agree that this |
| 8384 | 8 | 59 | 28 | | 29 | Demand reduction examples - referring to TDM is not enough since the social activities of a person seems to be neglected.<br>Why bringing up Beijing and Shanghai as nice cases dealing with the issue? This is an elite version of traffic policy and there are other more democratic ways of dealing with the issue that serve as good examples. □ | The cases of Beijing and Shanghai were selected as representatives of reducing vehicle use through strong policy intervention. Till now, four cities in China has implemented similar policies, with many more cities likely to follow. agreed, limiting vehicles is not a likely solution for most democracies….perhaps add to pricing discussion, show where it's used and level of success. HAO: The cases of Beijing and Shanghai were selected as representatives of reducing vehicle use through strong policy intervention. Till |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13894 | 8 | 59 | 31 | 59 | 36 | Inequality and social acceptability of carbon tax should be discussed (See Deroubaix, J.F., Leveque, F., 2004, The rise and fall of French Ecological Tax Reform: social acceptability versus political feasibility in the energy tax implementation process, Energy Policy 34 (2006) 940–949) | Agree |
| 3466 | 8 | 59 | 31 | 59 | 36 | Subsidies in oil destilates are widespread in the Word. It should be mentioned that this issue should be addressed in the future in order to contribute with the reduction of GHG emissions from transport sector | Will address fuel subsidies (IEA data). I agree that fuel subsidies should be |
| 8435 | 8 | 59 | | | | I suggest to discuss with major details all the policies and examples that have been used in the world to promote NMT (i.e., traffic calming, etc). In a lot of towns cycling is one of the most important strategies to reduce car use, and the co-benefits are enormous as stated elsewhere in the Chapter. Furthermore, the importance of intermodality must be better highlighted. | Also see Policy chapter 13-15 |
| 2433 | 8 | 6 | | | | Much more of a leadership role is needed from the developed countries as their emissions levels are far higher than those elsewhere - also real scope for reduction | Agree. Added later in text |
| 2434 | 8 | 6 | | | | Note interconnectedness between transport and energy (and CO2) as most of transport energy is carbon based, and between transport and the Built Environment (Ch12). | Is covered in text Page 6 line 26 |
| 2435 | 8 | 6 | | | | Related to the general point above is the more than doubling of transport related CO2e - how can the authors see any major change in the future, based on the past trends? | Covered in text. Too detailed for Exec summary |
| 2436 | 8 | 6 | | | | The risk of failure in the transport sector is high - this is not apparent in this Chapter - there is too much talk about choices and optimal packages - the importance of non motorised transport and public transport is totally underplayed in Ch8. | Noted. |
| 11602 | 8 | 6 | 1 | 6 | 1 | Behaviour change can also be cost-effective, not only technology. Too one-sided | Amended. also, which ones? Some developments would be very |
| 11603 | 8 | 6 | 10 | 6 | 15 | "Improvements need investments…" That is the industry logic, but this means that you precanonise a high-tech path. Low tech is cheap and effective! Think of a small, low-weight, low power car…. | Agree needs to be included |
| 4338 | 8 | 6 | 10 | 6 | 12 | need to provide actual figures (millions of US$) on R & D n energy efficient transport | Try to quantify |
| 2726 | 8 | 6 | 10 | 6 | 12 | It is better to say: "Developing innovative and improved transport technologies will require RD&D investment but also expenditure on infrastructure, such as high-speed rail networks, methane and hydrogen filling stations, public recharging points for electric vehicles, cycle lanes and bus rapid transport systems." In EU compulsary methane and hydrogen filling station requirement for all Member States has been proposed. | Rejected. The ES was restructured. Hydrogen is mentioned. |
| 15288 | 8 | 6 | 10 | 6 | 10 | "RD&D" to be "R&D" | Rejected. RD&D means RD and |
| 15295 | 8 | 6 | 11 | | | I'm surprised we are promoting high-speed rail. Specialized equipment, high-speed drag, largely vacant track, big stations, etc. generally means (much) higher LCA energy requirements per person-mile traveled than cars (& most airplanes). Best thing in developed countries is probably to fill up energy-efficient cars; best thing in developing countries is probably conventional rail; so I'd change to dynamic ride-sharing as an (ICC) technology in this line. | Noted. See discussion in 8.3.2.4 |
| 16880 | 8 | 6 | 11 | | 12 | Re public recharging for electric vehicles -- recently published papers seem to make case this is less critical than previously thought. Most people who have plug in electric vehicles charge them at home. They do not feel the need for public recharging stations. | Noted. See inclusion in section 8.3.4.2. Still, need to take global view with very different settlement structures. |
| 18900 | 8 | 6 | 11 | | | It is my understanding that besides "high speed rail" there are other important options, e.g. better integrated rail networks, so please consider widening the focus here. | Agree - in text but not a complete list of examples |
| 15769 | 8 | 6 | 14 | | 15 | Re: plug-in hybrids -- true, but currently very expensive and unlikely to come down in price any time soon. | Possible - but exemplifies transitional steps. unclear…..tell me what happens |
| 2727 | 8 | 6 | 14 | 6 | 15 | Full electrification can not be a goal for urban road transport, since it is not applicable at all to heavy freight transport and can only partially cover heavy personal transport. Renewable methane and hydrogen are needed, using them in ICEs and fuel cells, including plug-in-hybrids. | Hydrogen and methane added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8866 | 8 | 6 | 16 | 6 | 20 | The way this pargraph reads now seems to suggest that people find diffucult to change their travel habits what I am sure it is not what the authors mean and there is no additional text supporting this statement. If there are appropriate alternatives available and incentives in place, then people in developed countries will also change their travel habits. | Noted. This is one of our key messages being questioned - World regions with existing and mature transport infrastructures in place may find mitigation options through improving technologies easier to implement than changing travel patterns, whereas regions with rapidly developing infrastructures are more dynamic in terms of travel demand and modal |
| 17763 | 8 | 6 | 16 | 20 | | ensure that the bolden statements are consistent with the message in other chapters? | Noted. This is one of our key messages being questioned - World regions with existing and mature transport infrastructures in place may find mitigation options through improving technologies easier to implement than changing travel patterns, whereas regions with rapidly developing infrastructures are more dynamic in terms of travel demand and modal |
| 11604 | 8 | 6 | 16 | 6 | 20 | That's contentious. You can argue that in DEV supply lacks behind demand. Hence there is no time, money and capacity for mitigation in addition to demand satisfaction, hence no real flexibility. Vice versa, affluent countries have the means, time, liberty, capacities for change! | Noted. This is one of our key messages being questioned - World regions with existing and mature transport infrastructures in place may find mitigation options through improving technologies easier to implement than changing travel patterns, whereas regions with rapidly developing infrastructures are more dynamic in terms of travel demand and modal |
| 15770 | 8 | 6 | 16 | | 20 | This sounds good, and makes sense, but it would require a commitment on the part of govt to ensure the most cost-effective, from a GHG perspective, technologies are employed. | Noted. This is one of our key messages being questioned - World regions with existing and mature transport infrastructures in place may find mitigation options through improving technologies easier to implement than changing travel patterns, whereas regions with rapidly developing infrastructures are more dynamic in terms of travel demand and modal |
| 2805 | 8 | 6 | 16 | 6 | 38 | In order to make the logic clearer to readers, I think this section looks better better if moved after p7 line 7. Then, it reads:<br>"Optimal mitigation packages, and barriers differ between world regions due to variations in local transport demand"<br>→ "World regions with existing and mature transport infrastructures in place may find ..., whereas regions with rapidly developing infrastructures are ..." | Will consider but bold are the key messages |
| 5184 | 8 | 6 | 16 | 6 | 20 | Even in countries with mature infrastructures very large sums are invested in road, rail and (air)port infrastructures, funds that can still be redirected to low carbon transport modes. Furthermore, most of these countries are rich, so have the means to invest additionally in new low carbon infrastructures. | Will consider but bold are the key messages |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17707 | 8 | 6 | 17 | | | Readers would be interested to see in the summary a statement on whether present technologies could deliver sufficient savings in efficiency to meet carbon targets, given "business as usual" trajectories in km travelled, or whether there will need to be reductions in VKT. | Noted. |
| 16273 | 8 | 6 | 18 | 6 | 22 | Same as above. | Accept but too old references |
| 8361 | 8 | 6 | 19 | | | But perhaps some of the rapidly developing countries are less flexible when it comes to implementing alternative policies? Political ambitions and leadership skills are prerequisites for success. The experience of managing motorisation in different political, economic, cultural and technical contexts is largely missing in this part. PIs include. Political scientists seem to have been missing in the writings of chapter 8? | Accepted. |
| 14742 | 8 | 6 | 2 | 6 | 3 | Phrase is redundant | Amended |
| 16276 | 8 | 6 | 24 | 6 | 25 | The IEA (IEA, 2001. "Saving Oil and Reducing CO2 Emissions in Transport") indicates that the vehicle market is becoming increasingly global. Hence, I can't agree that there are also major regional differences in "available" technologies. | Not just road vehicles being referred to |
| 15296 | 8 | 6 | 26 | | | I don't think hyphens between built environment & land use are needed here. That's really only when those terms are modifying another noun. | Accept |
| 16274 | 8 | 6 | 26 | 6 | 32 | Same as above. | Not just road vehicles being referred to |
| 5393 | 8 | 6 | 28 | | 29 | quantitatively, technology has far greater potential, in a much faster timeline, than does land use policy….there's no doubt such policy is important, but don't oversell it | Needs to be mentioned. "in the longer term" added |
| 15297 | 8 | 6 | 29 | | | I don't know why "However, there are" is used here. These ideas are not in conflict. I would say "There are also…". | OK. I don't have a problem with the "however" |
| 15298 | 8 | 6 | 33 | | | The reader doesn't understand why climate change feedbacks would make light rail more likely. (I don't either. :-) ) I'd rewrite this sentence to give a more specific example. Perhaps you mean to say, "If highways are flooded, only rail systems may be operational"? Hard to imagine, but I'm not an expert on climate change accommodation. (I just remember the Loma Prieta earthquake taking out a section of the Bay Bridge, so BART & ferry became important modes across that bottleneck point.) | Amended |
| 2728 | 8 | 6 | 33 | 6 | 38 | Rural train transport is the most vulnerable transport technology to the effects of climate change. | Noted. |
| 5394 | 8 | 6 | 33 | | 34 | not at all clear why climate change would push people into light rail and away from private vehicles…is this backed up in the text?.....light rail's lack of flexibility could be a hindrance as the climate evolves | Agree. Amended |
| 3987 | 8 | 6 | 33 | 6 | 34 | The statement that "Positive mode transport change (e.g. from private vehicles to light-rail)…." Need justification. What is the empirical basis for this statement? | Agree. Amended |
| 14743 | 8 | 6 | 35 | 6 | 36 | This phrase is odd and implies a strange message! | don't agree, but need references to other |
| 16881 | 8 | 6 | 35 | | 38 | Can you provide context? How large are these impacts relative to today or relative to projected emissions if no change had occurred in polar region? | Too detailed for exec summary. Is in text |
| 3988 | 8 | 6 | 39 | 6 | 43 | The bold summary on optimal mitigation packages seems out of place. In particular it ends with "high agreement, medium evidence." But the immediate preceeding paragraph on feedback loops refers to section 8.5 where the evidence is characterized as: "Impacts are very dependent on regional climate change and the nature of local transport infrastructure and systems. Such impacts have not been well studied and sufficient information does not exist to determine their net positive or negative forcing impacts on many feedback scenarios." Thus, this summary section should either move or the statement of evidence and agreement should better reflect the text below. | Rejected. There is a difference between the paragraphs. The summary is about mitigation, the preceding paragraph is about climate feedback - somewhat related, but not a great deal. |
| 8865 | 8 | 6 | 4 | 6 | 9 | This paragraph needs to revised: transport also emits SO2 and other substances and by no means emits aviation ozone. | Accept. at least: yes, ozone is NOT an emitted gas, it's produced in the |
| 10763 | 8 | 6 | 4 | 6 | 9 | It is also important to mention that these effects operate on very different time scales. See e.g. figure 1 in paper by Berntsen and Fuglestvedt, PNAS, 2008, vol 105 no 49. | In text section 8.2 |
| 14269 | 8 | 6 | 44 | 6 | 45 | I'm not sure what the relevance of sustainable development as an objective is in this context. It might be desirable for various reasons, but in the context of mitigating climate change the long-term pathway should meet objectives solely relating to climate. | meeting a single climate objective seems pretty unrealistic….disagree |
| 17764 | 8 | 6 | 45 | | | state what are the "multiple objectives" | Too detailed for exec summary. See text |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14744 | 8 | 6 | 46 | 6 | 46 | The non-OECD class needs to be further disaggregated: BRICS and developing countries. | Rejected. For the issues highlighted in the ES a further differentiation is not |
| 18901 | 8 | 6 | 46 | | | The listed ragions "OECD, DCs, non-OECD" overlap. | It is EITs - not DCs |
| 15863 | 8 | 6 | 5 | 6 | 9 | Note that retrofits invalidate warrantees and if done poorly can actually worsen emissions. | Reworded |
| 15768 | 8 | 6 | 7 | | | Retrofits would need significant govt support to implement unless there is a financial incentive for the consumer, e.g., natural gas might work in some areas with cheap gas, but particulate traps for diesels would need a govt mandate. | Agree but too detailed for exec summary. Section 8.3 |
| 13873 | 8 | 6 | 28 | 6 | 29 | "Transport Demand Managementpolicies to frame urban expansion due to demographic growth" could be added in "such as facilitation of growth in city centres rather than urban fringes" | Amended |
| 2655 | 8 | 6 | 10 | 6 | 12 | The ability of infrastructure spending on rail, cycle lanes, BRT, and other alternative modes is really very dependent on getting the walking environment right. Should emphasize that detailed planning is needed to achieve the benefits from these systems. | Amended |
| 2656 | 8 | 6 | 33 | 6 | 38 | Second sentence in paragraph seems out of context. I'm unsure how relevant adaptation is to this chapter, could be a place to save pages by deleting some of this. | Adaptation relevant to transport |
| 2654 | 8 | 6 | 9 | 6 | 9 | Ozone is not emitted, but is caused by photochemical reactions. NOX emissions from aircraft affect ozone levels. | Amended |
| 17131 | 8 | 60 | 18 | 60 | 21 | ADD: Scrapping scheme reduces air pollutant emissions (NOx, PM) at the same time. For example, in Italy, due to the full replacement of EURO 0, EURO 1 and EURO 2 vehicle by newer technology models, total CO2 saving would amount to 8.74 million tons per year.<br>( Sustainable Mobility CO2 in the Road Transport Sector, The Integrated Approach A study by OICA, 2010, p.5-6, International Organization of Motor Vehicle Manufactures (OICA)<br>Available at: http://www.oica.net )<br><br>AFTER ORIJINAL TEXT: Policies that encourage the early scrapping of vehicles and restrict imports of older vehicles can help decrease the average fleet age, and hence carbon intensity (g CO2/km). Conversely, extending the life of a vehicle can help reduce its life cycle emissions (Kagawa et al., 2011). | Amended but scrapping schemes are expensive with a lot of "free riders". I'm a bit dubious that we should push scrapping schemes….expensive, a lot of "free riders" |
| 13119 | 8 | 60 | 2 | | | Please show 2015 (target enacted) and 2020(target propsed) in Japan, if available. | Check if legislation enacted. depends on whether standard is enacted |
| 13426 | 8 | 60 | 5 | | | Japanese government has not decided the new standard after 2016 yet. | Will update if they do. depends on whether standard is enacted |
| 5249 | 8 | 60 | 6 | 60 | 7 | Would feebates reflect (and moderate) the situation and costs for rural dwellers facing occasionally deplorable road conditions in winter or as a result of flooding? Why should they be penalised for buying, for example, a 4X4 to seek to safeguard their lives against deplorable road conditions? | Will consider but hard to incorporate without references. all regulations and broad pricing schemes are problematic for some portion of the population….not |
| 8721 | 8 | 61 | 20 | 61 | 20 | In a number of Asian and southern European cities, motorized two-wheelers are banned from city centres to prevent excessive particulate emissions. | Accept but need references. car-free areas should be mentioned, along with this….though this is an anti-pollution |
| 3845 | 8 | 61 | 26 | 61 | 31 | Probably, it may deserve to quote the efforts on GHG mitigation through the use of biodiesel and ethanol used in diesel type engines. For the last technology see the site BEST - Bioethanol for Sustainable Transportation at the web. | Covered elsewhere but can mention |
| 8020 | 8 | 61 | 32 | 62 | 4 | Please mention and describe shortly 'Integraler Taktfahrplan' ('integrated regular timetable') which is a central quality to increase the attractivity of passenger rail in many countries. | Accept |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11364 | 8 | 61 | 9 | 61 | 19 | Could the following point be considered in this paragraph? "Carbon taxes for new vehicle registration and fuels strengthen the consumer preferences toward diesel vehicles over gasoline vehicles. It was shown that the shift from gasoline to diesel contributes to the climate mitigation when all the components including short-lived climate forcers are considered (Tanaka et al., 2012, Environmental Science and Technology, 10.1021/es204190w). However, such a climate benefit becomes smaller when newer vehicle emission standards are introduced." | To be amended. perhaps, but I suspect the net GHG benefit is variable…hare do use just one reference here |
| 6924 | 8 | 61 | 17 | 61 | 19 | Please provide a more specific reference to WGI AR5. | Accept. sounds reasonable |
| 2721 | 8 | 61 | 33 | 61 | 33 | Rail transport is affected not just by relative travel time; comfort and convenience can be a major factor. | Accept. sure, but not sure this is necessary…travel time and probably |
| 2477 | 8 | 62 | | | | ETS is only mentioned here - surely this is one of the most important potential measures that needs to be introduced globally - and not just for aviation, but for all transport? | Accept but references needed. I would think emissions trading works best for larger entities (like airlines)….not clear to |
| 2478 | 8 | 62 | | | | The institutional and organisational issues - the decision making processes and the involvement of the huge number of stakeholders in transport must feature in this Chapter - it is no use having a solution to a problem and find that it cannot be implemented. The questions of governance at all levels - global, regional, national and local - cannot be ignored. | Accept |
| 8018 | 8 | 62 | 11 | 62 | 11 | I did not find (Kuhn, 2011) in the References | To be deleted as not peer reviewed. |
| 18229 | 8 | 62 | 15 | | | On this data it is important to highlight that technical measures taken by the IMO in 2011, through which are created the Energy Efficiency Index and the Management Plan for Energy Efficiency of Ships (SEEMP), will entry into force internationally from 1 January 2013. Afterwards, from 2013 to 2014, all necessary measures must be implemented to start decreasing, by 2015, up to 10 % of ships CO2 emissions, in accordance with that prescribed in Annex VI of the MARPOL on regulations for the prevention of air pollution from ships, through the inclusion of new regulations on energy efficiency. | To be amended. OK if we can understand the EEDI better |
| 15117 | 8 | 62 | 20 | 62 | 21 | There are no standards for age of aircraft even for Safety. The standards relate to the airwothiness (design, manufacture, certification and maintenance) and operation of aircraft. | Amended |
| 8019 | 8 | 62 | 20 | 62 | 39 | From the Special Report 'Aviation and the Global Atmosphere' we have known the warming effects of contrails and cirrus clouds (e.g. RFI = 2.7). Please add state-of-the-art intelligence on this issue in 8.10.4 | Amended |
| 15118 | 8 | 62 | 23 | 62 | 25 | Implementation of emissions reduction measures is not limited to EU States. States in other regions are also acting to reduce emissions from civil aviation through various measures. | Accept |
| 8017 | 8 | 62 | 23 | 66 | 23 | please add: '(...) fuel-efficiency standards. But even 15 years after the adoption of the Kyoto Protocol and asigning a mandate to ICAO to address mitigation no global mitigation measures in aviation are in affect.' | Accept |
| 15119 | 8 | 62 | 25 | 62 | 25 | For more clarity, this sentence should start with: ICAO member States.... | Accept |
| 15120 | 8 | 62 | 27 | 62 | 27 | The list of economic measures adopted/explored by ICAO includes also emissions trading | Accept |
| 15121 | 8 | 62 | 29 | 62 | 35 | The statement in this paragraph is not accurate. In 2010, the 37th Session of the Assembly of ICAO endorsed among other things: (1) a global aspirational goal of 2 per cent annual fuel efficiency improvement up to year 2050 ;(2) a medium term global aspirational goal from 2020 that would ensure that while the international aviation sector continues to grow, its global CO2 emissions would be stabilized at 2020 levels and (3) develop a global CO2 Standard for aircraft aiming for 2013. | Amended |
| 5212 | 8 | 62 | 29 | 62 | 32 | The reduction of 1.5% per year in energy consumption is very unlikely to be achieved for more than one decade ahead (see e.g. Peeters, P. M., & Middel, J. (2007). Historical and future development of air transport fuel efficiency. In R. Sausen, A. Blum, D. S. Lee & C. Brüning (Eds.), Proceedings of an International Conference on Transport, Atmosphere and Climate (TAC); Oxford, United Kingdom, 26th to 29th June 2006 (pp. 42-47). Oberpfaffenhoven: DLR Institut für Physic der Atmosphäre. | Amended |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17132 | 8 | 62 | 43 | 62 | 45 | DELETE: However, this additional capacity can induce demand for transport and, over time, lead to even greater congestion. An increase in road infrastructure can increase distance traveled proportionally (Duranton and Turner, 2011).<br><br>REVISE TO: Building more roads often induces more demand, but where appropriate, the total CO2 emission will be reduced even considering such an induced demand.<br>(-Traffic Flow Improvement Measures, Ministry of Land, Infrastructure, Transport, and Tourism, Japan Available at: http://www.mlit.go.jp/singikai/infra/kankyou/2/images/shiryou3.pdf<br>-Road Infrastructures to Avoid Global Warming, Ministry of Land, Infrastructure, Transport, and Tourism, Japan Available at: http://www.mlit.go.jp/road/singi/bunkakai/5_3.pdf)<br><br>ADD: The increase of traffic volume is one of the main causes which induce congestion. However, other causes include the obvious lack of road infrastructure especially in developing countries. Appropriate design of the route and traffic signal control, peak-time shift of commuting could be the solutions. | Amended |
| 14300 | 8 | 62 | 6 | 62 | 8 | The measure the IMO has adopted (the Energy Efficiency Design Index or EEDI) is positive, but technically it may not reduce emissions from shipping, since it only affects emission intensity. If demand increased faster than intensity improved, then emissions would increase. | Amended |
| 18228 | 8 | 62 | 6 | | 8 | To enrich this report, it is recommended to enhance information referring to mandatory measures adopted by the IMO in relation with reduction of greenhouse gas emissions, since such measures are barely mentioned. This with the purpose of referring to the established in the International Convention for the Prevention of Pollution from Ships (MARPOL), the Annex VI and the amendments adopted to prevent air pollution from ships activities. | Accept |
| 14301 | 8 | 62 | 9 | 62 | 12 | While sulphur emissions are important (and the IMO has taken action to reduce them), the reason the EU are considering indepedent action on emissions is more directly related to climate change. Specifically, international shipping is the only sector which is not currently covered by the EU's climate change targets. | Accept |
| 2722 | 8 | 62 | | | | Mention lower speed for ships as a carbon reduction policy. | Accept |
| 2723 | 8 | 62 | 36 | 62 | 39 | Provide an update on the status of aviation within the EU ETS. Are airlines complying? | Will do |
| 11283 | 8 | 62 | 40 | | | The content of this section can be enriched by including elements of the section "Contemporary Appraoches to Linking Spatial Planning to Urban Infrastructure" of the Global Report on Human Settlements 2009, also with regard to its table 8.2 "Approaches linking spatial planning to urban infrastructure" (p. 161). UN-Habitat (2009): Global Report on Human Settlements 2009: Planning Sustainable Cities, pp. 155-157, 160-165. [available at http://www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=2831 | Accept |
| 5419 | 8 | 63 | 19 | | 21 | "Comparing" London to Surabaya seems a strange comparison….I assume that Surabaya is a very poor city…..it is so far removed from a city like London that it's modal split has little to offer by way of comparison, at least in this discussion. | To amend |
| 3846 | 8 | 63 | 27 | 63 | 32 | Remove the sentence since it is a repetition. This text has already been discussed. Search for the reference "Trubka et al, 2010", in your paper, to identify earlier discussion. | Accept |
| 5420 | 8 | 63 | 42 | | 45 | Here and elsewhere in the text, esp. in the first two sections, a large number of citations are used to back up a fairly general comment…..this may just be a personal quirk of mine, but I prefer a bit more judicious use of citations, esp. for such general comments | Is a literature assessment |
| 5418 | 8 | 63 | 7 | | 8 | Not clear what this means…..toll projects have failed to achieve projected reductions in traffic volumes and hence revenue???? Seems that failure to achieve traffic reduction implies MORE revenue, not less. | Agreed. Accept |
| 8386 | 8 | 63 | 37 | | 40 | This part should be moved to the first pages of chapter 8. Pls move it. | Accept not policy - to 8.4. or repeat it |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8388 | 8 | 64 | 1 | | 22 | On this last page a number of comments are made that will fit well into an early presentation of current challenges in the sector of transportation instead of written as final comments. The entire chapter would improve if you re-work the outlined and explore the content of the comments made in the last part of the chapter. | Agree. I agree…these comments are both general and important, should be moved up front |
| 8387 | 8 | 64 | 11 | | 25 | Wordings are weak and most of this has already been said. Sharper writings are required – due to the magnitude of the problems and the state of the art of existing solutions. For instance a low-carbon transport system is not sufficient or good enough to alleviate all sorts of problem being discussed. Pls elaborate on the IPCC version of sustainable transport. | Accept. agreed, although not sure how we can do this |
| 5293 | 8 | 65 | | | | COMMENT: There are cases of national levels land use and mobility measures and objectives. In 2012, the French national government established compulsory Territorial Climate and Energy Plans for all public administrations representing at least 50 000 people. The PCETs include: 1) both mitigation and adaptation measures (experimental for the last); 2) an energy component; 3) EU 20/20/20 objectives. The PCET supersede all other planning documents: mobility, urban planning, transports, land use, construction, non carbon mobility… All texts and policies related to these issues must conform to PCETs' goals. However, the legally binding aspect concerns only administrations. The plans are voluntary for other actors on the territory (industries, small firms, universities…) who are encouraged to sign a charter and act on the emission linked to transports. No penalty (so far) has been planned for communities who do not reach their targets.<br>The different PCETs are supervised from far by the National Environment and Energy Agency (ADEME, which also developed a carbon footprint evaluation method). The emphasis is on policy innovation through new linkages between services, and efforts at mainstreaming the 20/20/20 climate objectives throughout the sectors, departments and institutions. Hence, efforts at decreasing cars in daily life are impulsed by a national legislation. | Accept - to be amended |
| 3591 | 8 | 65 | | | | It is almost impossible to read this table. See comment 14 | Draft only. at the very least, expand the |
| 5213 | 8 | 65 | 1 | | | More far reaching infrastructure planning is missing. The point is that the increase of long distance passenger transport by air, including all possible theoretical technologocal efficiency improvements, still may take up 20% of current global CO2 emissions by 2050, thus blocking a sustainable emissions path for theglobal economy by then (e.g. Bows, A., Anderson, B., & Peeters, P. M. (2009). Air transport, climate change and tourism. Tourism and Hospitality: Planning & Development, 6, 7-20). | Accept |
| 8209 | 8 | 65 | 1 | 65 | 4 | What is the most 'original' source of this Table? I saw a very similar Table in GIZ's report "Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities - Module 5e: Transport and Climate Change" (2007) pp35, table 16, which was written by Holger Dalkmann and Charlotte Brannigan. Please be careful to cite the sources, and do more literature review. | Will check |
| 4343 | 8 | 66 | 1 | 66 | 17 | international data of freight flows is notoriously weak. This section needs to mention that there is no data on urban logistic flows, average length of haul per commodity nor per value basis. There are no data on carbon emisssions at the level of individual supply chain sectors such as sub industries | Drawn attention to some new data-bases some which we should use for the next draft. This is partly true. There is certainly a need for greater harmonisation of the measurement and reporting of carbon emissions from freight transport. This should be mentioned in the report. On the other hand, there is an emerging consensus on the key measures that should be applied to cut freight-related emissions. The particular mix of measures will vary |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8023 | 8 | 66 | 1 | 66 | 17 | "Developing the capacity (analytical and data) for multi-objective evaluation is an important part of the process of cultivating sustainability and climate mitigation thinking and culture in the long term." from p.56, l.39 is worth being mentioned in 'Gaps in knowledge' | Accept |
| 3592 | 8 | 66 | 10 | 66 | 11 | Add text such as: "The effects of mitigation measures are difficult to quantify for freight transport, and the trial approach under real business condition is needed in order to prove the technical feasibility and economical viability of the solution. However, poor policy support for innovation and shortage of knowledge on the collection of the right kind of data leads to a poor knowledge base on innovative and effective solutions in freight technology and organisation. Therefore, the lack of clear data leads to a slow market uptake of innovation such as city logistics and low carbon vehicles. There is also a need for comparative studies of costs-benefits of different green logistics, city-logistics and low carbon freight vehicle solutions" | Some useful suggestions which will be separately evaluated and would be worth incorporating . This is partly true. There is certainly a need for greater harmonisation of the measurement and reporting of carbon emissions from freight transport. This should be mentioned in the report. On the other hand, there is an emerging consensus on the key measures that should be applied to cut freight-related emissions. The particular mix of measures will vary with a country's level of development, size, industry structure, resource endowment etc Useful suggestions here, particularly on the role of innovation and the difficulty of getting data on the implementation of carbon |
| 11655 | 8 | 66 | 2 | 66 | 2 | Why particularly aviation? | Has specific problems |
| 17171 | 8 | 66 | 2 | 66 | 2 | Aviation data is gathered, but not publically available; there could be a plea for cost-free aviation data. | Agree - not the place here though |
| 12160 | 8 | 66 | 2 | 66 | | The sentence "...particularly for aviation" is disconnected, without good connection. So, I recommed to remove "...particularly for aviation". | Accept |
| 13895 | 8 | 66 | 29 | 66 | 38 | Cost issues should be discussed (potential reduction at what cost ?) | In earlier sections |
| 5294 | 8 | 66 | 9 | | | ADD: A study on mobility in Lyon shows that modal transfers on the same journey was one of the key factors encouraging the use of the car due to lost time and comfort (Stéphane La Branche, « La gouvernance climatique face à la mobilité quotidienne. Le cas des Lyonnais ». Urban environment. 2011° | this is too specific and limited for this section |
| 11654 | 8 | 66 | | | | I think it would be good to mention the major uncertainties for the future development: Oil price; price, capacity, lifetime of batteries; price 2nd generatin biofuels; transport demand. | Agree: could be added but space constraints. there is a difference between unknowables (oil price, future cost and performance of new technologies) and gaps in knowable knowledge….I suspect we need to focus |
| 15857 | 8 | 66 | 1 | | | This section suggests that all of the gaps are in understanding of consumer behavior. This is surprising; there are a lot more gaps than this. Actually, it seems that customers will respond to value in choosing more efficient and lower GHG transportation. Seems like the bigger gaps are in having soundly based and well-informed and analyses that accurately point out and project value to customers among various options. This type of orientation is lacking in this chapter. Additional Gaps to consider: better data for transport fleets in developing world, more data that provide well-informed analyses to allow customers to accurately gauge value and choose among various options | good comment… |
| 3467 | 8 | 66 | 2 | 66 | 17 | Regarding gaps in data, it should be mentioned that in most of developing countries, there is no accurte or reliable information about the fleet by type of engine (diesel, gasoline, LPG, etc.). This information is relevant in order to analyse substitution process and its impacts | relevant |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6493 | 8 | 66 | 2 | 66 | 17 | The statements does not address the core problem i.e. lack of data in developing countries and cities to do accurate analysis of Carbon emissions as quoted by many researchers. The data is either not sufficient to do quality analysis and gain insights or not routinely collected to understand the impact of policies and investment. | relevant |
| 8014 | 8 | 66 | 24 | 66 | 24 | Please specify to "(...) increase into the future, if no drastic mitigation (...)": Only some mitigation won't reverse the trend. | Accept |
| 8015 | 8 | 66 | 42 | 66 | 42 | please insert 'less fatal accidents' after 'health' | reduction of fatal accidents may occur, but only with specific mitigation measures such as urban planning and increased transit share….frankly, a large shift to bicycling seems likely to increase |
| 11656 | 8 | 67 | | | | Clean up multiple duplications. | Accept |
| 17765 | 8 | 7 | 1 | | | what are these "improved techniques" | Detailed in 8.6. the current statement is |
| 15771 | 8 | 7 | 1 | | 3 | Again, unless there is significant govt intervention, this comes down to what is most cost-effective for the consumer. | Amended |
| 11273 | 8 | 7 | 11 | 7 | 12 | Are "travel cost savings" really a co-benefit of reducing CO2-emissions? If there are travel cost savings economic theory suggests that there is an increase in CO2 emissions (since cost savings are at least to a certain degree reinvested to travel) | Rebound effect discussed elsewhere. disagree….perhaps 10-20% reinvested in travel,and even that may be viewed as |
| 14270 | 8 | 7 | 16 | 7 | 17 | These factors are not specific to transport - they apply to all sectors. | Accepted. |
| 14746 | 8 | 7 | 16 | 7 | 17 | ??? | agree, statement isn't clear Deleted, |
| 14747 | 8 | 7 | 18 | 7 | 20 | Examples? | agree, statement is so broad as to be of little valueToo detailed to list in Exec |
| 16275 | 8 | 7 | 18 | 7 | 19 | Same as above. | agree, statement is so broad as to be of little valueToo detailed to list in Exec |
| 15300 | 8 | 7 | 20 | | | Comma needed before "such as". | Done |
| 15301 | 8 | 7 | 21 | | | I recommend a thoughtful statement to round up this Exec Summary, which reads like a series of generic statements that go both ways (so they can't be wrong) & don't really clue the reader into useful specifics. I imagine this Exec Summary is going to get a fair bit of editing once the body of the chapter is revised to reflect reviewer comments, and I hope its start & end can be more like an Intro/overview & Conclusion/summary. Thanks! | Agree |
| 8867 | 8 | 7 | 8 | 7 | 21 | Text in bold and the following seem to contradict each other. The text in bold talks about co-benefits of mitigation and the following text focuses on mitigation as a co-benefit, forgetting that mitigation has co-benefits in terms of reduced air pollution etc. | Differs rather than contradicts. doesn't seem contradictory, just a bit different |
| 15804 | 8 | 7 | 8 | 7 | 10 | statement about co-benefits is not quantified and no justificaiton in text given for statement that co-benefits may exceed costs | Agree. Section being re-drafted |
| 15299 | 8 | 7 | 8 | 7 | 10 | I'd love to see a section reference [8.x] for this statement. | Agree |
| 2657 | 8 | 7 | 13 | 7 | 14 | "The risks of technology failure in transport sector…" This seems like a vague comment, please be more specific about what is meant and why there may be risks. | agree…too much hand waving |
| 8870 | 8 | 8 | | | | This figure is out of date and shall be omitted (reduces also the length of the chapter). Figure 8.1.1.b is sufficient to show the regional differences | and it's not really discussed…I agree it doesn't serve much purpose here. |
| 4334 | 8 | 8 | | | | need to use GDP data expressed in purchasing parity levels rather than standard GDP | Deleted, |
| 4335 | 8 | 8 | | | | need to provide figures for freight transport emissions of carbon dioxide | This is total transport. Drawn attention to some new data-bases some which we |
| 15313 | 8 | 8 | | | | sorry to see this is in b&w. will this be color in the final report? I'm afraid I can't distinguish most of those short lines, so this is not such a useful figure to have right now. Y axis label should probably be "Transport sector's share of…" rather than Transport sector share in. | Deleted, |
| 15745 | 8 | 8 | | | | Figure 8.1.1.a needs to be coloured. | Deleted, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14748 | 8 | 8 | 1 | 16 | 30 | Chapter 8.1 and 8.2 needs improvement: A lot of complicated, nested phrases and redundancy. | To be re-written |
| 15305 | 8 | 8 | 11 | | | "movement of freight" reads better as "freight movement" here. (more concise writing :-) ) | Amended. Editorial |
| 15306 | 8 | 8 | 12 | | | sounds better as "the world's projected growth in transport" (rather than "the projected world growth in transport" | Amended. Editorial |
| 15307 | 8 | 8 | 13 | | | "the transition" reads better as "this transition" | Amended. Editorial |
| 12882 | 8 | 8 | 13 | 8 | 15 | Give citations for this statement. | Done. also: do most integrated assessments even CONSIDER "social |
| 15308 | 8 | 8 | 14 | | | please give an example (or two) of "stringent strategies" (in parentheses); thanks! | Amended. agree..this is just too vague |
| 15309 | 8 | 8 | 17 | | | demands overlapping with *systems* sounds odd (they are distinct things); perhaps we mean to say overlapping with "demands on the electric power system"? | Agree |
| 15310 | 8 | 8 | 21 | | | "to industry" should be "to industry's share" | Amended |
| 15311 | 8 | 8 | 22 | | | do we mean to say "anthropogenic" emissions when we say "total GHG emissions"? I find 14% unexpectedly low & wonder why it's not at least 20%. Please try to be more specific here, so the reader knows why the drop from 27% to 14%. | Amended. 14% correct. agree, but low value implies denominator is total, not anthropogenic |
| 15312 | 8 | 8 | 22 | | | ", 22%" should be "and 22%", since the final item in this list is non sequitur/distinctive (beginning with "but") | Reworded |
| 3818 | 8 | 8 | 23 | 8 | 27 | Very difficult to read the figure in black and white. | Deleted |
| 15314 | 8 | 8 | 26 | | | not sure why there are spaces on either side of the slash for GDP/capita in this title. (They are properly not in the y-axis label.) Personally, I'd say "GDP per Capita" in the title. | Deleted |
| 15302 | 8 | 8 | 5 | | | I'd say "congestion and crashes" not just congestion. Roadway crashes actually tally (in the US) to 3 times the cost of congestion (but they are less common, so people tend to neglect their serious toll). | Amended. good suggestion |
| 12880 | 8 | 8 | 6 | | | Add 'and noise pollution' after higher greenhouse gas (GHG) emissions | Added |
| 15303 | 8 | 8 | 7 | | | comma needed before "including". | Added |
| 8869 | 8 | 8 | 8 | | | This sentence seems to refer to the current situation and this needs to be made clear | Rejected. This is a general statement. |
| 16277 | 8 | 8 | 8 | 8 | 8 | It is better to modify the phrase "Each requires" to "Motorized transport modes require". | Cycling needs food energy. rather, "each |
| 15304 | 8 | 8 | 9 | | | comma before "infrastructure" should be an "and" (since the next item in this list is an infinitive, which would be inconsistent w/o the "and") | Agree |
| 12881 | 8 | 8 | 9 | 8 | 10 | The proposition of the sentence - the transport sector has the potential to decarbonize its energy supply at relatively low mitigation costs - needs to be clarified and proved by literature quote. It seems that the literature on economy-wide mitigation assessments derive the transport sector to be the least cost-efficient sector to decarbonize. | Amended. yes, we haven't shown this, and the proposition is doubtful |
| 5395 | 8 | 8 | 9 | | 10 | decarbonization certainly is possible, but it is unlikely to happen at "relatively low mitigation costs"….and I don't think you have shown this. | Agree - reworded |
| 16278 | 8 | 8 | 9 | 8 | 10 | Same as the comment No. 7. | Not clear which comment this is |
| 13874 | 8 | 8 | 10 | 8 | 10 | "relatively low mitigation costs" need to be referenced as this assertion is debatable | Amended |
| 2658 | 8 | 8 | 14 | 8 | 15 | "…that consider social acceptability and behavioural impacts." - this statement is vague, please be explicit about what you mean about both 'social acceptability' and 'behavioural impacts' | Amended. agree that it's not quite clear what this means |
| 6474 | 8 | 8 | 15 | 8 | 17 | – It is not very clear as to what is meant by “Depending upon technology developments, future transport end-use demands could overlap to a greater extent with electricity supply systems” – It’s not technology alone which would impact the future transport demand | Amended. reviewer seems to misinterpret statement….the developments affect whether batteries will be the primary driver of |
| 2659 | 8 | 8 | 15 | 8 | 17 | "Depending upon technology developments…..could overlap to a greater extent with electricity supply systems". This statement is again vague; any decarbonization strategy in transport by necessity will require electricity from renewables with a small portion of biofuels. So 'could' is a weak way to word this. | Amended text. don't agree. Not appropriate |
| 3462 | 8 | 8 | 19 | 8 | 23 | Please mention that transport efficieny is lesser than those observed in other sectors, so most of the energy used in this sector is wasted. | Rejected. Space constaints and difficulty to soundly compare (which references?), incl. other low efficiencies (coal-fired or |

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|---|---|---|---|---|---|---|---|
| 2660 | 8 | 8 | | 8 | | Delete table 8.1.1a as 8.1.1b shows intended point more clearly | Figure (not Table) deleted. referring to figures, not tables….not clear to me that the figure is all that useful…..though I'd love to see a figure that measures transport energy or GHG emissions vs. |
| 17170 | 8 | 80 | 35 | 80 | 36 | IEA 2009a and IEA 2009b are the same reference | Amended |
| 2437 | 8 | 9 | | | | This figure shows the scale of the problem - 1970 to 1990 with a 60% growth in CO2 emissions in transport and a further 36% to 2010 on a higher base - so a similar absolute increase. This is key - recent history does not suggest any reduction | Noted |
| 17766 | 8 | 9 | | | | no one can see the "indirect N2O emissions" in the figure | Agree. Will amend or incorpoate into |
| 10764 | 8 | 9 | | | 9 | It should be noted how CO2 equivalents are obtained. The picture would probably look quite different if a different time horizon or metric was used instead of GWP100. | Not in this chapter. Will be outlined in Chapter 1. suggest this be handled up |
| 10765 | 8 | 9 | | | 9 | It should be noted how CO2 equivalents are obtained. The picture would probably look quite different if a different time horizon or metric was used instead of GWP100. | Not in this chapter. Will be outlined in Chapter 1. We suggest this be handled |
| 2807 | 8 | 9 | | | | Please indicate the source. | Accpeted. |
| 2808 | 8 | 9 | | | | Please indicate the source. | Accpeted. |
| 16286 | 8 | 9 | | 9 | | I think that this figure is unnecessary as long as Fig. 8.1.2.a exists. | Shows regional differences |
| 14749 | 8 | 9 | - | 9 | - | Error in the legend - REF?. You need to explain the regional abbreviations - MAF? | Agree. |
| 15315 | 8 | 9 | 8 | | | I'd make the "from 1970-2008" into "from 1970 to 2008" (to be consistent & to remove that low-riding hyphen ;-) ). Odd to see no dark green for top band of this & the prior figure (for indirect N20 emissions). That makes readers think something is missing, or why even show that in the legend if it really doesn't factor in. Probably should have that in the "Other" categories shown. | Agree. Will amend or incorpoate into "other" |
| 15116 | 8 | 9 | 9 | 9 | 9 | To which year do the percentages 6.8% and 8.2% refer? | Amended - 2008 |
| 2661 | 8 | 9 | | 9 | | Spell out acronyms at top of table 8.1.1b | Amended |
| 2662 | 8 | 9 | 3 | 9 | 6 | Reference to AR4 - can this be updated with more recent information on growth rates? | Good to refer to earlier report- Now |
| 3411 | 8 | all | | | | Impressive piece of work! | OK |
| 17134 | 8 | Page27 | | | | COMMENTS:<br>- Only gasoline fueled Auto-motor vehicles are set to be baselines<br>- GHG emissions per passenger km travelled should be compared based on annual average occupancy of vehicles. Besides, this figure needs to also include updated PHV and BEV LCA results, otherwise this would mislead readers and societies.<br>- There is a comparison study on LCA of CO2 emission between next generation vehicle including HV and EV and public transportation including LRT, etc. (Y. Yamada, H. Kato, N. Shibata and K. Ito, Nagoya University (2011), The Institute of Life Cycle Assessment, Japan 2011, A Methodology for Choice of Low Carbon Transport Mode Fitting to Travel Scene and Transport Situation Based on LCA ). This study showed the result that automobiles can be lower carbon emitter compare to public transportation considering mass movement transportation situation, transportation situation in low DID population density and future technological innovation of fuel efficiency improvement. | Noted. Figure changed. The figure does base values on average occupancy. Assumed vehicles were empty. |
| 12576 | 9 | | | | | Legend for blue and green bars misssing (presumably these refer to the years 2006 & 2009). Also, this figure may be omitted (its objectiveness is not very clear) to meet the page limits of the chapter. | Accepted. Fix legend |
| 2901 | 9 | | | | | (Bretzke, 2005) is not in the References section at end of chapter | Accepted. Provide Henry/Katka with |
| 2902 | 9 | | | | | (Mapp, Nobbe, and Dunbar, 2011) is not in the References section at end of chapter | Accepted. Provide Henry/Katka with |
| 3508 | 9 | | | | | It is recommended to include various Green Mark Incentive Schemes, which are ongoing, but have been proven successful in upscaling the green building development take-up rate in Singapore so far. | Noted. If there are references, if there´s space |
| 2361 | 9 | | | | | The page constraint is recognized. One general idea could be to reduce text and move all key content elements to the tables. Focus the text to explain and synthesize the tables. (tricky thing…( | Accepted. Attempt more tables/figures |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16257 | 9 | | | | | The chapter mentions in the executive summary the importance of assessing the entire lifecycle of buildings, and particularly the important role of material choice for indirect emissions saving (new construction), however, beyond these general statements, it lacks more specific information on the relative relevance of building materials for total emissions (ev. also lack of information thereof) and potential mitigation options (particuarly relevant for developing countries that are currently urbanizing). | Accepted. Reduce text and move all key facts in tables |
| 10198 | 9 | | | | | EU27: Very good that which measures and measure effects are hypothetical is stated | Noted. No action |
| 15499 | 9 | | | | | (Whole chapter) Buildings - Very well documented and complete analysis - Having said that some parts need to be completed | Noted. Not clear what reviewer wants to be completed. However, my understanding is that; after addressing all the concerns by other reviewers then |
| 7788 | 9 | | | | | Considering the huge potential through the introduction of energy-efficient appliances/equipments especially in developing countries, Chapter 9 should address more on such potentials through the introduction of highly efficient equipments. For example, Morishita & Ghishi (2010) examined the potential of energy saving in the residential sector of Brazil, through the introduction of energy-efficient household appliances such as refrigerator, air conditioning, and electric shower. According to this study, replacement of incandescent lamps by fluorescent ones corresponds to a 14.5% per year average energy saving.<br>Besides, Boardman (2004) figured out that even in the U.K., introduction of energy-efficient domestic fridges and freezers resulted in a 15% improvement in the energy efficiency in 15 months.<br><br>(Claudia Morishita, Enedir Ghishi, “Assessment of the impact of energy-efficient household appliances on the electricity consumption in the residential sector of Brazil” Congress paper 244, World Energy Council (2010))<br>(B. Boardman, “New directions for household energy efficiency: evidence from the UK”, Energy Policy, 32, 1923-1933 (2004)) | Accepted. A separate section on Appliances and equipment and a summary table have been added. Our decision has been to not discuss specific technologies, but rather, to refer to sources of detailed information. |
| 2193 | 9 | | | | | Energy intensities are given in MegaJoules/m2 year in reference (Amstalden et al., 2007). A heating energy intensity of 195 kWh/m2 year (equal to 700 MJ/m2 year) should accordingly be mentionned in Table 9.4 at the corresponding position with a reduction of energy use down to 90 kWh/m2 year (equal to 320 MJ/m2 year). | Noted. |
| 2196 | 9 | | | | | MINERGIE-P (instead of MINERGIE-P5) should be written for Reg CH and reference [18]. | Rejected. Not applicable now - this level |
| 2199 | 9 | | | | | The Minergie Standard currently very favourable situation, discussed for page 17 (see comment above), should also be mentionned here (capture of 25% of the Swiss market of new constructions in 2012). | Rejected. Short space allowed |
| 17970 | 9 | | | | | Do you think that there are comoparable metrics in other chapters that could be compared to or even included in this figure? | Noted. The other sectoral chapters do not discuss analytically the employment impacts as a co-benefit of mitigation actions (there are only simple references). In the literature there are similar metrics at least for RES technologies. However, we think that |
| 18886 | 9 | | | | | As this table holds very much information that will probably be lost to the policy maker, try to consider extracting the essence of this table into figures, e.g. there could be a figure with y-axis "difference to baseline [%]" and another with y-axis "difference to base year". On the x-axis you would have for both a continuous part "delta time [yr]" and one column without time (for before/after data giving no time frame). | Accepted. Consider suggestion |
| 18889 | 9 | | | | | Is it possible to convert numbers in this table to LCCE? If so, that would be great! | Rejected. Would lose information |
| 18890 | 9 | | | | | Please make a figure from the LCCEs contained in the table. | Rejected. Would lose information |
| 18880 | 9 | | | | | Though there was very positive feedback to this figure at the Expert Review Meeting, having this figure is problematic, as in my view it is problematic to single out one or two scenarios. | Noted. Will be considered |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18893 | 9 | | | | | Given the arguments in line 15-19 I suggest to change (or ammend) the figure and have separate ones for the 5 world regions that we are using throughout the report (or for 3: developed, developing, EIT). As the figure is hard to read, please consider adding ranges at the right (like SRREN Figure SPM.9) for each of the six mitigation categories for the year 2050. In the text you could also take this figure as reason to discuss that the decarbonization of the electricity sector is not covered in your chapter, so that if this would take place and would be included the ranges would move downward. Please discuss with Ch.7 where you will centrally discuss this issue so that you can reference it from different points in your chapter as needed. | Noted. Will be considered |
| 18895 | 9 | | | | | Please make clearer which studies are sectoral and which IAM - this would pobably be interesting to identify possible systematic differences. (I understand that currently there is only on sectoral study.) | Noted. Will be considered |
| 7557 | 9 | | | | | This section will be eliminated because other sections can follow. | Rejected. Required FAQs |
| 7558 | 9 | | | | | This section will be eliminated or shortened because almost Q&A are contained in the body. | Rejected. Required FAQs |
| 7553 | 9 | | | | | This section will be eliminated or shortened especially 9.5.3. (For example, Soot emissions from cooking) | Accepted. Will be shortened |
| 7556 | 9 | | | | | This section will be eliminated or shortened especially 9.7.3. (For example, Environmental and health effects) | Noted. Taken into account. The text has been revised considerably and is more focued on buildings sector following the |
| 11698 | 9 | | | | | Section 9.1 contains only one subsection 9.1.1. If the summary of AR4 is only showing importance and GHG reduction potential of building sector, it should be unified into section 9.2. Alternatively, it should be outlined the "extensive discussion of the wide range of technical and design measures" of AR4, which is written at the line 22 to 23 of page 15. | Accepted. |
| 18860 | 9 | | | | | consider adding to the first paragraph the questions the chapter tries to answer | Accepted. |
| 18876 | 9 | | | | | Sort by size (either blue or green), this will help get more out of the figure. | Noted. Will consider |
| 9104 | 9 | | | | | Several statements and expressions should be described more accurately. The energy efficiency standard must be internationally harmonized. When a country's standard or measurement method is different from others, the promotion of efficient appliances will be delayed or can not be made perfectly there. The Japanese Top-runner Program is not MEPS. As the policies for market transformation depend on the status and conditions of the target market, they must be applied very carefully. Too many labels cause the confusion in the market. For example, there are detailed descriptions in the 'Good Practices Handbook for Market Transformation (Asia Pacific Partnership on Clean Development and Climate, 2008).' | Noted. Will consider |
| 3506 | 9 | | | | | It is recommended to include in this section a sub-section about building gross floor area incentive scheme. | Noted. Will consider |
| 9105 | 9 | | | | | same as above | Noted. Will consider |
| 18854 | 9 | | | | | Should it not rather be "in the building sector" rather than "in buildings"? | Editorial. |
| 8855 | 9 | | | | | Exteremely important section - There is a strong need to expand this section with statements on knowledge gaps and a summary of structured recommendations for future work; while reducing the pages other sections. Let's think about how will AR6 come back and focus in a few years compared with the completed AR5. | Rejected. Strict page allocation, unfortunately |
| 3490 | 9 | | | | | It is recommended to add a sub-session (called 9.2.3.3) to discuss about another major driver, which is the rise of household income in developing countries.<br>For more discussion about the driver, please refer to [Cam C.N.W. (2012). Technologies for Climate Change Mitigation: Building Sector. Denmark: UNEP Riso Centre.] | Noted. Urbanization and economic activity |
| 12578 | 9 | | | | | Ideas expressed here overlap with 9.2.3.1 - may be combined | Accepted. Avoid overlap |
| 9102 | 9 | | | | | There are no descriptions about Japanese frontier activities such as the CO2 zero emission house by the combination of energy-efficient equipments, solar battery, fuel cell co-generation system, Lithium ion rechargeable battery and their linkage by HEMS with efficient house insulations ( N.Shibaike and T.Hajima, Concept of a Lifestyle with Net Zero CO2 Emissions, Proceedings of Care Innovation 2010, CARE Electronics, 2010, 1.5.2. ). | Rejected. Our decision has been to not discuss specific technologies, but rather, to refer to general sources of detailed information. |
| 9103 | 9 | | | | | same asa above | Rejected. Same as above (comment no |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2879 | 9 | | | | | Add Ft. Polk military base 4000-home retrofit study to the table: Building type & location - 1994-1995 -- 4003 homes on Ft. Polk military base in Louisiana, USA retrofited with package of energy savings measures predominantly based on ground-source heat pumps under a 20-year energy savings performance contract (ESPC) to an energy services company (ESCO); Energy savings - 32.5% reduction in pre-retrofit electrical energy use, 40% reduction in electric peak demand, complete elimination of natural gas usage in base housing (all figures apply to total base housing); Economics - estimated annual energy and system maintenance cost savings to Ft. Polk is $3.2 million ; References - (Hughes and Shonder, 1998; Shonder and Hughes, 1997a; Shonder and Hughes, 1997b) | Rejected. Old reference - we've generally stuck to post-AR4. Even the case studies already in the FOD have been eliminated, following other comments - now we present only generalized results (but for separate end use categories) |
| 3492 | 9 | | | | | If case studies are mentioned, it is more appropriate for a report at the global scale like AR5 to make an attempt to include case studies from all continents or climatic regions, rather than overtly focus on only a few countries. | Noted. If case studies are retained, we've attempted to get what we can from all regions. |
| 12847 | 9 | | | | | A prominent example that could be added here is that the Empire State Building is slated to cut energy use by 38% from 2013 on, saving an estimated $4.4 million a year. Monitoring of the effectiveness of retrofit measures so far indicates that the project is on track to meet its goals. See: http://www.esbnyc.com/documents/sustainability/ESB_2011_Annual_Savings_Report.pdf | Noted. |
| 18878 | 9 | | | | | Maybe it is possible to develop a figure on the findings in this section, either giving % savings compared to BAU or by showing a qualitative cascade (or ranges) of which measures bring which improvements. | Noted. Will be considered |
| 3493 | 9 | | | | | This section should include a few additional paragraphs, highlighting the relevant technologies that have the ability to circumvent/mitigate the issues caused by negative behavioural aspects. | Accepted. Regulation for energy saving can tackle it. |
| 7552 | 9 | | | | | Eco-point system for housing in Japan has to be mentioned:<br>http://www.env.go.jp/en/wpaper/2011/pdf/22_Chapter4-3.pdf<br>For example, insert the following sentences.<br>The eco-point system for housing is similar to the one for home appliances. The objectives of the eco-point system for housing are to promote global warming countermeasures and revitalize the economy. Under this system, users can receive points for the construction of an “eco-house” or for doing a renovation with energy saving features, and can exchange those points for various products or for additional renovations. As a result of the introduction of this system, energy saving eco-houses are increasingly widespread. Since the system started, the total number of renovations and new construction combined increased from approximately 3,000 in March 2010 to approximately 75,000 in March 2011 (MOE Japan 2011). | Accepted. Consider suggestion by Writing Team. Add ‘housing eco-point system’ to "Comments" column "Grants and subsidies are economic incentive, in the form of funds transfer" row in Table 9.10. |
| 8852 | 9 | | | | | Shorten the section, improve the subsection 9.4.4 on costs by adding some quantified data. | Accepted. 1. Shorten entire section 2. Improve section 9.4.4 |
| 3494 | 9 | | | | | This section, “Urban Form and Human Settlement”, is too superficial, and indeed needs to rewrite substantially. In this category, land use planning is only one of many important affiliate plans that influence green house gas emissions. Other climate impactful affiliate plans are (1) green and blue network plan, (2) site coverage plan, (3) plot ratio plan, (4) building height plan, (5) amenities distribution plan, etc. It is highly recommended that each of the above affiliate components/plan is deserved to have one dedicated sub-section for sufficient analysis and assessment. | Accepted. To be discussed with Chapter 12 where the substantive section should be |
| 3496 | 9 | | | | | In this section, while “heating technologies" were received much attention by the authors, various "cooling technologies", including "district cooling" have not been adequately captured. | Accepted. 1. Provide clarity about the fact that cooling is generally provided by electricity and… |
| 3497 | 9 | | | | | It is recommended to include in the discussion the principle: plan for expansion, but do not size it. Please refer to [Graham C. I. (2009). High-Performance HVAC. In Whole Building Design Guide. Washington D.C.: National Institute of Building Sciences.] | Rejected. |

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| 4578 | 9 | | | | | Along with climate change feedbacks in energy consumption for buildings, there is also a potentially strong feedback between renewable energy policy, energy system transformations and building energy consumption. As energy systems are transformed from fossil-fuel-dominance to renewables, there may be advantages to increasing electricity shares in building energy consumption, replacing natural gas or other fossil-based direct combustion. At present, in most areas, however, increasing electricity use in the building sector would result in an increase in CO2 emissions. If buildings are constructed with current energy system parameters in mind, then the lock-in effects make changes to dramatically lower future emissions more difficult. | Rejected. Discussed in 9.4 No need in here. |
| 8853 | 9 | | | | | Very important section. However, results from limited studies cited in this section could present a bias and significant uncertainties in the predictions (e.g., 9.5.1). As a whole, we need more studies here and probably shall state knowledge gap and needs/recommendations for further studies, on global and regional levels. References and findings in section 9.5.2 (geo-engineering) seems to be US centric, shall add more validated outcomes from regional studies in developing worlds, e.g., China, India, Indonesia, etc. An example citation: Tengfang Xu, Jayant Sathaye, Hashem Akbari, Vishal Garg, Surekha Tetali. 2012. Quantifying the direct benefits of cool roofs in an urban setting: Reduced cooling energy use and lowered greenhouse gas emissions. Building and Environment, Volume 48, February 2012, Pages 1–6. http://dx.doi.org/10.1016/j.buildenv.2011.08.011. | Noted. Taken into account.<br>We didn't find additional studies on global level but several others on national and regional level confirm the results presented in our text (less heating, more cooling, increased electrification). We included in the text some additional references regarding national/regional studies. |
| 18863 | 9 | | | | | Add legend explaining which is 2005 and which 2000. Consider using colour coding for the 5 economic world regions we are using in the report, so that a (possible) clustering can bee seen. For the years 2000 could be coloured a bit greyish to distinguish the years. | Rejected. Not relevant to 9.5. It belongs to 9.4 |
| 7554 | 9 | | | | | There are global activities such as GSEP Coolrool & Pavement WG and has to be mentioned.<br>For example, insert the following sentences.<br>It is estimated that increasing the earth's reflectivity by 10 percent by adopting cool roofs and surfaces in hot climates would have a cooling effect equivalent to reducing greenhouse gas emissions by 44 billion metric tons of carbon dioxide over the 20-year life of the roof (2.2 billion metric tons annually). That is the rough equivalent of either eliminating global anthropogenic emissions for more than a year or taking 1 billion cars off the road for 11 years (GSEP 2012).<br>http://www.cleanenergyministerial.org/our_work/buildings_and_industry/cool_roofs.html | Accepted. Will see how can be addressed. |
| 7555 | 9 | | | | | Other related report can be found at a the following site.<br>http://www.miracool.jp/wp-content/uploads/thesis16.pdf | Accepted. Will see how can be addressed. |
| 18883 | 9 | | | | | Consider converting numbers in this section into a figure or table | Accepted. Will see how can be |
| 12582 | 9 | | | | | General comment: this section may be shortened (thereby reducing the overall length of the chapter) | Accepted. Has been shortened and re- |
| 8854 | 9 | | | | | Extremely important section. However, ther is a lack of cost per energy saving data with known uncertainties and consistent rigors among the data compiled. Also, while it may help reader understand the role of payback time in common decision-making practices by introducing such concept. I view this rather disturbing in the IPCC report because it is not a good metric/criterium to use, let alone to promote it whether or not it's intentional. For the worth of it, I'd suggest the section to be written surrounding the concept of cost of conserved energy as a way to judge cost effectiveness.... As a whole, we need more studies here and shall state knowledge gap and needs/recommendations for further studies, on global and regional levels, on different time frames. Again, references and findings in section 9.6 seems to be model based, with huge uncertainties not necessarily acknowledged. We shall add more validated outcomes from regional studies in developed and developing worlds, e.g., China, India, Indonesia, Brazil, etc. | Noted. LCCE will be computed where-ever possible if not already published. We genrally refer to CCE, but also mention payback time when it is short and is given in the cited literature. We agree with the point that payback time is the wrong metric when the payback time is long but the CCE is still less than the cost of energy. We have not been able to find any studies from developing countries giving the incremental cost of |
| 18864 | 9 | | | | | As the cooling/heating needs in different countries very much depend on the climate, this is besides the stage of development probably one of the main drivers. So I suggest to point this out in the text or even cluster by different climates focus on the other factors. | Rejected. Comment unclear |
| 18885 | 9 | | | | | This section has no text, please add to explain table. | Accepted. Editorial |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17969 | 9 | | | | | Introductory sentences like the ones in Chapter 10 might be a good idea to prepare the reader for the following discussions: "Besides economic cost aspects, several other aspects have implications on the final deployment of mitigation technologies. Co-benefits, co-costs, risks and uncertainties associated with alternative mitigation technologies as well as public perception thereof can affect investment decisions of companies and priority setting of governments." | Accepeted. Text revised. |
| 18865 | 9 | | | | | Consider changing this figure in the following manner: In order to see how different the development is throughout the world (and to hint at what might be coming with business-as-usual development) giving all numbers PER CAPITA might be more insightful. To preserve the info contained in the current figure, three stacked bars could be added, one for each building type, stacking the absolute number of the different world regions (colour code should then be for these bars for the world regions). This would allow better comparision between the regions and give the total world numbers, too. | Rejected. This comment is not related to the figure included in Section 9.7 |
| 12583 | 9 | | | | | Scope of shortening with focus on building related aspects only | Accepted. Text shortened. |
| 3503 | 9 | | | | | It is recommended to include a sub-section on the benefits of application of urban green roofs and vertical green towards reduction of urban heat island effect, and biodiversity restoration in urban setting. For details, please refer to [Cam C.N.W. (2012). Technologies for Climate Change Mitigation: Building Sector. Denmark: UNEP Riso Centre.] | Accepted. Text added. |
| 17974 | 9 | | | | | This section should rather be moved to section 9.7.2 since it related to an economic effect (i.e. productivity) rather than to helath. | Accepted. |
| 17976 | 9 | | | | | This section is solely about the rebound effect which is not a technological risk, but an economic response to relative prices changes. It should thus be discussed in the section 9.7.2.<br>Please consider a broader discussion of risks and uncertainties along the classification of risks and uncertainties provided in Section 6.7. Please liaise with the other sector chapter LAs to discuss the process by which a more consistent approach can be reached. | Accepted. Taken into account. The rebound effect is now discussed under 9.7.2. We mention risks associated with mitigation (see 9.7.1) but in the buildings sector risks are less important |
| 18853 | 9 | | | | | This section and Section 9.7.5 both have "public perception" in the title - try to clarify the titles so that it becomes clearer which aspects are discussed in which section. | Accepted. |
| 17977 | 9 | | | | | This section is instutional aspects that should be discussed in the policy section; but the section does not discuss public perception of mitigation actions in the building sector which seems to be a gap in the current state of the chapter. | Accepted. Taken into account. There are some overlays between capacity building and policies, here addressed |
| 17978 | 9 | | | | | An recommended usage of the introductory sentence to this section to the other Chapters to refer to the agreement reached in Wellington (p. 36) which might be helpful for readers: "Barriers and opportunities are referred to as conditions that hinder or facilitate the implementation of the analyzed measures." | Accepted. Incorporated |
| 18894 | 9 | | | | | "compare a few selected bottom-up and top-down building sector sceanrios": Please discuss this e.g. at SIE-3, as singling out few IAM scenarios will probably be problematic. | Noted. Will consider |
| 3093 | 9 | | | | | This is quite long and uses a lot of jargon. This should be cut to around 2 pages similar to other sector chapters (e.g. industry & agriculture). For example, the last section (from line 37 on page 6 can be cut - far too much detail on methodology that is unnecessary for an exec summary) | Accepted. |
| 2908 | 9 | | | | | The following references seem to not be cited anywhere in Chapter 9: ACEEE (2010); AEA (2011); Anderson and Leach (2009); APERC (2010); BETMG (2012); BPIE (2011); Cabeza et al (2013); CB (2012); CPI (2011); Dascalaki and Santamouris (2002); DECC (2011); Dili et al (2010); DPMT (2009); ECEE (2011); Enlighten (2010); EPC (2008); EU (2002); FI (2005); GMCF (2009); Gov't of Latvia (2011); Gov't of Slovakia (2011b); Gov't of Finland (2011a); Gov't of Ireland (2011); Jarvey (2008); Hayes et al (2011); Healy (2004); Holmgren (2006); IEA (2003); Kahn (2008); Kazuari (2007); Knigge and Gorlach (2005); LDA (2011); Li and Colombier (2011); Luttmer (2006); MacKellar et al (1995); MIKR (2011); Missaoui and Mourtada (2010); MLIT (2010b); Montanya et al (2009); Pavan (2008); Price et al (2011); Schneiders et al (2009); Togeby et al (2009); Uitdenbogerd et al (2009); UK DE (2011); UNEP Risoe (2012); UNHSP (2009); Urge-Vorsatz and Tirado Herrero (2012); Van Wie McGrory et al (2006); Wiel and McMahon (2005). | Accepted. Find these references |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2854 | 9 | 0 | | | | In many places (example - Executive Summary, pg 1, line 1) there are cmments like [high agreement, robust evidence] or similar. Why are these needed? I suggest deleting and several lines of texxt could be eliminated. | Rejected. Mandatory inclusion |
| 8974 | 9 | 0 | | | | There few sections that the titles do not reflect the contents. E.g. 9.3.3.3, 9.6.3.2, and 9.7.4. Though this review shall not make any comment on the language, some sections are not easy to understand due to the structures of the sentences | Accepted. Problems fixed |
| 12339 | 9 | 0 | | | | General comment: This chapter should also deal with the cooling agents used in air-conditioning equipment, heat-pumps and commercial refrigeration. Rationale: The use of cooling equipment in buildings is increasing and choices with regard to the the phasing out of existing agents (CFCs, HCFCs anf HFCs) and the alternatives (HFCs, natural agents, natural cooling) will have significant implications on total CO2-equivalent emissions from the sector.The IPCC special report "Safeguarding the Ozone Layer and the Global Climate System - Issues Related to Hydrofluorcarbons and Perfluorcarbons" (Chapter 4 and 5), as well as more recent publications, might serve as a basis for this coverage. | Accepted. |
| 16948 | 9 | 0 | | | | I regret I have not had time to review the Sectoral chapters in depth. It may be interesting to illuminate the hypothesis that the Buildings sector is the most heavily dependent upon “First Domain” characteristic, and in particular to liaise with FOD Chapter 2 on how they relate to “System 1” decision-making systems laid out there. This is the broad suggestion laid out in the structure-setting Chapter 3 of Grubb, Hourcade and Neuhoff, Planetary Economics: the Three Domains of Sustainable Energy Development, Taylor & Francis forthcoming (Chapters 1 – 5 submitted, others in draft available on request). See also Chapters 4 and 5 on the theory and evidence respectively around energy efficiency policies.<br>The authors also really need to liaise with Chapter 3 discussion of cost curves to try and bring some consistency to the IPCC report. | Accepted. 1. Liaise with Chapters 2 & 3; 2. Check cost curves |
| 2186 | 9 | 0 | | | | Chapter 9 gives an excellent overview of the current GHG emission trends and mitigation options of the building sector for the upcoming decades. It outlines the potential of state-of-the-art green building technologies with a focus on the contribution and opportunities offered by building refurbishments. The chapter is written using a clear style and includes enough scientific references to convince most readers about the importance of the building sector for the mitigation of climate changest. However repetitions can be observed in many sections of Chapter 9 and could simply be avoided by a further text polishing in order to reduce the pages number down to 40 pages (instead of 56 pages). | Accepted. Repetitions will be dealt with. |
| 15678 | 9 | 0 | | | | Chapter 9 is party difficult to read, because not all sections and subsections are at the same "level". With that, I mean that some sections with rather relevant information are put in subsubsections, whether less relevant information or additional examples are put in sections. In my comments, I now and then tried to rearrange some sections and subsections in such a way that it became more understandable to me. But it's of course just my opion. | Accepted. Re-structure the chapter; albeit within the constraints of the headings providerd by IPCC; which we have very little room to manoeuvre. |
| 18769 | 9 | 0 | | | | Please consider discussing planned obsolesence in context of sustainability or reference Ch.10 where this might be centrally discussed. | Noted. Covered indirectly. Will be done directly if a reference is found |
| 18972 | 9 | 0 | | | | General Comment: Storyline and strategies. The chapter is already in a good state, but please try to focus it more on answering: What are the different sectoral options/pathways to reduce emissions? What is their potential? What do they cost? What are the policy instruments that can facilitate this? And what are the trade-offs? Further, better carve out the barriers that hinder potentials being realized. For this consider shortening 9.1 through 9.6, particularly 9.3, (see comment on redundancies) and reorganizing 9.7 through 9.10. Try to introduce pros and cons of different options and trade-offs between them (e.g. NZEB, Passive House). Ensure that the approach you take on this is compatible with the other sectoral chapters to enable comparison and possible synthesis. | Accepted. 1. Story lines and strategies to be strenthened; 2. Re-organized 9.3 & 9.6; 3. Shorten section 9.1 and 9.2; 4. Reorganise sections 9.7-9.10 |

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| 18973 | 9 | 0 | | | | General Comment: Kaya identity. The Kaya identity is already well used in structuring the chapter. There are some section, though, that would be good to also use this approach, e.g. the policy section, where for different policies it could be described to which Kaya component (and how much) they could contribute to. Also, it would be very good if now the quantitative side of the Kaya approach could be taken on – if sufficient data exists. | Accepted. Include quantitative side of Kaya identity |
| 18974 | 9 | 0 | | | | General Comment: Trends and drivers. Try to introduce forecasts/scenarios about expected increase of floor space, change of number/types of buildings, etc. and provide (e.g. back-of-the-envelope calculation) numbers incl. consequences (e.g. contributions to Kaya components). | Accepted. Introduce forecasts/scenarios about expected increase in floor space, … |
| 18975 | 9 | 0 | | | | General Comment: Redundancies. There are overlaps and redundancies between Sections 9.3, 9.6 and 9.9, especially concerning mitigation options. Technologies could be presented more briefly. | Accepted. Eliminated redundancies between 9.3, 9.6 and 9.9 |
| 18976 | 9 | 0 | | | | General Comment: For all sectoral chapters there must be more clarity about what is covered in 9.6 and what in 9.9. The coming meetings should work on this. | Accepted. Streamlined |
| 18977 | 9 | 0 | | | | General Comment: Unified metrics. Unifying metrics would allow further comparison and synthesis. Sections 9.3.3 and 9.3.4 are very detailed and should be synthesized, e.g. – if possible – by unified metrics and by giving ranges. Please also try to be transparent about and possibly standardize discount rates and economic payback time. | Accepted. Section 9.3 completely rewritten with these comments in mind |
| 18978 | 9 | 0 | | | | General Comment: Interlinkage. Improve the (explicit) linkage to Chapter 12. | Accepted. |
| 18979 | 9 | 0 | | | | General Comment: Key message. Have a more prominent discussion of the danger of lock-in including quantification if possible [Section 9.4.5] | Accepted. |
| 18980 | 9 | 0 | | | | The chapter is still over its page limit. I suggest to particularly shorten Section 9.3 | Accepted. Shorten section 9.3 |
| 18981 | 9 | 0 | | | | Try to include more bottom-up studies in the transformation pathways section. | Noted. Within strict page limit |
| 18982 | 9 | 0 | | | | When evaluation policies, more attention needs to be given to multi-level governance | Noted. Where specific to building sector |
| 3648 | 9 | 0 | 0 | | | Overuse of abbreviations. Please reduce. | Accepted. Check all abbreviations |
| 7703 | 9 | 1 | | 86 | | I appreciate that much of the literature in this field is in the grey literature, including government reports. Just relying on the white literature greatly reduces the strength of the conclusions that can be reached. Personally, I have no problem reporting grey literature. But one should be very circumspect about drawing broad conclusions about how much mitigtion can be achieved at what cost from that grey literature. I would suggest backing off on the conclusions so that only those that are clearly supported appear. | Noted. Will consider |
| 9215 | 9 | 1 | 1 | 1 | 1 | Some contents of Executive Summary are not in the body text. So corresponding descriptions are necessary in the body text. Especially, since efficient improvement of energy consumption appliances are essential for CO2 reduction, latest information of technologies should be introduced in the body text. | Noted. It is better that Executive summary and body text have the same structure. Usually readers expect the summary summarizes the body text. Therefore, it is favorable to conform the |
| 4584 | 9 | 10 | | | | (Labeled as "Table 10.1") It seems that PE demand would also be an important metric, since carbon emissions will depend on that. | Noted. Will consider |
| 9545 | 9 | 10 | 7 | 10 | 10 | Please, replace text with the following; residential electricity consumption has been growing at an average of 3.4% globally between 1990 and 2006. It is mainly consumed in cooking, water heating, space heating, space cooling, lighting, and the use of appliances and electronic equipment. The share of electricity in each end-use category varies among countries depending on country circumstances, particularly climatic conditions and economic development level. (Energy efficiency policy and carbon pricing, 2011, IEA, p17). Energy consumption in the buildings sector is reduced by around one-third of the Baseline scenario level in 2050 (Technology roadmap Energy-efficient Building,2011, IEA, p6). Energy savings in residential space heating account for around a quarter of the savings.(ETP 2010, IEA, P223) | Noted. Grey literature? These detalis have been removed in FOD for saving space. Not the place for energy savings. |
| 3110 | 9 | 11 | | | | surely there are some more up to date figures than 2005? | Accepted. Seek for recent data; It refers to Table 9.2 and figure 9.5 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2866 | 9 | 11 | 14 | 11 | 14 | change ". . .keeping the same or having better living standards imply increasing demand. . ." to ". . .constant or improved living standards imply increased demand. . ." | Accepted. Should change statement as suggested. |
| 6619 | 9 | 11 | 15 | | | Remove the reference to energy service from this section, which deals with the scale of buildings | Accepted. Kaya identity should be used and then services can be examined |
| 2865 | 9 | 11 | 8 | 11 | 8 | change ". . .metrics of scale. . ." to ". . .metrics for scale. . ." | Accepted. Should change statement as |
| 4583 | 9 | 11 | | | | "Number of residential units" does not necessarily seem to be a good metric, since houses can also increase in size dramatically over time, e.g. In the US | Rejected. No such data available for all regions |
| 15212 | 9 | 11 | 12 | 11 | 13 | In this part the data are behind the times, and in order to calculate the growth rate, the data source should be unified. | Accepted. Check |
| 4582 | 9 | 12 | | | | Cannot distinguish light blue and white in legend | Accepted. Legend should be improved |
| 4581 | 9 | 12 | | | | Would be useful to have a longer term view, not just 2000-2005. For example, throughout the 20th century | Rejected. Data available provided |
| 2886 | 9 | 12 | 13 | 12 | 13 | (IEA, 2010b) is not in the References section at end of chapter | Accepted. |
| 6621 | 9 | 12 | 15 | | 17 | The last sentence of the paragraph reads obvious and unessential | Accepted. |
| 18862 | 9 | 12 | 4 | | | unit for 2.9 missing | Accepted. Provide units |
| 2867 | 9 | 12 | 5 | 12 | 5 | change ". . .space and hours of air conditioning is an important driver. . ." to ". . .conditioned space and hours of air conditioning are important drivers. . ." | Accepted. Consider making changes as suggested by reviewers |
| 6620 | 9 | 12 | 5 | | 6 | Remove the whole sentence, which deals with energy service but not with the scale of buildings | Accepted. Kaya identity should be used and then services can be examined |
| 2868 | 9 | 12 | 7 | 12 | 7 | change ". . .building's. . ." to ". . .building. . ." | Accepted. Should change word as |
| 16888 | 9 | 13 | | | | It would be very interesting to see this broken out by climate zone as well. | Noted. If data is available |
| 18866 | 9 | 13 | 10 | | | "new types of energy services": Please define or give examples. | Accepted. Provide examples of energy |
| 4988 | 9 | 13 | 3 | 13 | 4 | Sentence: Energy intensity for residential buildings ……as shown in figure 9.6. Is it for resenditial buildings or for all buildings as in title of figure 9.6 | Accepted. Delete the word residential |
| 13518 | 9 | 13 | 3 | 13 | 4 | Sentence: Energy intensity for residential buildings ……as shown in figure 9.6. Is it for resenditial buildings or for all buildings as in title of figure 9.6 | Accepted. Delete the word residential |
| 3095 | 9 | 13 | | | | No mention here of climate - it's the key reason why Iceland and Canada are right at the top (high heating requirements), whereas other countries at similar levels of development like France and the UK are lower down (lower heating requirements and also limited air con needs) | Accepted. Include a line about the climate influence, but without missing the point of the influence of the level of |
| 11699 | 9 | 13 | 1 | 13 | 7 | The description is required that the difference of energy consumption among countries come from not only the difference in economy but also the difference in climate. | Accepted. Include a line about the climate influence, but without missing the point of the influence of the level of |
| 15215 | 9 | 13 | 6 | 13 | 7 | In this figure the data of Korea is wrong, see sheet 'figure modified' | Noted. OK but couldn't find the sheet |
| 2870 | 9 | 14 | 12 | 14 | 12 | change ". . .projected to. . ." to ". . .will. . ." | Editorial. |
| 18868 | 9 | 14 | 13 | | | "... population": add until/by when | Editorial. |
| 2871 | 9 | 14 | 14 | 14 | 15 | change ". . .despite the fact that the rural population is still larger with as high values as. . ." to ". . .up to. . ." | Accepted. Should state as suggested. |
| 18869 | 9 | 14 | 15 | | | "... for the US": give reasons, e.g. higher living standards in cities | Accepted. Should state as suggested. |
| 2872 | 9 | 14 | 16 | 14 | 16 | change ". . .use until. . ." to ". . .by. . ." | Accepted. Should state as suggested. |
| 2869 | 9 | 14 | 2 | 14 | 4 | reword first sentence on page 14 as follows -- Increased size and daily usage hours leads to increased energy consumption and building emissions (Zhou et al., 2008; Zhang, Jiang, et al., 2010). | Rejected. |
| 18870 | 9 | 14 | 20 | | | "since 2007": Please give range instead to be clear when study took place. | Accepted. Include 2007-2008 as range |
| 2887 | 9 | 14 | 21 | 14 | 21 | (ABC, 2008) is not in the References section at end of chapter | Editorial. |
| 6623 | 9 | 14 | 26 | | 27 | Without more detail, this sentence is quite uninformative. Either develop it or delete it. | Accepted. Develop sentence as suggested by Writing Team. Could be developed by adding that, by 2050, 82% |
| 2873 | 9 | 14 | 27 | 14 | 27 | delete the phrase "than in the other income groups" | Accepted. Delete the phrase |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6624 | 9 | 14 | 30 | | 31 | The first two sentences of section 9.2.3.2 are not clear | Accepted. Delete phrase as suggested by Writing Team. DELETE "Such totals do not show, however, huge inequalities." |
| 6625 | 9 | 14 | 33 | | 35 | This sentence reads unessential | Rejected. None. It's one of our key |
| 2888 | 9 | 14 | 37 | 14 | 43 | (WBSCD, 2006) is not in the References section at end of chapter | Editorial. |
| 7492 | 9 | 14 | 38 | 14 | 43 | "Providing energy to the more than 1 billion people without access to electricity (Pachauri 2012), as well as to the 2.7 billion people, nearly 40% of humanity (Hailu 2012), who do not have clean cooking facilities is one of the world's most critical development challenges. The ways these energy services are provided will significantly determine building-related emissions, since energy sources and technologies vary greatly between regions (WBCSD 2006)". Most rural people have access to kerosene and urban people to coal, kerosene LPG/natural gas. They also have access to electricity. For rural people it is availability and cost that are the important factors and for urban people it is the coost of the various fuel type. Electricity is an expensive cooking fuel and in many cases the supply is unreliable. Simple initiatives can provide 'clean cooking facilities'. They include: better ventilation if cooking indoors: dryer biomass fuel: in improved and more efficient stoves (with chimney for indoor cooking): and better kitchen practices etc. Using unprocessed biomass and charcoal are important household fuels as Figure 9.8 indicates. They will be around for many decades so these households should be helped. I should add, that wood etc. are important fuels in the service sector in developing countries – about 10% of household energy use. This is not shown in Figure 9.8. | Rejected. Too much detail, not enough space. Biomass in services sector is actually reflected in Fig. 9.8 |
| 2889 | 9 | 14 | 39 | 14 | 39 | (Pachauri, 2012) is not in the References section at end of chapter | Accepted. |
| 2874 | 9 | 14 | 39 | 14 | 40 | delete the phrase ", nearly 40% of humanity (Hailu 2012)" -- Hailu 2012 is not in the References Section at end of the chapter | Accepted. |
| 6626 | 9 | 14 | 39 | | | I couldn't find Pachauri 2012 in the reference list | Accepted. |
| 9427 | 9 | 14 | 4 | 14 | 8 | ・ Addition is needed as shown below.<br>・ To avoid misunderstanding, following description is necessary.<br>(following the passage of "By 2050, emissions from the building sector, including those associated with electricity use, willcould nearly double from 8.1 Gt to 15.2 Gt CO2 according IEA Energy technology Perspective reference scenario (IEA, 2010). ")<br>Currently, both space heating and cooling as well as hot water are estimated to account for roughly half of global energy consumption in buildings. Most of CO2 emissions from space heating and water heating are caused by combustion of fossil fuels and also the demand for cooling is rapidly increasing in developing countries (IEA Technology Roadmap, 2011 and IEA-ETSAP and IRENA Technology Policy Brief E19, 2012). ・ Refer to the following<br>documents.<br><br>①IEA Technology Roadmap<br>Energy-efficient Buildings: Heating and Cooling Equipment<br>②IEA-ETSAP and IRENA © Technology Policy Brief E19 – March 2012 - www.etsap.org - www.irena.org | Rejected. Don't think this explanation in really necessary taking into account our space limit. |
| 2890 | 9 | 14 | 40 | 14 | 40 | (Hailu, 2012) is not in the References section at end of chapter | Accepted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3649 | 9 | 14 | 43 | 14 | 43 | Please add "E.g. in rural and urban China, coal lost shares as the most important heat energy supplier. Especially in urban areas, coal was substituted by natural gas. In rural areas, the trend for coal is similar, however here, coal as the main primary energy supplier was substituted by electricity as a secondary energy supplier which to a large extent is also fuelled by coal. As even high-end ultra-super critical power plants only have an energy efficiency of 45% (co-generation is not used as there is rarely district heating in rural areas), in the end, the coal consumption in rural areas did not change. Coal stoves with a low energy efficiency of maybe 50% were substituted with electricity generated with an energy efficiency way below 45%. Average rural power generation efficiency may be estimated with between 30% and 35%. However, convenience and indoor pollution decreased through the utilization of electricity for heating purposes (Oberheitmann, 2012)". Cite as: Oberheitmann, a: (2012). CO2-emission reduction in China's residential building sector and contribution to the national climate change mitigation targets in 2020. Mitigation and Adaptation Strategies for Global Change, 17, 769-791 (R). DOI 10.1007s11027-011-9343-5. | Noted. Too much detail for an example of a single country (altough a significant one) given our space restriction. I could try to get the main idea in one sentence Provide a short sentence to summarise the whole idea |
| 18867 | 9 | 14 | 5 | | | Grammar/orthography: "are expected to" instead of "willcould" | Accepted. Check and deal with grammar |
| 18872 | 9 | 14 | 6 | | | "reference scenario": I suggest to state that "reference" means "BAU" as this might not be clear otherwise to everyone - but maybe "reference" is also well enough established. | Accepted. Clarify usae of "reference scenario" or BAU |
| 2189 | 9 | 14 | 9 | 14 | 28 | Urbanization can lead to more efficient and sustainable construction forms than rural areas, in particular in regard to transportation: this should be mentionned. See reference Dujardin S. at al, Home-to-work commuting, urban form and potential energy savings: a local cale approach to regional statistics, Transpoatation Resaerch part A: Policy and Practice, 46(7), pp. 1054-1065, 2012. | Rejected. For Chapter 12. |
| 3096 | 9 | 14 | | | | I presume an important issue here is that urbanization tends to be accompanied by higher energy service requirements (e.g. air con, appliances) as people's incomes tend to be higher in urban than in rural areas? | Accepted. Review text |
| 8975 | 9 | 14 | 22 | 14 | 24 | Suggest to use the same basis of growth rate for Japan (e.g. m2 per year). That would be clearer and fair for comparisons. | Rejected. Unclear |
| 6622 | 9 | 14 | | | | This discussion does not provide an intuitive understanding of the issue of urbanization. On the one hand it seems like it increases energy consumption, but on the other hand it is stated later in the text (section 9.4.1) that compact urban forms can lower energy consumption. The two effects should be very briefly commented on | Noted. They are complementary perspectives of urbanization. 9.2 is about drivers and trends, and urbanization as a driver of energy use, while 9.4 compares urban forms and their impacts on |
| 7029 | 9 | 14 of 86 | 8 | 14 of 86 | 8 | Add "and so, it'd be worthy to transfer them modern technologies and technologies for renewable energy sources, in order to reduce those emissions". | Rejected. Don't think this is the place to such statement |
| 7030 | 9 | 14 of 86 | 18 | 14 of 86 | 18 | Substitute "industrialized" for "developed", after "with 1% in", around the middle of the line. | Accepted. For consistency replace "industrialised " with "developed" |
| 2358 | 9 | 15 | | | | Good figure, examine whether a "post abatement view" of the right hand side column (energy by usage type) is possible, will give an indication how much you can reduce each usage bucket | Accepted. Include iconic graph |
| 6627 | 9 | 15 | | | | Figure is very hard to read | Accepted. enlarge figure |
| 2875 | 9 | 15 | 10 | 15 | 10 | change ". . .buildings (Jennings et al., 2011). In OECD countries, the rate of new construction is low. Annual new. . ." to ". . .new buildings (Jennings et al., 2011). In OECD countries, annual new. . ." | Rejected. Not agree |
| 18871 | 9 | 15 | 12 | | | "0.6% - 16%": Please check whether that wide range is actually correct. | Accepted. Check correctness of range |
| 2876 | 9 | 15 | 13 | 15 | 14 | delete the sentence "Retrofit of existing buildings is an important strategy for developed stocks." | Accepted. Delete sentence s requested |
| 2877 | 9 | 15 | 15 | 15 | 16 | change ". . .the 1990s. In China, for example, more than 90% of buildings have been built since 1996." to ". . .the 1990s - more than 90% in China." | Accepted. Change as suggested |
| 12577 | 9 | 15 | 17 | | 19 | diefference between'buildings' and 'accommodation' is not clear | Accepted. Change as suggested |
| 4580 | 9 | 15 | 17 | 15 | 19 | Comment seems to be misplaced here - out of context | Accepted. Change as suggested |
| 2891 | 9 | 15 | 5 | 15 | 5 | (IEA ETP 2012 data) is not in the References section at end of chapter | Accepted. |

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| 11711 | 9 | 15 | 20 | 24 | 3 | Compared to corresponding part of chapter 8 and 10, it is strange that there is no description on technology inventories. At least, it should be include the table of technologies.<br>“Regional specificities” in building sector means not only economic development but also difference in climate. There are different kind of applicable technologies between cold region that require insulation and energy cascading and hot region that require cooling and shading. This point should be emphasized. | Noted. Our decision has been to not discuss specific technologies, but rather, to refer to sources of detailed information. |
| 6628 | 9 | 15 | | 16 | | This section is too long. First, it is redundant (at least in its intention) with section 9.1.1. Second, even though the subsequent section states that there has not been any major technological developments since the AR4, the key points of the AR4 don't need to be described again with so much detail. | Rejected. The summary of AR4 is short compared to the material it summarizes, and all the points made here need to be |
| 3491 | 9 | 15 of 86 | 15 | | 16 | Please provide reference or source for the claim of "more than 90% of buildings have been built since 1996". | Accepted. |
| 7031 | 9 | 15 of 86 | 7 | 15 of 86 | 7 | Substitute "industrialized" for "developed" before "and developing", at the last part of the line. | Accepted. Substitude "industrialized" |
| 12579 | 9 | 16 | | 17 | | Another subsection under 9.3 may be intoduced to address the building embodied energy (EEn) issue (reference material will be e-mailed). Since urban India will undergo huge additional residential floor space in the coming years and EEn of these multistoried apartments are in the range of 10-12 GJ/Sq m, the cumulative EEn can no longer be ignored. | Rejected. We already have a subsection on LCA, which involves embodied energy. |
| 2892 | 9 | 16 | 13 | 16 | 13 | (Lewis, 2004) is not in the References section at end of chapter | Accepted. To be done |
| 2190 | 9 | 16 | 21 | 16 | 22 | Item (ii) should also include "appropriate window shadings" | Rejected. Our decision has been to not discuss specific technologies, but rather, to refer to sources of detailed |
| 7723 | 9 | 16 | 34 | 16 | 48 | Rigid polyurethane foam is one of the most efficient insulation materials for buildings. HFC(Hydro FluoroCarbon) is essential as the blowing agents for rigid polyurethane foam. The existing HFC is zero ODP, but rather higher GWP. Receently several fluorocarbon producers announced zero ODP and very low GWP HFO(Hydro Fluoro Olefin) as the blowing agents for rigid polyurethane foam. In a few years, HFO blown rigid polyurethane foam is expected to be used for the excellent building insulation materials in the world. (TEAP Report-Decision XXIII/9 Task Force, 2012, page 57-67 ; TEAP Rigid and Flexible Foam Report. 2011 May. page 43-44) | Noted. We've added a section on F-gases, which includes a reference to foam insulation. |
| 15681 | 9 | 16 | 35 | 16 | 35 | This section is called "Significant technological developments …" and starts with the sentence "There have been no major technological developments …". Maybe renaming the section in "Currently planned developments" or something like that? Maybe also rephrasing the first sentence, because it is interesting to know what happened in the last few years and not what has not happened. Other suggestion: put subsections 9.3.2 and 9.3.3 together, because 9.3.2 is something like an introduction to the examples discussed in 9.3.3. | Accepted. Re-written |
| 11700 | 9 | 16 | 35 | | | Is it really true that "There have been no major technological developments since AR4"? ICT technology (written in 9.3.6), progress in inverter technology, LED, distributed generation and efficiency improvements in appliances might have huge impact on global warming mitigation in this sector. | Accepted. Re-written |
| 7698 | 9 | 16 | 5 | 16 | 5 | Harvey is grey literature -- conference proceedings. Shouldn’t be used for what appears to be a very substantive conclusion. | Rejected. The cited reference is in a book published by the American Institute of Physics. This is a point demonstrated later by the case studies - so will refer to |
| 6629 | 9 | 16 | | | | I would remove the word 'significant' from the title of the section | Accepted. Re-written |
| 6630 | 9 | 16 | | | | The first sentence of this section comes at odds with the statement made on page 4, lines 13-15. A discussion about how the 2 ideas articulate would be welcome | Accepted. Re-written |
| 4730 | 9 | 16 | 35 | 16 | 35 | After AR4, residential fuel cell have been on the market and getting diffuse. Some technologies using ICT such as demand response using smart meter are new developments. Since 9.3.6Energy Management System and Control and 9.4.3.1 introduces demand-response, the expression "There have been no major technological development..." seems to be inadequate. | Accepted. Re-written |

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| 3097 | 9 | 17 | | | | please clarify in each case whether these are residential or non-residential buildings. Most of these examples/sources are now quite a few years old - can't you find some more up-to -date examples? E.g. in the UK this office building (http://www.passivhaus.org.uk/page.jsp?id=96) has an energy demand of 103 kWh/m2 and CO2 reductions of 80% | Accepted. References to specific case studies have been deleted. |
| 11701 | 9 | 17 | | | | These examples (Germany, US, UK) are only in relatively cold climate. Examples in temperate or tropical region should be added in this table and description in 9.3.3.1. | Accepted. Section re-written, with a better cold:hot balance. |
| 2191 | 9 | 17 | 13 | 17 | 25 | The list of Building Standards given here should absolutely include the Swiss "Minergie" Standard created in 1996, which comprises more than 20'000 buildings and has captured 25% of the Swiss market of new constructions in 2012. This standard is described in details at http://www.minergie.ch . It is probably the first worldwide "Green Building " label, already created in the 90's, promoting heating intensities lower than 38 kWh/m2 year. The "Minergie" Standard has been regurlarly updated over the years (as Minergie-P, Minergie-P ECO and recently Minergie-A), the last update corresponding to a Net-Zero Energy Buidling Standard with a heating intensity of 0 kWh/m2 year. | Rejected. We mention only one standard, Passive House, because it is the most strict. NZEBs are discussed separately. |
| 18874 | 9 | 17 | 14 | | | "new residential buildings" - suggest to change to "new standard [or: average] residential buildings" | Noted. No longer applicable due to re- |
| 6631 | 9 | 17 | 3 | | | I couldn't find a working paper version of Harvey 2013 on the internet | Noted. We did not say that it was on the internet. What is now Harvey (2013) will |
| 18873 | 9 | 17 | 7 | 17 | 8 | "recently completed": Are these BAU references? | Noted. No longer applicable due to re- |
| 6632 | 9 | 17 | | 18 | | It seems like sections 9.3.3.1, 9.3.3.2 and 9.3.3.3 deal with the same object but differ by the methodology reviewed. Rather, these subsections could be combined in one, and a foreword could be introduced at the beginning of section 9.3.3 to say that there are different methodologies available. Note that the discussion in current section 9.3.3.3 can be removed, since it is inconclusive | Noted. Section 9.3 has been completely re-written. |
| 15679 | 9 | 17 | 1 | | | It's unclear to me how this section is build up. It's called "Exemplary New Buildings", but only gives examples of new buildings in subsections 9.3.3.1 and 9.3.3.4 (Passivhaus and NZEBs, resp.). For me, it would be better understandable to give the subsections the names of the new buildings and put subsections 9.3.3.2 and 9.3.3.3 together as measures to evaluate new buildings at the end of this section. | Noted. No longer applicable due to re-write. |
| 9428 | 9 | 17 | | | | ・ Addition is needed for the description of Japanese cases.<br>・ This is because little reference has been made to Japanese cases in the sections cited above. ・ Refer to the following documents.<br>A district heating and cooling system (DHC) is expected to be a promising energy-saving measure for high-density business areas in Japan. However, it has not been verified what advantages of the DHC are important for energy conservation. The clarification of this issue is supposed to contribute to improving the energy efficiency of the DHC.<br>This paper focuses on the electric-driven heat-pump-type DHC, which uses only electricity as its energy source. An existing DHC plant has been selected for the case study, and its energy efficiency is examined by a simulation model that uses parameters derived from the measurement data. The simulation results for the plant reveal that the DHC exhibits an energy-saving effect of 29% for cooling when compared with the individual heat source system mainly due to the following two advantages: “economy of scale in chillers/heat pumps” and “thermal storage effect”. Further, the energy-saving ratio for heating is only 5% since heat recovery chiller cannot be operated sufficiently due to the lack of cooling demand during winter.<br>Verification of the energy-saving effect of the district heating and cooling system—Simulation of an electric-driven heat pump system<br>Energy and Buildings, Volume 40, Issue 5, 2008, Pages 732-741<br>Tomoji Nagota, Yoshiyuki Shimoda, Minoru Mizuno | Rejected. Our decision has been to not discuss specific technologies, but more might be said about district cooling systems in 9.4. No action |
| 6633 | 9 | 18 | 15 | | | can be easily achieved' is vague. One wonders: 'at what cost?' | Rejected. Cost is not given in this case. |

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| 2192 | 9 | 18 | 23 | 19 | 14 | Countries dominated by heating loads admit also another definition of Net-Zero Energy Buidings and Energy-Plus Buildings. In these cases, the heat generated on an annual basis by the solar thermal collectors installed on the building roof is equal (or resp. larger) than the building heat demand for space heating and domestic hot water; sensible heat storage are used to retrieve the solar heat produced during summertime in the winter season. Several realizations of this kind are described each year by the Solar Energy Agency at http://www.solaragentur.ch/ | Noted. This is not inconsistent with our definition. No space for elaboration |
| 6635 | 9 | 18 | 34 | | 38 | One issue mentioned in the executive summary is the absence of evidence about how a large-scale implementation of low-energy buildings can occur (page 4, line 28). How does this general idea articulate with the more precise points made here? | Rejected. The discussion here is about NZEB's, not LE buildings, and the very next sentence raises the Q of feasibility. |
| 6636 | 9 | 18 | 41 | | | the 'effective', or 'realized' reduction | Rejected. Unclear |
| 3099 | 9 | 18 | 42 | | | not sure it's true to say that net zero energy is easiest in buildings with a large roof area. Biomass CHP linked to district/communal heating is an easy and probably cheaper option - very common in Austria. | Rejected. These are not NZEBs as we have defined them. |
| 3102 | 9 | 18 | | | | rather than making this a subsection, this could be integrated into 9.3.6 (which is about control) | Noted. Will consider |
| 8976 | 9 | 18 | 18 | 18 | 22 | The title does not reflect the contents. Furthermore, 'post-occupancy evaluation' should include objective and subjective based assessments, which based on calculation and also surveys. | Rejected. Yes it does. |
| 6634 | 9 | 18 | | 19 | | This section is too long | Noted. Section 9.3 has been completely |
| 12637 | 9 | 18 | | 18 | | In Japan, a demonstration house "Life Cycle Carbon Minus House" was built within Building Research Institute on the initiative of MLIT. (http://www.kenken.go.jp/japanese/contents/lccm/kengaku.html) | Rejected. We have avoided specific case study examples here |
| 11702 | 9 | 18 | 23 | | | Is there significant potential at wind turbine in building sector? In contrast, solar water heater should be emphasized. | Noted. Probably not cost-effectively. We can refer to a couple of recent papers |
| 8977 | 9 | 18 | 38 | 18 | 41 | This statement is unclear to me. Moreover, renewable energy could be part of the 'energy saving measures', unless the author is referring to 'energy efficiency measures'? | Accepted. Clarify |
| 3100 | 9 | 19 | | | | again, these sources examples are mostly more than 5 years old. Surely, there are more up to date examples? | Rejected. Not found such examples |
| 11704 | 9 | 19 | | | | As same as table 9.3, there is only the case in the cold region. | Rejected. Not found such examples |
| 6637 | 9 | 19 | 19 | | 21 | Do these expectations take into account post-retrofit behavioral adjustment? | Noted. Will check |
| 2878 | 9 | 19 | 3 | 19 | 3 | change ". . .heat pumps, than. . ." to ". . .heat pumps, then. . ." | Editorial. No longer applicable due to re- |
| 9622 | 9 | 19 | 3 | 19 | 7 | Please, mention heat pumps are useful for space heating as well as cooling. In addition, air source heat pumps reach 6.7 of COP with the average cooling and heating efficiency of household air conditioners, and reach 7.0 of COP with centrifugal chillers for commercial and industrial uses. 1)Masanobu Sasaki(2011), Policy Trend of Heat Pump In Japan 2)ETSAP TECHDS Energy Technology Briefs http://iea-etsap.org/web/Highlights%20PDF/E19_HL_HeatPump_HN_March2012_Final_GSOK.pdf | Rejected. We do not have a general discussion of heat pumps, but only mention them in one specific context. Anything more would not fit in. |

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| 9429 | 9 | 19 | 3 | 19 | 8 | ・ Addition is needed as shown below.<br>・ For better explanation, add the description following the phrase '…the heat pump electricity use.'<br>According to IEA, CO2 emissions reductions in space heating/cooling and water heating by 2050 will be projected at 2 Gt. Of this amount, reductions by electrical heat pumps are assumed to be 1.25 Gt (63% of the total in space heating/cooling and water heating). As for reductions in other technologies, solar thermal systems will account for 0.58 Gt (29% of the total) and cogeneration for 0.16 Gt (8% of the total) (IEA Technology Roadmap, 2011).<br>Figure7 is good example.<br><br>・ Refer to the following documents .<br>①IEA Technology Roadmap<br>Energy-efficient Buildings: Heating and Cooling Equipment<br>②IEA-ETSAP and IRENA © Technology Policy Brief E19 – March 2012 - www.etsap.org - www.irena.org | Rejected. Does not fit into the context here |
| 18875 | 9 | 19 | 3 | | | Grammar: "then" instead of "than" | Accepted. Fixed |
| 11703 | 9 | 19 | 5 | 19 | 6 | Concrete numerical value ("COP of up to 5" ) is not significant since COP is affected by climate and the category of heat pump. | Noted. It is an example of what can be done in a relatively cold country, |
| 8978 | 9 | 19 | 3 | 19 | 7 | Not sure if the author means reducing the peak heating load,s hence smaller size of heat pumps and so smaller kW of PV is needed? If it is then 1) there is no connection or discussion on how ZEB reduce the peak heating loads; 2) the size of PV array could be misunderstood as the physical size. Suggest: reduce the power needed from PV system; 3) besides pumps, in fact the efficiency of all the auxiliary items bring effect on the total electricity/ energy use. | Rejected. Both physical size and required power outpout are reduced. We need to keep the text short. |
| 8979 | 9 | 19 | 8 | 19 | 10 | Should be the energy efficiency measures reduce the demand but not the PV | Rejected. The sentence refers to NET |
| 12635 | 9 | 19 | | | | Reduction effect by retrofitting building insulation is diverse by region. In general, reduction potential depends on the Degree-Day or so on. Cases in other regions should be described. | Rejected. The table shows what has been done in regions |
| 7699 | 9 | 19 | 16 | 20 | 11 | 30 year payback is hardly economic. These conclusions should be tempered and only white lit cited. | Rejected. We don't call them such, but in fact if payback time < measure lifespan, it is economic in the sense of being negative cost. 3 out of 6 sources |
| 8980 | 9 | 19 | 20 | 19 | 21 | What is the definition of 'primary energy use' here? Usually it refers to energy before any conversion, whereby electricity is not part of it but after the primary energy converted into electricity. | Rejected. Standard definition applied |
| 12580 | 9 | 20 | | | | List may be augmented through more reference material (reviewer may mail some case studies of tourist buildings of India) | Noted. Not applicable now, as case studies have been cut. |
| 6639 | 9 | 20 | | 21 | | too much detail here | Accepted. Consider suggestion by |

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| 9430 | 9 | 20 | | | | ・ Addition is needed for the description of a case where absorption chiller was replaced with heat pump chiller or centrifugal chiller.<br>・ As Fig. 9.8 in the text shows, one half of the CO2 generated in buildings comes from space heating/cooling and from water heating; it is therefore important to take measures to deal with the space heating/cooling and water heating. Specifically, in addition to the enhanced thermal insulation of buildings (load reduction) proposed in the text, introduction of high-efficiency space heating/cooling and water heating using heat pumps are important as measures taken on the demand side. Use of solar heat and CHP has less effect in reducing CO2.<br>・ Refer to the following documents .<br>・ Kanto Bureau of Economy, Trade and Industry of the Ministry of Economy, Trade and Industry cites a case of energy-saving attempt in hospitals where oil-burning absorption water cooler/heaters of air conditioners were replaced with electric heat pump chillers, and oil-burning boilers of water heaters were replaced with EcoCute devices, thereby reducing the energy consumption by 18%, from 550 kl/year to 452 kl/year [1]. The Bureau also reports a case of a factory where space heating/cooling, water heating and lighting account for a large part of the energy consumption, which achieved 22% reduction in yearly energy consumption by replacing oil-burning absorption refrigerator with heat pump. 1] Kanto Bureau of Economy, Trade and Industry's Compendium of Energy Saving Actions by Small- and Medium-sized Enterprises (Regional survey for the promotion of voluntary measures, conducted in fiscal 2009) http://www.kanto.meti.go.jp/tokei/hokoku/data/20100709shouene_torikumi.pdf p p age42-43 page18-19 | Rejected. two much detail |
| 3101 | 9 | 21 | 14 | | | needs to explain what a 'curtain wall' is - not a term in common use | Noted. But the sentence has been |
| 6640 | 9 | 21 | 16 | | | there seems to be no major technical problem': this is not a very rigorous statement | Noted. But the sentence has been |
| 7700 | 9 | 21 | 27 | 21 | 35 | cites are to grey literature | Rejected. I consider ECOFYS to be a credible source of information |
| 18877 | 9 | 21 | 33 | 21 | 34 | "30 year period" and "payback times": If possible please state assumptions about discount rate. | Noted. But the section has been deleted |
| 10196 | 9 | 21 | 8 | 21 | 12 | Speculative, preferrably only report projects that have shown to be effective | Noted. But case studies have been |
| 6638 | 9 | 21 | 9 | | | I could not find the reference listed as Anonymous 2009 on the internet | Noted. Its from ASHRAE Journal - which is widely available. N, but case |
| 6641 | 9 | 21 | | | | This section is informative, but not essential | Rejected. We keep this section |
| 15680 | 9 | 21 | 36 | | | Section 9.3.5 is, compared to the other sections within section 9.3, far less technical. Sections 9.3.6 and 9.3.7, however, are technical again (EMCS and materials lifecyle, resp.). For me, it would be more logic to put subsections 9.3.5 and 9.3.8 together (or at least at the end of section 9.3) to go beyond the technical part and include the human side of this section. | Accepted. This, and a new section on biomass, have been put near the end of 9.3 |
| 2194 | 9 | 22 | 12 | 22 | 48 | Further possible references on predictive and adaptive control (with corresponding market produts in 2012) are Morel N. et al., NEUROBAT: a predictive and adaptive heating control system using artificial neural networks, Solar Energy, 21 (2-3), pp. 161-202, 2001 and Guillemin A. and Morel N., Innovative lighting controller integrated in a self-adaptive building control system, Energy and Building, 33(5), pp. 477-497, 2001. | Noted. The section has been deleted, repalced with a summary statement in 9.3.2 |
| 4577 | 9 | 22 | | | | Although likely important, optimization of building energy consumption can also be achieved by looking at much coarser data, for example, monthly data from utilities as is commonly available in the US. See e.g. Brecha et al. Energy Policy (39) 2011 pp. 2982-2992; Hallinan et al, ASHRAE Transaction Vol. 117, Part 2, Paper ML-11-003 (2011) (for commercial buildings); Hallinan et al, ASHRAE Transaction Vol. 117, Part 2, Paper ML-11-009 (2011) (for residential buildings) | Noted. Will look at the suggested reference. Useful, but I think that we already have too much material |

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| 6642 | 9 | 22 | | | | This section is too long | Rejected. We should actually expand the section to address the next two |
| 11660 | 9 | 22 | 12 | 22 | 48 | The potential emission reduction or energy-saving from the energy management system should be described. | Accepted. Agree. We can mention the |
| 11705 | 9 | 22 | 12 | 22 | 48 | Information and communication technology have strong impact on GHG mitigation in building sector. There are so much examples other than shown here such as high performance sensing technology, behavior change due to visualization of energy consumption using smart meter, detailed building commissioning using BEMS data and so on. | Accepted. Agree. We can mention the potential. |
| 2195 | 9 | 23 | 3 | 23 | 4 | Low-energy buidlings do not systematically show larger embodied energy and/or environmental impacts (through construction materials) than conventional buildings, as shown by reference Altherr R. and Gay J.-B., A low environmental impact anidolic façade, Building and Environment, 37(12), pp. 1409-1419, 2002. | Editorial. Inserted "generally" before "greater" |
| 2893 | 9 | 23 | 37 | 23 | 37 | (WBSCD, 2006) is not in the References section at end of chapter | Accepted. The reference was deleted in |
| 6645 | 9 | 23 | 42 | | 43 | More comments on figure 9.11 are needed | Noted. The figure has been deleted. |
| 4579 | 9 | 23 | | | | What are the total lifecycle impacts from low- to zero-energy buildings? If operating energy use is reduced 90% or more, but the embodied energy in construction is significantly higher, is there a possibility of reaching overall goals of, e.g. 90% lower emissions? | Noted. Probably not - the cited examples show much less savings on a lifecycle basis. |
| 6643 | 9 | 23 | | | | This section is informative, but the sake of clarity, the case studies should rather be summarized in a table. | Accepted. Actually, case studies have been deleted.and replaced with general conclusions form a detailed review paper. |
| 6644 | 9 | 23 | | | | Without naming it, this section implicitely deals with the rebound effect. I could be worthwhile to name it more explicitely, or at least it is consistent with what is said in Section 9.7.4 | Noted. Will check |
| 12638 | 9 | 23 | | 23 | | There are studies which show that change of life style contribute more to reduction of energy consumption than improvement of insulation in residential building. (Kenichi HASEGAWA et al., 2006) (http://ci.nii.ac.jp/els/110004809857.pdf?id=ART0007535868&type=pdf&lang=jp&host=cinii&order_no=&ppv_type=0&lang_sw=&no=1347573540&cp=) | Noted. Since there is expression that “life style has a major effect on energy use…”, no action is necessary. This depends on how much the insulation |
| 4576 | 9 | 23 | 33 | 23 | 43 | The personal behavior aspect should be emphasized far more, especially with regard to existing homes in developed countries. See for example Dietz et al. PNAS November 3, 2009 vol. 106 no. 44 pp. 18452–18456; Brecha et al. Energy Policy (39) 2011 pp. 2982-2992 etc. | Accepted. Consider suggestion by Writing Team. Since there is expression that “life style has a major effect on |
| 15213 | 9 | 23 | 33 | 23 | 43 | In this part we should point out that in developing countries we should not change our lifestyle into life style of developed country like US and Europe. This will result great energy use in buidling sector and the earth can not afford this much energy. | Accepted. Consider suggestion by Writing Team. Add text shown below to 9.3.8..<br>Building sector of developing countries has a risk to become huge emission source because of their large population. Though it is unavoidable to change their life style with modernization, the change should be guided to the life style which |
| 7032 | 9 | 23 of 86 | 43 | 23 of 86 | 43 | Substitute "industrialized" for "developed" before the word "nations", at the last part of the line. | Editorial. |
| 4731 | 9 | 24 | | | | Figure 9.11 doesn't seem to be the best graph showing "Emerging economies like China have different consumption level benchmarks from developed nations." Figure 9.11 could be deleted. | Accepted. Improve Fig. 9.11. |
| 11779 | 9 | 24 | 21 | 24 | 24 | Delete all. In Japan recent GTCC technology achieved more than 58% efficiency, thus this sentense is not nesesarily matched. | Noted. This will be revised to clarify that the total efficiency of cogeneration plant is higher where heat can be effectively |
| 9561 | 9 | 24 | 21 | 24 | 22 | This seems to be wrong as combination of high efficiency heat pumps and centralized power plants becomes more efficiently use of energy.(renewableenergy in idustrial applications, p37, UNEDO) | Noted. This will be revised to clarify that the total efficiency of cogeneration plant is higher where heat can be effectively |
| 10665 | 9 | 24 | 21 | 24 | 24 | Delete all.Japan's most recent CCGT technology achieved more than 58% efficiency, thus this sentense is not nesesarily matched. | Noted. This will be revised to clarify that the total efficiency of cogeneration plant is higher where heat can be effectively |

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| 4732 | 9 | 24 | 21 | 24 | 22 | Reference should be added.<br>IEA (2010) Energy Technology Perspectives 2010, International Energy Agency (IEA), Paris, France. | Accepted. Consider suggestion by Writing Team |
| 10010 | 9 | 24 | 21 | 24 | 22 | This part should be deleted or revised to explain that total energy efficiency of cogeneration is higher than centralized power plant only if waste heat could be utilized perfectly. The detail energy efficiency is described in (IEA, 2011, page15, Table4). This literature is listed in the No51 line of this table. | Noted. This will be revised to clarify that the total efficiency of cogeneration plant is higher where heat can be effectively |
| 9431 | 9 | 24 | 21 | 24 | 24 | ・ Deletion of the entire sentence is needed.<br>・ Distributed energy systems are not necessarily higher in efficiency than centralized power plant.<br>・ Cogeneration improves energy efficiency when the heat is utilized, although there are only a few applications where usages of heat and electricity can be balanced. When compared in terms of efficiency of only the power generation function, centralized power plant has higher efficiency. (e.g. Efficiency of gas burning engine CGS is about 40 to 45%, while the most advanced thermal power plant in Japan has efficiency of about 58% <MACC1, 500□C>).<br>・ Refer to the following documents .<br>Fukuda et al. introduced “heat factor” for the evaluation of the total energy efficiency of cogeneration system in Japan. According to their analysis based on exergy basis, the “heat factor” for Japan is calculated to be 0.24-0.28, which is much smaller than the factor for US and Europe, which are 0.5 or higher. This result implicates the difficulty of the use of the thermal output of cogeneration in Japan, which has little heat demand compared to the US and Europe. By comparing the adjusted total efficiency of cogeneration with the grid power plant (all average, fossil fuel average, state of art LNG combined cycle), they found that it was inappropriate to regard cogeneration as highly efficient just by the simple total efficiency. The adjusted total efficiency was calculated to be nearly equal or a little higher than the average fossil fire power plant depending on the type of demand, and much smaller than the state of art LNG combined cycle for all demand assumed in their study. ・ Evaluation of Total Energy Efficiency of CGS on the Basis of Exergy Concept ）」(2008) Journal of the Japan Institute of Energy 87, 285-290 ( 2008 )<br>・ Refer to the following documents .<br>①Masanobu Sasaki(2011), Policy Trend of Heat Pump In Japan ( Chapter4 4.2 ) | Noted. Will check. Space prevents a full analysis of the thermodynamics |
| 18879 | 9 | 24 | 22 | | | should read "thAn centralized power plantS" | Accepted. Consider suggestion by |
| 9432 | 9 | 24 | 30 | 24 | 38 | ・ Addition to the case study is needed for the description of the district heating and cooling system in Tokyo Skytree area.<br>・ The above-mentioned DHC is a good example, in that Japan’s highest comprehensive yearly energy efficiency (coefficient of performance) of 1.35 is planned (c.f. average DHC efficiency in Japan is 0.749), and that high-efficiency heat pump, large-capacity heat reservoir and ground source heat pump are employed. | Rejected. The case has just started operation. It's too early to evaluate the performance. We do not believe it is appropriate to mention specific projects. No action |
| 10011 | 9 | 24 | 32 | 25 | 1 | This part should include "heat pumps" that use underground water. Heat pump system using underground water is effective where underground water is abundant. | Accepted. Agree. Should add 'groundwater' to the list of potential heat pump sources. We will add |
| 11287 | 9 | 24 | 5 | 24 | 10 | We suggest to add to this paragraph the following sentence: Urban planning that take into consideration local climatic patterns such as: the sun path, the direction of prevailing winds, and the topography of the area, will facilitate the construction of buildings that are properly oriented and that make use of passive building elements such as natural shading, cooling and lighting, and resulting in less GHG emission. | Accepted. To be discussed with Chapter 12 where the substantive section should be. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11706 | 9 | 24 | 9 | | | From the viewpoint of natural ventilation potential, compact urban form is not effective for passive cooling. | Accepted. will check with ch12 and see who covers this issue. This needs input from someone in the team with better expertise on passive cooling, but may be |
| 9073 | 9 | 24 | 4 | 27 | 12 | 9.4 Infrastructure and systemic perspectives can be deleted due to limitations on the nos of pages | Rejected. Disagree. This section is a requirement. Also important to understand the potential of the buildings sector to use low carbon fuels. Infrastructure and system play a very |
| 15682 | 9 | 24 | 4 | | | Does subsection 9.4.1 really belong here? It seems very much decoupled from the rest. Subsection 9.4.2 says "This section therefore focuses …", but then stops, so it seems to be more an introductionary passage, which doesn't need a subsection number at all. | Accepted. Chapter 12 is a better home for the substance on the wider built environment infrastructure. Just needs |
| 6646 | 9 | 24 | | | | With so few elements, this section is not very informative and could be removed | Accepted. Chapter 12 is a better home for the substance on the wider built environment infrastructure. Just needs |
| 11712 | 9 | 24 | 5 | 24 | 11 | This description is also shown in Chapter 12 (Section 12.3-4 especially in 12.3.2.6). In general, sections 12.3 and 12.4 have strong relationship with 9.4. Coordination between two chapters is needed. | Accepted. Chapter 12 is a better home for the substance on the wider built environment infrastructure. Just needs |
| 12581 | 9 | 24 | 8 | | | In the warm humid climate region of India, more surface-to-volume- ratio is preferred to induce natural ventilation and passive cooling - this may also be mentioned | Accepted. Will modify the text to recognise the urban heat island effect is |
| 6647 | 9 | 24 | | 25 | | This section is too long | Accepted. Agreed, can be edited. |
| 7033 | 9 | 24 of 86 | 16 | 24 of 86 | 16 | Add "zero and" before the phrase "lower carbon fuels". | Rejected. Disagree. For the foreseeable future, all external fuels to buildings in the form of electricity, gas and heat/coolth supplied through |
| 7034 | 9 | 24 of 86 | 19 | 24 of 86 | 19 | The same as 32nd Comment. | Rejected. Disagree. For the foreseeable future, all external fuels to buildings in the form of electricity, gas and heat/coolth supplied through |
| 17389 | 9 | 25 | | | | It is very interesting and useful to talk over the utilization of ground source heat pump(GSHP), I think it needs to be further discussed and explored, from the point of COP and associated costs in some typical regions, both industrialized and developing countries. Some challenges related to the deployment and scale-up potentials should be adequately assessed, since this option is quite promising and should be well analyzed for giving the audience a good view. | Accepted. This is a valid point. The section on electricity infrastructure does not see the best place for a detailed discussion of heating technologies. But there is no detail in Chapter 7 or Chapter |
| 4733 | 9 | 25 | 10 | | | The title "Electricity infrastructure" doesn't seem to fit the contents which includes heat pump. Text is too long. | Accepted. There should be a discussion of the implications for infrastructure here |
| 9546 | 9 | 25 | 17 | | | Please, add following; heat pumps use renewable energy from their surroundings (ambient air, water or ground). They achieve point-of-use efficiencies greater than 100%, i.e. they provide more useful cold or heat (in energy terms) than the electricity input. (Technology roadmap Energy-efficient Building,2011, IEA, p16, p18) | Noted. This is a valid point. However, the section on electricity infrastructure does not see the best place for a detailed discussion of heating technologies. But there is no detail in Chapter 7 or Chapter |

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| 9433 | 9 | 25 | 17 | 25 | | ・ Addition needed for the description of HP used at minus 25□C.<br>・ Since the most advanced air source heat pump can be used under ambient condition of minus 25□C, this case can be added as a good example.<br>・ Refer to the following documents.<br>①Masanobu Sasaki(2011), Policy Trend of Heat Pump In Japan ( chapter2 2.2 )<br>②ETSAP TECHDS Energy Technology Briefs<br>http://iea-etsap.org/web/Highlights%20PDF/E19_HL_HeatPump_HN_March2012_Final_GSOK.pdf | Rejected. This section is about decarbonisation strategy, not the temperature range within which heat pumps are viable. No action |
| 9624 | 9 | 25 | 19 | 25 | 20 | Please, replace 'and therefore …process.' with a technology has steady progressed because air source heat pumps can be used in outdoor with minus 25 degree Celsius.<br>1)Masanobu Sasaki(2011), Policy Trend of Heat Pump In Japan<br>2)ETSAP TECHDS Energy Technology Briefs<br>http://iea-etsap.org/web/Highlights%20PDF/E19_HL_HeatPump_HN_March2012_Final_GSOK.pdf | Rejected. This section is about decarbonisation strategy, not the temperature range within which heat pumps are viable. No action |
| 4734 | 9 | 25 | 22 | 25 | 24 | The market of heat pump is matured in Japan. So the text could be modiefied as follows.<br>In some countries heat pump is prevailing technology and the market is matured especially in Japan. There is a growing<br>market for low-cost air source heat pumps in mid-latitude countries, notably Italy and France (Singh, Muetze, et al. , 2010)., New Zealand(Howden-Chapman et al., 2009), some regions of China (Cai et al., 2009) are growing. | Accepted. Consider suggestion by Writing Team |
| 11780 | 9 | 25 | 27 | 25 | 30 | Agree. | Noted. Nothing to be done |
| 9547 | 9 | 25 | 27 | 25 | 30 | Good comment | Noted. Nothing to be done |
| 10666 | 9 | 25 | 27 | 25 | 30 | Good example. | Noted. Nothing to be done |
| 9548 | 9 | 25 | 30 | 25 | 31 | Please, replace here with the following due to unclear; the electricity sector is decarbonised and this enables the buildings sectors to reduce CO2 emissions by additional electrification. As a result, the share of electricity in final consumption rises to 27% in 2050 as low-carbon electricity increasingly substitutes for fossil fuels. (ETP2010, IEA, p81) | Accepted. Happy to clarify the point in the SOD. Quoting the precise estimate from IEAETP does not seem appropriate here. |
| 9549 | 9 | 25 | 31 | 25 | 33 | Please, check and accommodate analysis of sectoral energy use, 6.8.2.1, in Chpter 6 as the trend of final energy use in buildings sector looks downwards. | Noted. This will be addressed through liaison with Chapter 6 |
| 9550 | 9 | 25 | 36 | 25 | 38 | Please, describe here in a positive manner due to unclear; e.g. a high cost heating system needs a supportive scheme to shift the neregy source. | Rejected. Disagree. It is not the role of an IPCC assessment to promote a |
| 10012 | 9 | 25 | 36 | 25 | 38 | This part should be deleted because there is no evidence that the electrified heating system is more costly than other heating systems. | Rejected. Disagree. Well established that a heat pump is more expensive than |
| 9623 | 9 | 25 | 4 | | | Please, insert a good following example after (kuzuki et al., 2010); 'Tokyo Skytree district heating' is a good example as the highest annual energy efficiency of 1.35 is planned, compared with domestic DHC with 0.749, and high spec heat pumps and huge thermal storage tank and geothermal heat pumps are introduced.<br>1)Masanobu Sasaki(2011), Policy Trend of Heat Pump In Japan<br>2)ETSAP TECHDS Energy Technology Briefs<br>http://iea-etsap.org/web/Highlights%20PDF/E19_HL_HeatPump_HN_March2012_Final_GSOK.pdf | Rejected. The case has just started operation. It's too early to evaluate the performance. We do not believe it is appropriate to mention specific projects. No action |
| 9551 | 9 | 25 | 40 | 25 | 42 | Please, replace intermittent with low or zero emissions. | Rejected. Disagree. The SRREN reference is about intermittent renewables not low carbon electricity in |
| 9552 | 9 | 25 | 43 | | | Please, add hydro pumps as means of energy storage; e.g. not only hydro pumps but also thermal energy strage… | Rejected. Disagree. This section is about infrastructure for buildings. No |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11707 | 9 | 25 | 43 | 25 | 49 | In combination with electricity infrastructure using intermittent renewable energy, electricity load curve leveling such as demand response is important. However, it seems strange that this subsection include thermal energy storage in building envelope, which is originally intend to stabilize the operation of building HVAC equipment. Since this phase is duplicate page 23, line 26-28, it should be unified. | Accepted. Thermal storage in buildings is included here because it will affect electricity infrastructure needs and therefore the viability of electricification of heating. Agree that repetiton of 9.3.7 |
| 6648 | 9 | 25 | | 26 | | This section is too long | Accepted. Agreed. Should be edited for |
| 3495 | 9 | 25 of 86 | 16 | | 16 | To add: "in the temperate region" after the first word of this line, i.e. "countries". | Rejected. Disagree. The same principles apply to electrification of water |
| 7035 | 9 | 25 of 86 | 5 | 25 of 86 | 5 | Add "zero and" after the phrase "alone deliver", at the beginning of the line. | Accepted. Precise phrasing will be revised for consistency with Section 9.3 |
| 7036 | 9 | 25 of 86 | 8 | 25 of 86 | 8 | Add "zero and" before the phrase "very low energy", at the last part of the line. | Rejected. Disagree. For the foreseeable future, all heat supplied through infrastructure systems will have some |
| 7037 | 9 | 25 of 86 | 10 | 25 of 86 | 10 | I haven't seen here issues like decentralized and distributed renewables electricity generation, smart grids, local grids, WADE, etc. I think they deserve an important place concerning "Electricity infrastructure", which is the name of the Section. | Accepted. Needs wider discussion where this fits in Chapters 7, 9 and 12. Those new technologies should be |
| 7038 | 9 | 25 of 86 | 11 | 25 of 86 | 11 | Substitute "industrialized" for "developed", before "world, around the middle of the line. | Accepted. |
| 7039 | 9 | 25 of 86 | 41 | 25 of 86 | 41 | Add "zero and" before "lower carbon off peak electricity", around the middle of the line. | Rejected. Disagree. For the foreseeable future, all electricity supplied through infrastructure systems will have some |
| 6649 | 9 | 26 | 20 | | | the concept of commissioning is not clear to me. How does it compare to maintenance? | Rejected. This is a surprising comment. They are different concepts both in everyday use and amongst building |
| 6650 | 9 | 26 | 23 | | | the economic barriers identified above': throughout the chapter, the barriers are not clearly identified (see for instance the vacuum in section 9.8) | Rejected. No action needed here as barriers addressed in Section 9.8 and there is a huge extant literature on them |
| 18881 | 9 | 26 | 47 | | | "size of the lock-in risk": define the metric used | Noted. I think Figure 9.12 is fairly clear. The potential reduction from 'sub-optimal' to 'state of the art' is 80% of the |
| 15683 | 9 | 26 | 48 | 26 | 48 | Since the word "cost-effective" is also mentioned here and subsection 9.4 deals with the "systemic perspectives" promised in its title, subsection 9.4.4 could be integrated in subsection 9.4.5. For me, it would make section 9.4 a bit more fluently; going from a general view about the energy infrastructure at the start via a more deeper view on the electricity and gas infrastructure in the middle to the political and financial barriers and challenges at the end. | Accepted. Very good point to be addessed in revsion of 9.4.4 and 9.4.5 |
| 4735 | 9 | 26 | 9 | | | Gas infrastructure is still important for high efficiency distributed energy systems described in 9.4.3. | Noted. This is a difficult sub-section. The developing literature is divided on |
| 6651 | 9 | 26 | | 27 | | Useful reference on this topic: Vogt-Schilb and Hallegatte, 2011, "When starting with the most expensive option makes sense", Policy Research Working Paper 5803, World Bank, http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2011/09/21/000158349_20110921094422/Rendered/PDF/WPS5803.pdf | Accepted. Thank you for the helpful comment. Will consider in revision. |
| 7040 | 9 | 26 of 86 | 8 | 26 of 86 | 8 | Add "zero and" before the phrase "lower carbon supplies", at the last part of the line. | Rejected. Disagree. For the foreseeable future, all electricity supplied through infrastructure systems will have some |
| 7041 | 9 | 26 of 86 | 23 | 26 of 86 | 23 | Add "zero and" before the phrase "low carbon vectors", around the middle of the line. | Accepted. Proposed to omit this sub- |
| 7042 | 9 | 26 of 86 | 23 | 26 of 86 | 23 | Add "zero and" before the phrase "low energy buildings", at the last part of the line. | Accepted. Proposed to omit this sub- |
| 7043 | 9 | 26 of 86 | 42 | 26 of 86 | 42 | Add "zero and" before the phrase "very-low energy", at the last part of the line. | Rejected. Limited literature on district heating in zero energy buildings |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6652 | 9 | 27 | 14 | 28 | 14 | The introduction to section 9.5 is too long | Accepted. |
| 15703 | 9 | 27 | 17 | 27 | 17 | Besides the reference "Pyke et al., 2012", the following reference gives a good overview of the current status about the various interactions between the climate sciences and the construction industry: Gerdes, A., Ch. Kottmeier, and A. Wagner (eds.) (2012). Proceedings of Conference on Climate and Constructions, 24 and 25 October 2011, Karlsruhe, Germany, KIT Scientific Publishing, ISBN: 978-3-86644-876-6, 384pp. Available at: http://digbib.ubka.uni-karlsruhe.de/volltexte/1000028785 | Accepted. Reference added |
| 9074 | 9 | 27 | 13 | 29 | 42 | 9.5 Climate change feedback and interaction with adaptation can be deleted due to limitations on the nos of pages | Rejected. No action |
| 4736 | 9 | 27 | 13 | 28 | 14 | The opening text for 9.5 is too long. It should be divided to some sub-sections. | Rejected. No space left |
| 7044 | 9 | 27 of 86 | 17 | 27 of 86 | 17 | Add "zero and" before the phrase "low-carbon buildings", at the middle of the line. | Accepted. Section 9.4 |
| 7045 | 9 | 27 of 86 | 18 | 27 of 86 | 18 | Substitute "industrialized" for "developed", before the beginning of the hyphen around the middle of the line. | Accepted. Section 9.4 |
| 7046 | 9 | 27 of 86 | 27 | 27 of 86 | 27 | Add "zero and" before the phrase "Low energy consuming buildings", at the second half of the line. | Accepted. Section 9.4 |
| 7047 | 9 | 27 of 86 | 30 | 27 of 86 | 30 | Add "zero and" before the phrase "Low energy consuming buildings", at the first half of the line. | Accepted. Section 9.4 |
| 7048 | 9 | 27 of 86 | 31 | 27 of 86 | 31 | Add "zero and" before the phrase "lower-energy consuming", at the last part of the line. | Accepted. Section 9.4 |
| 6653 | 9 | 28 | 15 | | | I would remove 'and CC mitigation' from the section title | Accepted. |
| 9434 | 9 | 28 | 32 | 28 | 36 | ・ Deletion of the entire sentence is needed.<br>・ The description implying that the 0.3Gt increase in CO2 emission from the residential sector is caused by electrification is inappropriate.<br>・ It is illogical to blame electrification for this increase in CO2 emission.<br>・ The increase of 0.3 Gt occurred mainly through meeting residential demands. The problem lies in whether to meet the demands with electricity or with other energy sources. Electricity is preferable because it provides for higher amenity and enables CO2 reduction.<br>・ Refer to the following documents.<br>Sugiyama [1] found that the electrification rate increases more or less in final electricity demand by 2050; however, the final energy demand doesn't necessarily show an increase in all the studies. He suggested that climate policies can lead to reduced final energy demand. In conclusion, policy measures which decarbonize power generation and accelerate future growth of electrification are "promising" options. [1] Masahiro Sugiyama(2012), "Climate change mitigation and electrification (Energy Policy44)" Volume 44, May 2012, Pages 464-468 | Noted. Taken into account. It is not electrification that leads to these results but the assumptions of the scenario considered, which assumes that the emission factor of electricity is higher compared to those of fuels. The text was rewritten to clarify this.The suggested reference shows that the implementation of mitigation actions enhance electrification and so decarbonization of power sector is of particular importance. However, in this paragraph the focus is on the possible implications of cc on energy demand and the associated emissions and so the suggested reference is not very relevant. |
| 18882 | 9 | 28 | 48 | | | "$2B": Please spell out billion/bio. | Editorial. Consider reviewer's comment |
| 2894 | 9 | 28 | 5 | 28 | 5 | (Graham, 2005) is not in the References section at end of chapter | Accepted. We contact Graham to provide the required reference. |
| 6925 | 9 | 28 | 40 | | | Suggest to refer to WGI AR5, Ch7 for the assessment of physical science basis of RM (SRM). Please make sure not to reassess what is the task of WGI Ch7, e.g., in the discussion of changes in radiative forcing, and ensure consistency. | Accepted. Will include the reference. |
| 8524 | 9 | 28 | 40 | | | The title and text of Section 9.5.2 concern the Section 6.9.2 (ground-based SRM). The first part of Section 9.5.2 (from page 28 line 41 to page 29 line 5) could be omitted at all because this part of the text deals with microclimate of buildings. | Noted. We will not delete, but cross reference 6.9.2. |
| 7049 | 9 | 28 of 86 | 36 | 28 of 86 | 36 | After the phrase "above that of fuels", add the sentence "if electricity continues to be generated with the current energy mix; in case it would be generated with renewables, the result could be very different at all." | Accepted. Will (a) make a reference to the proposed study, (b) make the |
| 6654 | 9 | 29 | 1 | | 25 | Too much detail. Should be summarized in a table | Rejected. A table only repeats the |
| 2895 | 9 | 29 | 12 | 29 | 13 | (Hansen et al.., 1997a,b; Hansen et al.., 2005; and Myhre et al., 1998) are not in the References section at end of chapter | Accepted. |
| 18884 | 9 | 29 | 15 | | | "100 kg CO2 per m2": This is probably annual, right? If so, please add it. | Accepted. No. It is one time. Added |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2896 | 9 | 29 | 21 | 29 | 21 | (Menon et al, 2010) is not in the References section at end of chapter | Accepted. We added. |
| 6655 | 9 | 29 | 29 | | 33 | Problem with the sentences | Accepted. Improved the sentence. |
| 7493 | 9 | 29 | 29 | 29 | 35 | "Black Carbon (BC) or soot is highly absorptive of solar radiation and can be transported by clouds over long-distances (Ramanathan and Carmichael, 2008) leading to an increase in the radiative force (RF) of the Earth. BC is a pollutant emission resulting from incomplete combustion of coal, oil products and, particularly to the buildings sector, of bio fuels -fuelwood and other types of traditional biomass utilized (e.g., cooking on wood burning fire in developing countries)". If households have chimneys, then some soot will accumulate in them. With indoor cooking and no chimney, most soot etc. will accumulate within the kitchen. Also soot added to the soil increases its fertility. Chimneys can be swept and the soot put on the market garden as can the ash from the wood – a fertilizer high in potassium. (K). | Accepted. Deleted a part of the section. |
| 2897 | 9 | 29 | 35 | 29 | 35 | (Edenhofer et al, 2011) is repeated twice; delete one | Accepted. |
| 9607 | 9 | 29 | 37 | 29 | 41 | Please, move to technical risks, page 60, in chapter 7. | Rejected. This is status quo not |
| 2898 | 9 | 29 | 42 | 29 | 42 | (Edenhofer et al, 2011) is repeated twice; delete one | Accepted. Agree. Did it. |
| 13061 | 9 | 29 | 43 | 37 | 12 | On the Costs & Potentials issues it is difficult for the reader to access the bigger picture of the cost & potential information. Each sector has its own approach to costs and potentials, which is appropriate as each sector has its own unique qualities and considerations. Nonetheless, the information that will be most relevant to take-away for policy-makers is overarching cost information that brings these different pieces together. To help policy-makers access this information, it should be important to highlighting market realization, but also the policy aspects of cost (by policy it is meant institutional frameworks and/or market frameworks and/or capacity building arrangements, etc...). In both developing and developed countries policy can have a strong impact on cost. Simply looking across the costs & potentials sections of the sector chapters, the reader could miss this message, although the information on policies and measures is there in the chapter. Therefore it could be important to make sure that these informations are put in perspective appropriately. | Accepted. The section has been redrafted, with a focus on measures to reduce costs where high, and on the fact that in many cases costs are already low |
| 12634 | 9 | 29 | | | | This paragraph may refer to Global Alliance for Clean Cookstoves at the Clinton Global Initiative(http://www.state.gov/secretary/rm/2010/09/147500.htm) and SLCF report by UNEP(http://www.unep.org/publications/ebooks/slcf/). | Accepted. Deleted a part of the section. |
| 4737 | 9 | 29 | 26 | | | This story may be less important for Buildings chapter. Text should be shortened. | Accepted. Deleted a part of the section. |
| 15685 | 9 | 29 | 26 | | | The thematic in this subsection is really interesting, but does it really belong in a chapter called "Buildings"? | Accepted. Deleted a part of the section. |
| 8400 | 9 | 29 | 27 | | | Delete "by clouds", this is not correct. Correct grammer in this sentence. | Accepted. Deleted a part of the section. |
| 6926 | 9 | 29 | 27 | 29 | 33 | Please be more specific when talking about RF, also refer to WGI AR5 Ch07. | Accepted. Deleted a part of the section. |
| 4738 | 9 | 29 | 44 | | | Only the table 9.5 consists 9.6.1 and there is no text. It looks unusual. | Accepted. Table has been moved to later in 9.6, and text about it written |
| 2359 | 9 | 30 | | | | Split table into "by technology" and "by policy" - those two things should rather not be mixed | Noted. |
| 9553 | 9 | 30 | | 31 | | Please, simplify two-page table. | Noted. |
| 12639 | 9 | 30 | | 31 | | The criteria for selecting of literature is unclear. There are many literatures in other regiions, thus these other literatures should be described. | Noted. |
| 3498 | 9 | 30 of 86 | | | | Under "CARBON EFFICIENCY" category, please include two more mitigation measures. The two are: (1) Carbon-sequestration building materials and products, and (2) building integrated greenery systems. For details, please refer to [Cam C.N.W. (2012). Technologies for Climate Change Mitigation: Building Sector. Denmark: UNEP Riso Centre.] | Noted. |
| 3499 | 9 | 31 of 86 | | | | Under "DEMAND EFFICIENCY" category, please consider to include "behaviour change catalyst" mitigation measures. They include home area network (HAN) and Pre-paid meters. For details, please refer to [Cam C.N.W. (2012). Technologies for Climate Change Mitigation: Building Sector. Denmark: UNEP Riso Centre.] | Noted. |
| 7701 | 9 | 32 | 10 | 32 | 49 | Virtually all of the cites here are to the grey literature -- reports. Also, on line 33 it is not clear what $0.10/kWh means as an "equivalent cost." | Noted. Much of what is available is on the grey literature. Case studies have |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18887 | 9 | 32 | 18 | | | Please define what you mean with "premiums" here. | Accepted. Consider suggestion by |
| 15687 | 9 | 32 | 2 | 32 | 2 | Sentences like "Earlier sections have shown …" and "The previous section has demonstrated …" (subsection 9.6.3.1 - first sentence) are not always relevant and make the text longer and since the chapter has to become shorter… | Accepted. |
| 6656 | 9 | 32 | | 33 | | Section is too long | Accepted. Has been shortened |
| 9554 | 9 | 33 | | 36 | | Please, simplify two-page table. | Accepted. Table has been deleted in fact. |
| 6657 | 9 | 33 | 1 | | | particularly well documented': some references should be effectively cited | Accepted. This section has been |
| 6660 | 9 | 33 | 10 | | 11 | The first sentence of the section reads redundant and way too general | Accepted. This section has been |
| 2899 | 9 | 33 | 19 | 33 | 19 | Mata et al., (2010) is not in the References section at end of chapter | Accepted. This section has been |
| 6661 | 9 | 33 | 19 | | | I couldn't find Mata et al 2010 in the reference list | Accepted. This section has been |
| 6658 | 9 | 33 | 2 | | 5 | conventional standards' versus 'specific circumstances': this remains quite vague and it could aptly be removed. Moreover the status of two references is inappropriate for citation in IPCC report | Accepted. This section has been completely re-written |
| 18888 | 9 | 33 | 20 | | | are the numbers in this line global - if so, please add this information | Accepted. This section has been |
| 2900 | 9 | 33 | 22 | 33 | 22 | Polly et al., (2011) is not in the References section at end of chapter | Accepted. This section has been |
| 6662 | 9 | 33 | 22 | | | I couldn't find Polly et al 2011 in the reference list | Accepted. This section has been |
| 6663 | 9 | 33 | 23 | | 25 | 3% discount rate and 3% price escalation seems like a set of assumptions that would be very favorable to investments in energy conservation. What is the sensitivity to these assumptions? | Noted. This section has been completely re-written |
| 15690 | 9 | 33 | 30 | | | It's hard to compare the costs if they are in euros, pounds, and dollars (also counts for the tables 9.7 and 9.8). Is it possible to use one of them and then put the currency exchange rates as footnote? | Noted. The table has in fact been deleted. |
| 6659 | 9 | 33 | 8 | | 9 | policies such as…discount rates and anticipated holding times': these two elements are not 'policies' | Accepted. This section has been |
| 12640 | 9 | 33 | | 34 | | It might be better to follow the format of Table 9.8. | Noted. The table has in fact been |
| 15688 | 9 | 34 | 2 | | | I couldn't find a reference of the table in the text. | Noted. The table has in fact been |
| 12641 | 9 | 34 | | 35 | | Same as above | Noted. The table has in fact been |
| 3500 | 9 | 34 of 86 | | | | It is highly recommended to include NZEBs from other regions, at least different climatic regions, for a more comprehensive assessment. Examples of these buildings in the tropic include BCA Academy ZEB in Singapore, Zero Energy Office in Malaysia, etc. | Noted. The table dealt with costs, but in any case has been deleted. |
| 6665 | 9 | 35 | 11 | | | cost-optimality (rather than cost-effectiveness) is indeed not a very intuitive concept. A short definition would be necessary | Noted. Will consider |
| 15689 | 9 | 35 | 3 | | | I couldn't find a reference of the table in the text. | Noted. The table has in fact been |
| 6664 | 9 | 35 | 7 | | | as section 9.6.1 already pointed out': there was no text in section 9.6.1 | Accepted. Text added |
| 15686 | 9 | 35 | 7 | 35 | 7 | In my version, section 9.6.1 is empty… | Accepted. Text added |
| 6666 | 9 | 35 | | | | Too many details | Noted. Not sure what is being refered to, but the table has been deleted and the |
| 6667 | 9 | 36 | 25 | | 32 | Repetition with the methodology discussion of pages 17-18 | Accepted. Re-written to avoid |
| 15691 | 9 | 36 | 37 | 36 | 38 | What is "industrial ecology literature"? | Noted. Now deleted |
| 15693 | 9 | 36 | 43 | 36 | 47 | If I understand right, Lovins (2010) desribes a concept that technical development will increase so fast in future that it will reduce the expected costs of today. If that's right, it's hard to believe. It would mean that I can plan as expensive as I want. I just have to "believe" that time will be on my side. It seems also not consistent with subsection 9.4.5 (lines 28 to 31: This means that buildings ...). | Noted. This material has been deleted. |
| 18892 | 9 | 36 | 43 | | | "...through costs": add refrence to Figure 9.13. | Noted. This material has been deleted. |
| 18891 | 9 | 36 | 5 | | | "... years, decades": consider adding "no time give (before/after)" here | Noted. This material has been deleted. |
| 3103 | 9 | 36 | | | | I would cut this section - it's quite vague and doesn't really discuss what the heading suggests (or certainly not community approaches) | Accepted. Deleted |
| 6668 | 9 | 36 | | 37 | | The concept of 'tunneling through costs', without giving more concrete examples, remains abstract. Overall, the evidence of it seems not compelling enough (and not peer-reviewed) for it to be cited in this report. | Accepted. Deleted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7702 | 9 | 36 | 34 | 37 | 12 | again, most references here are from the grey literature. Also, what is the source of Fig 9.14? Finally, on lines 36-7, you cant simultaneously minimize energy demand and maximize efficiency--one or the other. | Accepted. Deleted |
| 15692 | 9 | 36 | 34 | | | Because this section deals with economic benefits, doesn't it fit better in section 9.6.3. This would make section 9.6.3 a bit more substantial, since it deals for a large part with what already has been written and what will be discussed in the next sections. | Noted. This section has been deleted. |
| 12122 | 9 | 36 | 36 | 36 | 38 | The statement "It requires understanding and leveraging whole-system design to minimize energy demand and maximize efficiency" is unreferenced ..... Please add a reference to the only book on Whole System Design in the world - Stasinopoulos, P., Smith, M., Hargroves, K. and Desha, C. (2008) Whole System Design: An Integrated Approach to Sustainable Engineering, Earthscan, London, UNESCO and WFEO.<br>And please also consider adding from 2007 IPCC AR4 WGIII Building Chapter - "Energy efficiency strategies focused on individual energy-using devices or design features are often limited to incremental improvements. Examining the building as an entire system can lead to entirely different design solutions. This can result in new buildings that use much less energy but are no more expensive than conventional buildings. The systems approach in turn requires an integrated design process, in which the building performance is optimized through an iterative process that involves all members of the design team from the beginning." | Rejected. These points are covered earlier in our discussion of the integrated design process. The book is only 208 pages and only one chapter in 10 deals with buildings. No room for more. |
| 12123 | 9 | 36 | 36 | 36 | 38 | The economic benefits of integrated and community-based approaches - the real economic benefit from integrated design approaches arises because it is in the front end design phase that most of the design decisions are made which will lock in the overall building energy usage long term. As Paul Hawken et al wrote in the book Natural Capitalism,<br>"By the time the design for most human artefacts is completed but before they have actually been built, about 80-90 percent of their life-cycle economic and ecological costs have already been made inevitable. In a typical building, efficiency expert Joseph Romm explains, 'although up-front building and design costs may represent only a fraction of the building's life-cycle costs, when just 1 percent of a project's up-front costs are spent, up to 70 percent of its life-cycle costs may already be committed. When 7 percent of project costs are spent, up to 85 percent of life-cycle costs have been committed'. That first one percent is critical because, as the design adage has it, 'all the really important mistakes are made on the first day'. " | Noted. We already discuss integrated design and cost reduction, moreso in the revised draft |
| 6669 | 9 | 37 | | | | This figure brings some value added but there are no details about the sources, etc. | Accepted. Figure deleted |
| 6670 | 9 | 37 | | | | Again, the existence of co-costs (loss in amenities due to efficient lighting, mercury pollution due to efficienct lighting, inconvenience due to housing works), even if they don't prevail in the cost-benefit balance, should be mentioned (and ideally some estimates of their value should be provided) | Noted. Taken into account. The issue of riks associated with mitigations actions is now mentioned in Sub-section 9.7.1. However, we consider that these risks are limited compared to co-benefits and |
| 15694 | 9 | 37 | | | | I don't understand the figure. The colors are countries, right? From the text, I understand that you want to show that there is hardly any relationship between energy savings and CCE (Page 5, line 5 and 6). Why then do you need the classification by countries? Does it make sense anyway to show a figure where you see so less? Wouldn't a sentence like "A meta-analysis of data reported by the literature showed that cost-effectieness of retrofits does not necesserily depend on the depth of a retrofit." tells the reader the same as the figure does? | Accepted. Figure has been deleted to save space |
| 12848 | 9 | 38 | 11 | 38 | 13 | The criticism of some of the studies about green jobs potentials deserves a little more prominence and a reference to an actual study that criticizes green job claims (Carley at al. only includes a reference to such studies). In addition to questioning the efficacy of using public funds for energy projects instead of other investments, the criticism has been made that several green jobs studies neglect the possible inefficiencies of investing in labour-intensive activities. An example of a study criticizing green jobs claims is: Gülen, Gürcan (2011), Defining, Measuring, and Predicting Green Jobs. Copenhagen Consensus Center: http://www.copenhagenconsensus.com/Default.aspx?ID=1542 | Noted. Taken into account. Much of the criticism about green jobs potential mainly concerns investments on RES technologies, while this section focuses on energy efficiency initiatives.<br>The suggested study will be included in the text. Also, we can refer Alvarez et al. 2009.<br>The additional point on possible |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12849 | 9 | 38 | 24 | 38 | 28 | It is worth clarifying if lines 24-26 refer to gross or net jobs generated. A problem with stating job numbers generated by a specific amount of money is that wages differ greatly between countries. Obviously, where wages are higher, the same amount of money will generate fewer jobs, and vice versa. It has to be pointed out whether these numbers apply only to developed countries, and even if this is specified, there is still a wide range of wages. | Accepted. Accepted text - revised appropriately. |
| 12642 | 9 | 38 | | 40 | | As mentioned in 9.10.3.2, it was revealed that the higher environmental perofomance, the higher rent and occupancy rate was. Thus, the enhancement of asset value may be considered as one of co-benefits derived from improving environmental efficiency of building. | Accepted. Accepted It is included in the table in Section 9.7.1. No space for a more extended analysis. |
| 9555 | 9 | 39 | 33 | 39 | 35 | Please, reflect here by using the following information; 1) Residential appliances and equipment represent one of the fastest-growing energy loads. The IEA estimates that at least 3.7 EJ per year could be saved costeffectively by 2030. 2) Lighting represents almost 20% of global electricity consumption. This consumption is similar to the amount of electricity generated by nuclear power. The latest IEA estimates show the total savings potential in residential and services lighting at more than 2.4 EJ per year by 2030. 3) Buildings hold great potential for cost-effective energy savings. The IEA estimates that the energy savings potential in this sector in 2009 will be in the range of 20 exajoules (EJ) per year by 2030, which is the same as the current annual electricity consumption of the United States and Japan combined. (25 energy efficiency recommendation, IEA) | Noted. Taken into account. The text that the comment concerns deleted. |
| 17971 | 9 | 39 | 3 | 39 | 3 | To avoid confusion, it might be a good idea to change 'all the studies' into 'All the studies for the USA' to avoid the impression that this applies to all studies considered. | Accepted. |
| 17972 | 9 | 39 | 14 | 39 | 21 | Reduction of demand is included in both (i) and (iv) making this effect redundant. | Accepted. Text revised. |
| 17290 | 9 | 4 | | 7 | | Comment to Exective Summary. In this section, the energy policy of Appliances should be described clearer. Reducing our use of energy for buildings and appliances decreases the demand for primary energy and is a key means to deliver better economic performance, increase energy security and reduce greenhouse gas. About the energy policy of Appliances, Market Transformation should be highlighted as the concept. Market transformation is a holistic, market-based approach designed to promote the manufacturer, purchase, and use of energy-efficient products, services, and/or practice. As its core, it is an integrated and dynamic strategy that coordinates separate "technology push" and "market pull" policies and programs to trigger a permanent shift in the target market. - Technology oriented approaches are closely related to the international standars for IEC, ITU-T test procedures, etc. and the present performance of target products. policies and programs must precisery reflect the level of available technologies and be mindful of the incubation of emerging technologies with future progress and protection of their intellectual property inmind. - Market oriented approaches target improved communications between players in the target market such as governments, manufacturers, retailers and consumers. They must be analyzed with the section of tools and objects in each segment in order to evaluate the cost effectiveness of implemented policies and programs. The global of market transformation is to create structual and behavioral changes in the marketplace that are self-sustainig over time and ultimately deliver: (i) An increased market share for high energy efficient appliances,, services, and practices; (ii) Accelerated deployment of the most efficient technologies; (iii) an array of measures - such as "S & L scheme", "Monitoring & Verification scheme", "Tarining and Education", "Utility DSM programs", "Design competicions", "Financial incentives" and bulk purchasing are employed - targeted at appropriate market participants. (iv) Exisiting market or competitive forces are tapped or leveraged to acheive energy efficiency gains. For example, there are detailed descriptions in the Good Practices Handbook for Market Transformation (Asia Pacific Partnership on Clean Development and Climate, 2008). | Noted. Will consider |
| 7853 | 9 | 4 | 1 | 56 | | It is suggested to include a list of abbrecviations in each chapter to increase the user-friednlyness. | Accepted. in case the page limit allows. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8851 | 9 | 4 | 1 | 86 | | General comments on a whole chapter: The chapters are too long, improvement shall be made to enhance the coherence and focus within and among chapters. e.g., for both chapters 9 and 10 it's important to compile/analyze/present data on the costs of conserved energy for efficiency measures in consistent manner, in comparisons with tranditional energy sources and emerging renewable energy addressed in other chapters (e.g. chapter 7). Also, indusrtrial buildings are very energy intensive (e.g., cleanrooms, laboratories) and GHG-intensive. Opportunities to improve efficiency and save energy from this subsector are abundant, and needs to be included/addressed. This may benefit from research outcomes (cleanrooms) published in archival journals for North America and Asia. | Noted. |
| 3094 | 9 | 4 | 11 | 9 | 12 | page 4 talks of potential savings of 29% by 2030 but doesn't say compared to which year, whereas page 9 talks about 40% but doesn't specify by when. Are these figures consistent? They need to clearly state by year y, compared to year x. | Accepted. |
| 2356 | 9 | 4 | 11 | 4 | 11 | Avoid qualifying wording without quantification. "cost effective" - how do you define? | Rejected. Following literature |
| 2187 | 9 | 4 | 11 | 4 | 29 | The Executive Summary gives a sound and synthetic view of the content of Chapter 9. The second alinaea should however also mention Positive Energy Buildings as recent developments in green buidling technology (even for building retrofits); its should not be only restricted to Lean and Net Zero-Energy Buildings, giving the impression that the latter are the ultimate possible targets for green buildings | Noted. Will consider |
| 2857 | 9 | 4 | 17 | 4 | 17 | change ". . . GHG storage . . ." to ". . . Greenhouse gas (GHG) storage . . ." | Editorial. |
| 2858 | 9 | 4 | 18 | 4 | 18 | delete the word "fundamentally" | Editorial. |
| 9168 | 9 | 4 | 18 | 4 | 20 | NZEB and ZEB are economical GIVEN a lot of subsidies for PVs and others - as such the costs to the owner may be negative, but the costs to the society is very high. | Rejected. Impossible to figure out all subsidies in the Energy sector |
| 14408 | 9 | 4 | 2 | | | Clarify whether emissions associated with production of electricity for heating and cooling buildings are attributed to “buildings” or to “energy sector” emissions. In other words, how is double-counting avoided? | Noted. Wherever possible. In Japan, only energy loss of generation is counted for energy sector, which means no |
| 9172 | 9 | 4 | 2 | 7 | 27 | I got the impression from this exec summary that you put too much emphasis on building hardwares and computer softwares. The source of large energy efficiency gap is lack of proper human energy management systems in place. Proper human capital development and policy intervention to facilitate the coordination among key actores are essential. | Accepted. |
| 9175 | 9 | 4 | 2 | 7 | 27 | Also I got the impression that this exec summary you put too less attention to appliance efficiency improvement. The share of heating use at building sector is much less In developing countries and appliance efficiency of non-heat use are important there. | Accepted. |
| 18855 | 9 | 4 | 2 | | | Probably you want to add "usage" after "final energy" | Editorial. |
| 2859 | 9 | 4 | 22 | 4 | 22 | change ". . . energy active . . ." to ". . . traditional . . ." | Editorial. |
| 2860 | 9 | 4 | 25 | 4 | 25 | The term "ICT" is used for the first in the chapter here. Please define it -- what is ICT? | Editorial. |
| 4575 | 9 | 4 | 25 | | | ICT introduced without definition | Editorial. |
| 6609 | 9 | 4 | 25 | | | Abbreviation 'ICT' has not been defined before | Editorial. |
| 3647 | 9 | 4 | 25 | 4 | 25 | Please explain the abbreviation "ICT" in the text. | Editorial. |
| 9625 | 9 | 4 | 30 | | | Please, replace strong with particular. | Editorial. |
| 2861 | 9 | 4 | 31 | 4 | 31 | change ". . . strong policies . . ." to ". . . strong incentive policies . . ." | Editorial. |
| 16882 | 9 | 4 | 32 | | | You note that market forces won't cause needed transformation "fast enough" -- but this is imprecise. Mkt forces under a cap and trade or price based regime? Or simply current situations in most countries where emissions have no price? Simply because emissions do not decline as rapidly as we want, is not necessarily a signal that they are behind schedule -- even under a CO2 price, not all sectors should decline at the same pace. | Noted. Will consider |
| 4789 | 9 | 4 | 33 | 4 | 33 | Could you please explain what are "plus new business and financial models"? | Editorial. |
| 9169 | 9 | 4 | 41 | 4 | 41 | Is this decrease due to policy, or economic downturn, or population decrease? | Noted. Will consider |
| 18856 | 9 | 4 | 42 | | | "many new buildings will be added": quantification by giving a range would be good | Noted. Will consider |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2856 | 9 | 4 | 5 | 4 | 5 | change ". . ., 25-33% of black. . ." to ". . ., and 25-33% of black. . ." | Editorial. |
| 2855 | 9 | 4 | 8 | 4 | 8 | change ". . .energy carriers start using electricity. . ." to ". . .energy carriers will start using. . ." | Editorial. |
| 11147 | 9 | 4 | 4 | 4 | 4 | Halocarbon emissions are a significant part of building emissions. I am surprised that there is little mention of legislation etc. within this chapter. | Accepted. Consider suggestion by Writing Team |
| 15211 | 9 | 4 | 2 | 6 | 36 | In this part we should point out that in developing countries like China, the energy use in different climate zones and in urban and rural area is quite different. And when we are talking about the potential of different technoligies, we should recognise that different lifestyles and service demands need different technoligies to adapt. | Accepted. |
| 7020 | 9 | 4 of 86 | 40 | 4 of 86 | 40 | Substitute "industrialized" for "developed", around the middle of the line. | Editorial. Substitude "industrialized" with |
| 7021 | 9 | 4 of 86 | 45 | 4 of 86 | 45 | The same as 19th Comment. | Rejected. Unclear |
| 6672 | 9 | 40 | | | | This section mostly deals with health problems, so it is hard to separate it from the subsequent one. What makes the two sections different should be made more clear; alternatively, the two sections could be combined | Accepted.Text revised. |
| 17912 | 9 | 40 | | | | On housing please refer to the housing burden of disease and the recent publication of the WHO, 2011. Just an abstract of the executive summary: http://www.who.int/hia/brochure_housing.pdf | Accepted. |
| 6671 | 9 | 40 | 10 | | | I would remove 'equity, distributional impacts, gender' from the section title, as these issues are not addressed | Accepted. |
| 11708 | 9 | 40 | 7 | 40 | 9 | Rolling blackout after Great East Japan Earthquake on March 11, 2011 and implementation of nation-wide large-scale electricity saving activities give good example of this sentence. (Ex. Nishio and Ofuji, J. Environmental Engineering, Trans. AIJ, No.679, pp.753-759, Yagita et. al., Journal of Japan Society of Energy and Resources, Vol. 33, No. 4 pp.7-16) | Rejected. From the abstracts of these 2 papers (the main text is in Japanese) I understood that they focus on the estimation of the energy conservation effort undertaken in Japan after the big earthquake. However, the text in the |
| 8981 | 9 | 40 | 11 | 40 | 41 | The title not exactly reflects the content. Only fuel poverty has been discussed. | Accepted. |
| 3104 | 9 | 40 | 11 | | | first para is about housing issues in general but not necessarily directly linked to fuel poverty (cut be cut). Don't really understand the terms 'upliftment and up gradation' | Accepted. |
| 15695 | 9 | 40 | 43 | | | I understand why improved indoor conditions improve the health of people, but why have energy efficiency interventions have implications on the indoor conditions? Does a more energy efficient house have automatically better indoor conditions? Isn't it one aspect of building an energy efficient house to keep indoor conditions at an acceptable level (besides reducing GHG emissions, keeping the costs acceptable, etc.)? | Noted. Taken into account. Energy efficiency interventions results in fuel poverty alleviation in both developing and developed countries as less energy is need for achieving acceptable thermal coditions.<br>Also, substituting traditional biomass for cooking in several developing countries |
| 3501 | 9 | 40 of 86 | | | | This section has not addressed gender issue, as partially suggested in the section's title. | Accepted. The title changed. |
| 6674 | 9 | 41 | | | | This is an issue general to energy consumption, not very specific to buildings. It is not useful here | Noted. Taken into account. We have revised the text providing quantitative information for this type of co-benefits |
| 6673 | 9 | 41 | 18 | | 22 | this part is informative about LIME, but not about the results this tool delivers. It should be removed | Accepted. Text revised |
| 17973 | 9 | 41 | 2 | | | There is a lot more literature on cookstoves also assessed in the SRREN, the GEA and the WEO. | Accepted. Additional material has been |
| 8982 | 9 | 41 | 24 | 41 | 30 | Suggest to be discussed in terms of thermal comfort. Air-conditioning can be applied for hot climates only. The discussion is more appropriate to cover in general or different types of climates. | Noted. Taken into account. In this subsection, workspace productivity is discussed, not the thermal comfort.The subsection has been substantially |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17975 | 9 | 41 | 40 | 41 | 45 | What is the range of these monetisation of outdoor air pollution? With so many references, this could be a second candidate for a meta-analysis beyond the one provided for employment effects. | Accepted. The revised text qives some quantitative information about the magnitude of these co-benefits. |
| 15696 | 9 | 41 | 46 | | | The first part of this subsection fits better in subsection 9.7.3.3. The part about water saving is a completely new topic, never mentioned before. Either add it to another section as an additional example or skipp it (probably the topic will already be discussed thouroughly in other parts of AR5). | Accepted. |
| 6675 | 9 | 42 | 10 | | | The current title of the section is inadequate; when not simply call it 'the rebound effect'? | Accepted. |
| 3281 | 9 | 42 | 13 | 42 | 14 | For a more up to date review of rebound effects, see Maxwell et al (2011).<br>Maxwell, D., P. Owen and L. McAndrew (2011). Addressing the Rebound Effect - Final Report, European Commission DG ENV. | Accepted. |
| 3282 | 9 | 42 | 15 | 42 | 17 | The phrase ".....  caused by the additional spending....." is inaccurate. The indirect rebound effect is caused by re-use of the money saved, which is different from simply "additional spending". Re-use of the money saved will generally include investment (eg saving the money in a bank) as well as additional spending. The balance of how the money is re-used (saved or re-spent) is important for estimating the rebound effect, depending on the savings ratio. See Druckman et al 2011.<br>Druckman, A., M. Chitnis, S. Sorrell and T. Jackson (2011). "Missing carbon reductions? Exploring rebound and backfire effects in UK households " Energy Policy 39: 3572–3581. | Accepted. |
| 3283 | 9 | 42 | 29 | 42 | 31 | Chitnis et al (2012) estimate the direct and indirect rebound effect to be 5-15% for a selection of typical energy efficiency measures applied to the UK domestic building stock.<br>Chitnis, M., S. Sorrell, A. Druckman, S. K. Firth and T. Jackson. (2012). "Estimating direct and indirect rebound effects for UK households. Sustainable Lifestyles Research Group: Working Paper 01-12." available from http://www.sustainablelifestyles.ac.uk/sites/default/files/publicationsdocs/slrg_working_paper_01-12.pdf. | Accepted. |
| 6676 | 9 | 42 | 39 | | | effective energy efficiency policies can reduce the rebound': Giraudet and Quirion (2008) show that this is true for the tax, but not for other instruments (Giraudet, L.-G., P. Quirion, 2008, "Efficiency and distributional impacts of tradable white certificates compared to taxes, subsidies and regulations", Revue d'économie politique, 118(6):885-914, http://www.cairn.info/resume.php?ID_ARTICLE=REDP_186_0885) | Accepted. |
| 6677 | 9 | 42 | 44 | | | I don't see what 'public perception' means here | Rejected. No space to explain, cannot olace in a glossary either |
| 6678 | 9 | 42 | 44 | | 45 | this section is little informative | Accepted. Restructured within short |
| 15500 | 9 | 42 | 45 | 43 | 3 | Quote examples not only link with USA. | Accepted. |
| 8983 | 9 | 42 | 7 | 42 | 9 | How do the green schools reduce the water usage by 32%? Is it because of reuse the rain water or due to energy efficiency measures? If it is due to the former reason, is this part of mitigation strategies? If it is because of the latter reason, it is better to mention the technogies/ measures that applied in this case. 32% is impressive. | Accepted. Explanation added. |
| 3105 | 9 | 42 | | | | Heading is misleading - the rebound effect is neither a technological risk nor public perception | Noted. Location of the analysis of rebound needs discussion. It's no even obvious it should be in Chapter 9 at all. There are different discussions in Chapters 7, 8, 10 and 15 (but nothing in Chapter 3). I think ours is the most best (e.g. Ch 15 only considers very old literature) Noted that this is rather misleading. However, it is a risk/se |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15697 | 9 | 42 | 10 | | | New title suggestion: Rebound Effect | Noted. Location of the analysis of rebound needs discussion. It's no even obvious it should be in Chapter 9 at all. There are different discussions in Chapters 7, 8, 10 and 15 (but nothing in Chapter 3). I think ours is the most best (e.g. Ch 15 only considers very old literature). But it is proposed to retain |
| 15698 | 9 | 42 | 44 | | | New title suggestion: Integrating co-benefits into decision-making frameworks | Accepted. In 9.7.5 now |
| 3106 | 9 | 42 | | | | Not sure why this section is called 'public perception' - it seems a mishmash of different things. First sentence mentions several US voluntary programmes but so what - what are you trying to say here? This whole section isn't very clear in what it's trying to day. | Accepted. Section rewritten |
| 3502 | 9 | 42 of 86 | 10 | | | The title of the sub-section 9.7.4 does not reflect well its content. Since this section highlights the rebound effect, please consider to include a discussion on mitigation technologies that address this issue i.e. pre-paid meter and HAN. | Accepted. But it is proposed to retain the title for consistency with other sector chapters. |
| 12584 | 9 | 43 | | | | Institutional/cultural/legal Barriers also include slow reaction of relevant govt. departments (like municipal affairs or urban development etc.) and inadequate provision of green design elements in construction guidelines that directs the commissioning of public sector buildings in some countries. | Accepted. Included, considering short space |
| 2360 | 9 | 43 | | | | This table is in principle very helpful. Currently the formulations are very high level. Try to be much more specific - for space reasons, possibly create links to other parts instead of recreating tables | Accepted. Specific references given |
| 6680 | 9 | 43 | | | | Bullet points would make the reading easier | Rejected. Short space available |
| 6679 | 9 | 43 | | | | It is very surprising to have only a table to summarize the issue of barriers, which is very important and very well documented issue. See for instance the comprehensive and laready very much cited review by Gillingham, Newell and Palmer, 2009 (Energy Efficiency Economics and Policy, in the Annual Review of Resource Economics | Rejected. Short space available and no case studies post-2007 mentioned |

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| 9913 | 9 | 43 | 14 | | | An analysis of 104 empirical studies of innovation to change showed the following barriers, that could refine the discussion of barriers:<br>Issues of resourcing (76%), for instance, “not enough resources” (Post and Altman 1994), “lack of adequate resources such as time and staff” (Adams and McNicholas 2007), limited or no budgeting (e.g. Harris 2000 and Anumba et al. 2006), access to capital and lack of time (Rohdin and Thollander 2006).<br>Issues of capabilities (75%), for instance, “low technology literacy” (Stewart, Mohamed and Marosszeky 2004), “ill-equipped in terms of training and expertise” (Whitaker 1987), “employees are not trained” (Tamimi and Sebastianelli 1998), “lack of understanding” (Waldron 2005), “lack of technical skills” (Rohdin and Thollander 2006), “lack of skill, knowledge and expertise” (Kirkland and Thompson 1999), etc.<br>Issues of communication (64%), for instance, “communication barriers” (Heide, Grønhaug and Johannessen 2002), “communication overload and distortion” (Allen 2002), “lack of communication within the team” (Attaran and Nguyen 1999), “lack of communication among those sharing responsibility for different aspects” (Kunda and Brooks 2000), “poor communication practices that damaged employee commitment to projects” (Jacobs et al. 2006), “tension among departments arising from the incompatibility of actual or desired responses” (Aggarwal 2003), etc.<br>Issues of organizational structure (62%), for instance, bureaucracy (e.g. Molinsky 1999; Borins 2000; Abdul-Hadi, Al-Sudairi and Alqahtani 2005), “salary structure” (Al-Qirim 2007), “complexity, centralization, and formalization”(e.g. Allen 2002), “rigid organizational boundaries” (Butler 2006), “departmental fortresses” (Cicmil 1999), and organizational structure (e.g. Scarbrough and Lannon 1988; McGaughey and Snyde 1994; Yauch and Steudel 2002).<br>Abdul-Hadi, N., Al-Sudairi, A. und Alqahtani, S. (2005): Prioritizing barriers to successful business process re-engineering (BPR) efforts in Saudi Arabian construction industry, In: Construction Management \& Economics, Vol. 23, Nr. 3, S. 305-315.<br>Adams, C.A. und McNicholas, P. (2007): Making a difference: Sustainability reporting, accountability and organisational change, In: Accounting, Auditing and Accountability Journal, Vol. 20, Nr. 3, S. 382-402.<br>Aggarwal, N. (2003): Organizational Barriers to Market Orientation, In: Journal of Management Research, Vol. 3, Nr. 2, S. 87-97.<br>Allen, R.Y.W. (2002): Assessing the impediments to organizational change: A view of community policing, In: Journal of Criminal Justic, Vol. 30, Nr. 6, S. 511-517.<br>Al-Qirim, N. (2007): The adoption and diffusion of E-commerce in developing countries: The case of an NGO in Jordan, In: Information Technology for Development, Vol. 13, Nr. 2, S. 107-131.<br>Anumba, C.E.H., et al. (2006): Understanding structural and cultural impediments to ICT system integration: A GIS-based case study, In: Engineering Construction & Architectural Management, Vol. 13, Nr. 6, S. 616-633.<br>Attaran, M. und Nguyen, T.T. (1999): Design and implementation of self-directed process teams, In: Management Decision, Vol. 37, Nr. 7, S. 553-561.<br>Borins, S. (2000): What Border? Public Management Innovation in the United States and Canada, In: Journal of Policy Analysis and Management, Vol. 19, Nr. 1, S. 46-74.<br>Butler, J.C. (2006): Ten Lessons Learned: Data Warehouse Development Project, California Department of Fish and Game, In: CrossTalk: The Journal of Defense Software Engineering, Vol. 19, Nr. 10, S. 16-20 | Rejected. Old references, prior to 2007 |
| 4264 | 9 | 43 | 41 | | | Markandya et al showed that in India when the health co-benefits of reduced particulate air pollution were taken into account using EU methodology to monetise the benefits they covered the costs of mitigation. This was less so in the case of China and the EU because of lower baseline levels of air pollution but the benefits were still substantial. Markandya A, Armstrong BG, Hales S, Chiabai A, Criqui P, Mima S, Tonne C, Wilkinson P. The Lancet - 12 December 2009; 374, 9706: 2006-2015 | Accepted. The revised text gives some quantitative information about the magnitude of these co-benefits. We included a more detailed paper of the same research team concerning this |
| 3107 | 9 | 43 | | | | should mention here that barriers into energy efficiency have been widely studied. This (short) section seems to be in the wrong place - should be with 9.10 as this is about policies to overcome the barriers. | Accepted. Section structure readapted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12636 | 9 | 43 | | | | "Principal-agent problem(Tenant-owner problem)"should be featured as a significant barrier in building sector. Following document may have implications.<br>Owner-Tenant Engagement in Responsible Property Investing<br>http://www.unepfi.org/fileadmin/documents/TenantEngagementReport.pdf | Accepted. Consider suggestion by Writing Team. Add “Principal-agent problem(Tenant-owner problem)” to Barriers column and “Institutional, |
| 12643 | 9 | 43 | | 43 | | The complexity of interaction and visious spiral of shifting responsibilties among many stakeholders are building value chain is referred to as a major barriers to energy efficient buildings.<br>(WBCSD, "Energy Efficiency in Buildings Facts & Trends", 2007)<br>(RICS, "Breaking Vicious Circle of Blame- Making the Business Case for Sustainable Buildings", 2008) | Accepted. This comment is true, but it is difficult to respond with simple expression. Consider suggestion by Writing Team. Add “too many stakeholders interact along a building |
| 15700 | 9 | 43 | 14 | | | The table gives a good summary of the barriers and opportunities that exit. However, wouldn't it be better to put this table (it's hardly a section) more at the end of chapter 9 and call the section something containing the word "summary"? | Accepted. Section structure readapted |
| 15214 | 9 | 43 | 19 | 43 | 23 | How the lifestyle is changes in developing countries is also of importance. | Accepted. Consider suggestion by Writing Team. Add “Lifestyle change in developing countries” to “Opportunities” |
| 3504 | 9 | 43 of 86 | | | | Under "Opportunities" column of "Institutional, cultural and legal" row, it is recommended to add (1) the opportunities presented to education sector, including R&D at tertiary level, (2) Inter-governmental agencies action plans, (3) cross-sectoral relationship, (4) public private partnership, etc. Overall concept can be found in [Cam C.N.W. (2012). Technologies for Climate Change Mitigation: Building Sector. Denmark: UNEP Riso Centre.] | Rejected. Overall points were already included, found no practical case to be cited. Barriers structure was the same from AR4. |
| 2362 | 9 | 44 | | | | Taking a critical view, this chart can be interpreted that we have no clue what is needed in buildings to achieve certain pathways. Rethink if this chart is needed at all. | Rejected. Chart conveys the right messages |
| 6681 | 9 | 44 | | 45 | | the EMF25 report (http://emf.stanford.edu/files/pubs/22530/summary25.pdf) and the 2011 Special Issue of the Energy Journal on Energy Efficiency of the Energy Journal provide such modelling comparisons | Noted. Will check |
| 15699 | 9 | 44 | | | | What do the diagonal lines mean? The figure is rather complicated, due to so many lines. | Noted. Clarify |
| 15501 | 9 | 44 | 15 | | | Delete additional brackets after Krey et al., 2012 | Editorial. CSAs please check |
| 9556 | 9 | 44 | 4 | 44 | 6 | Please, take into consideration following; the buildings sector has an important role to play in CO2 emissions reduction. Energy efficiency options are available in the buildings sector that can reduce energy consumption and CO2 emissions from lighting, appliances and heating and cooling rapidly and at low cost. But achieving deep cuts in energy consumption and CO2 emissions in the buildings sector is a challenge. The implementation of these technologies will require much more ambitious policies, particularly in relation to building shells in the existing stock of buildings in OECD countries, as well as decarbonising the energy sources used. (ETP 2010, IEA, p218) | Noted. Already conveyed such message |
| 4263 | 9 | 44 | 40 | | | It is the combination of insulation with improved ventilation control for example through mechanical ventilation with heat recovery, that results in the health benefits by reducing exposure to indoor air pollution and to the ingress of outdoor pollutants if filters are fitted and maintained. In the Wilkinson study referred to it was assumed that the 20% of dwellings that were most tightly sealed and insulated were fitted with MVEHR | Noted. Checked. |
| 3167 | 9 | 44 | 3 | | | Section 9.9.1 is a good model of what's needed in other sectoral chapters—a link back to chapter 6 so that readers can see how a common set of transformation pathways affects each sector. | Noted. Thanks. No action |
| 2363 | 9 | 45 | | | | Split into "total" and "hvc" energy use | Noted. |
| 2197 | 9 | 45 | 3 | 45 | 22 | The evolution of the final energy demand for buildings in Switzerland, held constant over the period 1974 to present (see http://www.bfe.admin.ch), can be used to strongly back-up the argument that "despite all assumed increases in GDP, floorspace and service levels global building energy use can be held at least constan,t or decreas,e as a result of measures". | Noted. Will check |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8984 | 9 | 46 | | | | What are the elements that included in 'resident others'? Heating and cooling usually play the major consumptions. Other than that are the appliances, refrigerators, TVs, etc, which is quite surprised to be the major and a lot higher than heating and cooling demands. | Noted. Clarify please |
| 15502 | 9 | 46 | | | | Add a sub chapter on initiative to reflect building performance (Common Carbon Metric from UNEP-SBCI or others) – Link somewhere this information with baseline needs - Can be in Chapter 9.10 | Rejected. No space |
| 6682 | 9 | 46 | 12 | | | the previous sections demonstrated that many strong barriers…': again, the nature of the barriers is not formally discussed, nor 'demonstrated' | Accepted. Change wording |
| 9557 | 9 | 46 | 12 | | | Please, replace strong with particular. | Editorial. |
| 15701 | 9 | 46 | 12 | 46 | 12 | "The previous sections demonstrated …" Such sentences take a lot of space and are, in my point of view, not really necessary and sometimes confusing. My sentence would be "Strong barriers prevent the full uptake of energy saving measures and market forces alone will not achieve ..." Maybe it's just a matter of opion ... | Accepted. Change wording |
| 9558 | 9 | 46 | 14 | | | Please, add the following; significant evidence shows that appliance MEPS and labelling programmes have generally been successful in terms of their effectiveness in saving energy and cost efficiency. (Technology roadmap Energy-efficient Building,2011, IEA, p22) | Noted. Will consider |
| 9559 | 9 | 46 | 19 | | | Please, add the following; McKinsey's global marginal abatement cost curve (MACC) places efficient lighting systems and air conditioning as measures that achieve GHG emission reductions at zero or negative cost (between -60 EUR/tCO2 and -80 EUR/tCO2), i.e. at no net cost to the economy. In MACC analysis developed by McKinsey for Germany, the UK, Australia and the United States, residential appliance, equipment and lighting efficiency improvements are negative cost measures across the four countries, though the specific cost varies (AP Envecon, 2009). Most of the studies emphasize the importance of policies concerning end-user efficiency (residential and industrial energy demand) and some studies describe measures in this field as crucial factors in the short run (2010 to 2030) to reach the emission targets set for the long run (e.g. ETP Blueline). The proposed measures comprise the thermal integrity of buildings and heat pumps (Energy Roadmap 2050, Impact assessment, European commission, p104 ) http://ec.europa.eu/energy/energy2020/roadmap/doc/sec_2011_1565_part2.pdf | Noted. There is a lot of controversy about Mc Kinsey´s curves |
| 3108 | 9 | 46 | 22 | | | which 5 years are these? | Accepted. Clarify |
| 18896 | 9 | 46 | 6 | | | "Figure 9.10": Probably this should read "Table 9.10" | Accepted. CSAs please check |
| 11709 | 9 | 46 | 10 | 56 | 11 | In the developing countries in which increase in floor area is expected, is there any other policy tool than financing shown in this subsection? | Rejected. All the policies presented (e.g. S&L, building codes, etc.0 in this |
| 6684 | 9 | 47 | 14 | | | Again, I could not find the reference cited as 'Anonymous 2009' on the internet | Accepted. Provide this reference |
| 2903 | 9 | 47 | 2 | 47 | 2 | (Lewis, 2010) is not in the References section at end of chapter | Accepted. Provide this reference |
| 3109 | 9 | 47 | 2 | | | should say 'these buildings' will still be standing | Editorial. CSAs please check |
| 6683 | 9 | 47 | 2 | | | I could not find the Lewis 2010 reference | Accepted. Provide this reference |
| 11781 | 9 | 47 | 20 | 47 | 21 | In the paragraph "Energy efficeincy 'white' certificates" at page 56, concern in the future is described. Thus in order for readers to understand it's not the best way to take, [only in the short-term] should be added after this sentence. | Rejected. Not Accepted WhC have proven to be cost-effective, this bullet point as it is in the FOD should be |
| 9562 | 9 | 47 | 20 | 47 | 21 | Please, provide the reason of very cost effective with text as overhead costs incurred in SMEs sholder uts burden and most of savings are delivered by ESCOs. | Noted. Consider suggestion by Writing Team. Partly accepted, we can include a reference to ESCOs but the rets of the |
| 6685 | 9 | 47 | 33 | | 36 | this sentence is redundant and very general. It can be removed | Rejected. Cannot accept this comment, it is very important to hav e this |
| 18897 | 9 | 47 | 5 | | | Orthorgraphy: should read "countries for example" | Editorial. Correct the spelling mistake |
| 12633 | 9 | 47 | 41 | 47 | 4 | "Tax credit" for energy efficient building seems also emerging . | Accepted. OK accepted it will be mentioned in the paragrapgh on |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3505 | 9 | 47 of 86 | 33 | | 40 | It is recommended to start this paragraph by highlighting the importance of deploying policies that promote the implementation of the building sector's mitigation technologies to be in line with the national sustainable development goals. Detailed analysis can be found in [Cam C.N.W. (2012). Technologies for Climate Change Mitigation: Building Sector. Denmark: UNEP Riso Centre.] | Accepted. Consider reviewer's suggestion |
| 2880 | 9 | 48 | 16 | 48 | 16 | (Bertoldi, 2010) should be (Bertoldi et al, 2010) | Accepted. Consider correction |
| 6687 | 9 | 48 | 23 | | 24 | The reference to Brussels' building code seems a bit anecdotal. It can be removed | Rejected. NOT Accepted this is very good example, which I would like to |
| 6686 | 9 | 48 | 5 | | | Another pioneering publication on sufficiency is: Alcott, 2008, 'The sufficiency strategy: would the rich-world frugality lower environmental impact', Ecological Economics | Accepted. |
| 3111 | 9 | 48 | 9 | | | personal carbon allowance - this is only a potential policy instrument, it hasn't been introduced anywhere and would be politically very difficult to do. Not sure about the link between property taxation and energy sufficiency. Property taxation is usually done for other reasons, need to explain their use in this instance. | Accepted. Distinction between policies that have been implemented and those that have not. Ok to explain that propose tax proposety is set as fucntion of total eenrgy consumption of the household |
| 9514 | 9 | 48 | 9 | 48 | 12 | delete these 2 sentences - It is not acceptable to mention personal carbon allowance in IPCC report | Rejected. No action. It's a form of carbon trading, so the comment is unjustifiable. |
| 9435 | 9 | 48 | 9 | 48 | 12 | · Deletion of the entire sentence is needed.<br>· A policy that sets out carbon emission allowance per person or yearly kWh consumption per person does not have universal relevance. An IPCC document that includes this stipulation will lose relevance as a world-wide agreement applicable beyond particular countries or regions. Such a policy would also infringe on individual freedom and will not gain consensus. □ | Accepted. Partly accepted, will be challanging to have it accepted by population, but has some additional bebefits such as social equity. IPCC does not prescribe any policy nor recommend any policy, jus indicates |
| 6688 | 9 | 49 | 10 | | | there is agreement among experts and it is widely reported in the literature': further evidence should be provided on that point. All the more that I could not find Harmelink et al 2008 in the reference list | Accepted. (1) Provide more peer-reviewed literature<br>(2) Include reference in the |
| 2904 | 9 | 49 | 45 | 49 | 45 | (Harmelink et al, 2008) is not in the References section at end of chapter | Accepted. OK it will be added |
| 3112 | 9 | 49 | | | | why is this a subsection? It's one sentence and doesn't really say anything. | Accepted. OK we can delete this sub section for individual policy instruments |
| 15702 | 9 | 49 | 5 | | | This subsection holds just one sentence, which can be added around the first time table 9.10 is mentioned (page 47, line 12). As a result, the title of 9.10.2.3 can be skipped as well (the title only, not the content). If you want to keep the title, then keep it and put an extra subsection before the instruments in section 9.10.2, which can be called "Policy instruments" or something like that. | Accepted. OK we will accept this comment, see also previous comment |
| 3113 | 9 | 49 | | | | this could be merged with 'a holistic approach' on page 48 | Rejected. NO we need a section specific to policies pacakages. No action |
| 17291 | 9 | 49 | | | | Comment to Policy packages. In this section, the energy policy of Appliances should be described clearer. In many cases, policy measures of Appliances are used in combination to increase their impact. There are numerous examples, such as "MEPS and performance labels", "Endorsement labels and procurement policies" and "Labels, retailer programmes and customer insentives. However, with effectiveness of energy policy of Appliances, there is no one single model to employ; rather, each program varies in terms of structure, funding, and implementation. The specific policies, regulations, programs, and incentives needed are highly dependent on the nature of the target product or the technological area and conditions (e.g. market structure, resources, institutional capacity) of the target market area (e.g. national, state, regional grouping), and the background of each country such as its history, culture, custom, economical development, national awareness, etc. For examples, The Japanese Top-runner Program is not MEPS. As the policies for market transformation depend on the status and conditions of the target market. There are detailed descriptions in the Gadgets and Gigawatts - Policies for Energy Efficient Electronics (IEA, 2009). | Accepted. Include comment in the Text |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3507 | 9 | 49 of 86 | | | | It is recommended to include the successful case example from Singapore government's green building policy packages, termed as Green Building Master Plan. | Accepted. OK good suggestion, it wil be included |
| 4790 | 9 | 5 | 1 | 5 | 3 | I am not sure that this sentence is correct and true. It depends on several parameters (devil in details), and pricing could be more effective than regulation/programs. Have you got evidence to prove this sentence? | Noted. Will consider |
| 16883 | 9 | 5 | 1 | | 7 | No evidence that prices influence building EE? Can you not examine energy efficiency in high price electricity markets like Germany and compare to low price markets like parts of U.S. to test? Is it really true? Generally, if there is no response or it is a smaller response than expected, it means the price has not increased enough, or else the models looking at the costs needed to become more efficient are not factoring in other costs that also influence peoples' decisions (opportunity costs, time, etc). | Noted. Will consider |
| 9170 | 9 | 5 | 1 | 5 | 7 | It is very important message to policy maker hence should be put in the exec summary. | Accepted. Will consider |
| 9171 | 9 | 5 | 1 | 5 | 7 | But energy price (not necessarily "mitigation policy instruments") does affect the energy consumption behaviour. It should be noted. I imagine Japan and EU are spending less than AUS and US and it is (at least partly) due to the difference in energy price. | Noted. Will consider |
| 18857 | 9 | 5 | 12 | 5 | 15 | This sentence is unclear. Why is "most ambitious policies" worse than "best practice standards" | Noted. Will consider |
| 7697 | 9 | 5 | 20 | 5 | 24 | This statement is unsupported by the literature (white lit anyway). I couldn't find support in the chapter but I may have missed it. | Noted. Will consider |
| 6610 | 9 | 5 | 22 | | 23 | There is no comment throughout the report about the persistence of these potential energy savings | Noted. Will consider |
| 6611 | 9 | 5 | 24 | | | The word 'risk' seems inappropriate here. Alternative suggestion: 'likelihood' | Noted. Will consider |
| 16884 | 9 | 5 | 34 | | 45 | Similar to the previous comment, I would encourage caution in claiming that price does not impact building efficiency value or investment -- I would also be very cautious in depending on engineering models that determine the value of energy savings. These will be very different from actual market potentials. The engineering or economic models frequently fail to account for other costs that dissuade people for making the investments that look like obvious energy saving winners. | Noted. Will consider |
| 6612 | 9 | 5 | 42 | | | The existence of co-costs should be mentioned, even though they might be largely offset by co-benefits | Noted. Will consider |
| 16256 | 9 | 5 | 49 | 5 | 50 | Unclear: Why should uniformization be needed in order to adress the problem of fragmented actions? Uniform solutions might be less flexible to take the specific context into account. | Rejected. |
| 3487 | 9 | 5 of 86 | 37 | | 40 | It is recommended to add: "decreased the needs to invest in additional/expansion of communal energy supply/distribution infrastructure." There are cases where more energy efficient buildings in a community are the very reason for local governments to revoke the plan of expanding/building new power plant. | Noted. Will consider |
| 7023 | 9 | 5 of 86 | 18 | 5 of 86 | 18 | Add "zero and" after the word "adequate". | Editorial. |
| 7024 | 9 | 5 of 86 | 22 | 5 of 86 | 22 | Substitute "industrialized" for "developed", after the word "In", at the beginning of the line. | Accepted. Substitude "industrialized" |
| 7025 | 9 | 5 of 86 | 25 | 5 of 86 | 25 | Substitute "industrialized" for "developed", as the first word of the line. | Accepted. Substitude "industrialized" |
| 7022 | 9 | 5 of 86 | 6 | 5 of 86 | 6 | Modify the sentence after the word "both", for the following one: "promotion of energy efficiency and reduced energy demand". | Editorial. |
| 9560 | 9 | 50 | | 51 | | Please, wrap up and simplify policies described by categories of labeling, MEPS, procurement, fiscal measures, and tradable energy and GHG saving scheme. | Accepted. Categorise as agreed in Vigo. OK (partly accpeted) we have already in each row a different policy, but we could categorise them as agreed in Vigo on |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4739 | 9 | 50 | | 52 | | The element of Table 9.10 in the 13th row and 2nd column could be modified as follows<br>Incentives (e.g.grants and subsidies) and financing (e.g.low interest loans,) for investments in energy efficiency, an in the UK Green Deal pay as you save scheme, or Japanese housing eco-point system, provides shopping point when the consumer invest energy efficiency of housing.<br><br>The element of Table 9.10 in the 16th row and 2nd column could be modified as follows<br>Information campaign to stimulate both behavioral changes (e.g. to turn down the thermostat by 1 C during the eating season and Japanese Cool-Biz Campaign) as well as investments in energy efficiency technologies: new developments in the area of smart metering will also impact on consumer behavior | Accepted . OK accepted (we need paper reference with the evaluation of this policy) |
| 9173 | 9 | 50 | | | | good table. But it needs much more explanation in the main text to get the message across. | Accepted . Introduce a message in the |
| 9174 | 9 | 50 | | | | I will refer to this table and some numbers within in our ch15 SOD. | Accepted . |
| 9176 | 9 | 50 | | | | kazuari 2007 should be Kainou 2007. | Accepted . To be done |
| 6689 | 9 | 51 | | | | Giraudet et al 2012 in the second row, fifth column refers here to: Giraudet, L.-G., L. Bodineau, D. Finon, 2012, “The costs and benefits of white certificates schemes”, Energy Efficiency, 5(2):179-199. This should be added in the reference list | Accepted . To be done |
| 10013 | 9 | 51 | | | | In the third columns from top, Tokyo cap & trade program is mentioned. But this example should be deleted completely. Tokyo cap & trade program is currently under the special measure for the Great East Japan Earthquake, which allows CO2 emission increase caused by home generation, which means the program is not implemented under normal condition. Therefore, Tokyo cap & trade program is not considered as a good example of cap & trade policy. | Accepted. Should delete example. OK we can take it out, though I personally think it was a good policy, just suspended because of the earthquake |
| 2881 | 9 | 53 | 13 | 53 | | define ESCOs - energy services company? | Accepted . Provide definition. Definition is available in the prior draft |
| 2905 | 9 | 53 | 33 | 53 | 33 | (Milin and Bullier, 2011) is not in the References section at end of chapter | Accepted. |
| 3114 | 9 | 53 | 7 | | | The UK government is not planning to subsidise the interest rate. However, some measures installed under the Green Deal (notably solid wall insulation) will be subsidised under the separate energy company obligations (where energy companies have obligations to meet carbon targets) | Accepted. Rewrite the section |
| 2906 | 9 | 54 | 3 | 54 | 3 | (RSA, 2009) is not in the References section at end of chapter | Accepted. |
| 15504 | 9 | 54 | 38 | | | Present more in detail MRV reality and NMM opportunities link with the build environment. A dedicated sub chapter on NAMAs will make sense (see Johnson Controls or others reports) - Can be also in sub-chapter 9.10 | Rejected. NMM and NAMA new concepts still being negotiated in COP/MOP climate meetings |
| 15503 | 9 | 54 | 38 | 55 | 9 | Suggestion to add a more comprehensive chapter on this issue. This sub-chapter is a crucial one as it is link also with methodologies to report buildings performance in a climate perspective. At least explain methodologies to secure data and carbon reduction. Explain difficulties link with CDM design (see UNEP-SBCI, Risoe) | Rejected. 1. No CDM to be discussed 2: 2 sentences to explain difficulties link with CDM. No space to discuss CDM methodologies in this chapter. 1-2 sentences highlighting |
| 13698 | 9 | 54 | 40 | 55 | 9 | Replace "The CDM is regarded … SHS type of projects" by: Replace by: "However, it until recently has bypassed the sector entirely. Some of the methodological obstacles to energy efficiency projects are discussed by Michaelowa et al. (2009). However, a "whole building" baseline and monitoring methodology approved in 2011 may pave the way for more building projects (Michaelowa and Hayashi 2011). Since 2009, the share of CDM project in the building sector has increased, particularly with regard to efficient lighting schemes UNEP Riso Centre (2012)". References: Michaelowa, A.; Hayashi, D.; Marr, M. (2009): Challenges for energy efficiency improvement under the CDM—the case of energy-efficient lighting, in: Energy Efficiency, 2, 4, p. 353-367; Michaelowa, A.; Hayashi, D. (2011): Waking up the sleeping giant: How the new benchmark methodology can boost CDM in the building sector, in: Trading Carbon Magazine, 5, p. 32-34. (Data should be updated at the time of finalization of AR5.) | Accepted. Consider reviewer's comment as suggested but do not replace; agree to include, but not replace any sentence. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2198 | 9 | 54 | 5 | 54 | 31 | Real estate values of Minergie certified buildings in Switzerland are generally higher than those of state-of-the-art buidlings in 2012 for reason of better aging perspectives for the future, backing-up the assertion made for Leed certified buildings in the US. | Noted. References not provided though |
| 2907 | 9 | 54 | 7 | 54 | 7 | (Lewis, 2010) is not in the References section at end of chapter | Accepted. |
| 6690 | 9 | 54 | 7 | | | Lewis 2010 is missing in the reference list | Accepted. |
| 2882 | 9 | 54 | 9 | 54 | 9 | should not (UNEP FI PWG) be changed to (UNEP FI 2009)? | Rejected. It is abbreviation of text provided in the section. No action |
| 12644 | 9 | 54 | 15 | 54 | 19 | The effects of environmental performance on the rent and occupancy rate have been studied intensively in recent years<br>(Norm Miller et al., "Does Green Pay Off?", 2008)(Piet Eichholtz et al., "Doing Well by Doing Good", 2008)<br>(Norm Miller et al., "Does Green Still Pay Off?", 2010) | Accepted. Reference the proposed literatures |
| 3509 | 9 | 54 of 86 | 39 | | 48 | It is essential to elaborate the potential of CDM (Programmactic CDM) that are more "friendly" to the building sector. For more details, please refer to [Cam C.N.W. (2010). On Formalising Building Sector in the Renewal of International Climate Change Treaty. International Journal of Sustainable Development. InderScience Publishers. ] | Rejected. No space to discuss pCDM here it would require a lot of discussions. No action |
| 11288 | 9 | 55 | 35 | 55 | 35 | To be included: "Green mortgage programme in Mexico is designed to promote sustainable building by offering a very attractive interest rate for such building." | Noted. Will check |
| 3650 | 9 | 55 | 9 | 55 | 9 | Please also take into consideration that concentional CDM projects in the buildigh sector suffer from the disadvantage that the GHG emission reduction per building is relatively small. Hence, Programmatic CDM projects bundling a large number of buildings provide for a larger potential. | Rejected. No space to discuss pCDM here it would require a lot of discussions. No action |
| 11710 | 9 | 57 | 12 | 57 | 22 | Line feed is missing | Accepted. |
| 11289 | 9 | 57 | 3 | 57 | 3 | It is worth mentioning that more developing countries are looking at green building design as a solution for their energy crises. Some of them have initiated the process of reviewing their building code to include resources efficiency measures. | Accepted. |

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| 9436 | 9 | 57 | 30 | 57 | 32 | · Deletion of the phrase 'on-site renewable energy generation and cogeneration' is needed.<br>· This is because it does not reflect the reality.<br>· Power generation efficiency of cogeneration is lower than that of the most advanced centralized power plant, if the usages of heat and electricity are not balanced, and therefore does not reduce dependence on imported fuel. While cogeneration has limitations on the kind of fuel (gas, oil) that can be used, centralized power plant is capable of using various types of fuel (gas, oil, coal, uranium, etc.) Take coal, for example, having the advantage of energy security in terms of both geopolitics and the amount of reserves.<br>· Refer to the following documents.<br>Pepermans et al.[1] discussed the issue of energy security of distributed generation. They say in some discussion, energy security in linked to the diversification of primary energy supplies, in others it is interpreted as the reliability of the electricity system. Under the first interpretation, energy security improves as the diversification of primary energy supplies increases. In this case, the advantage of distributed generation are limited, as most technologies – with the exception of systems based on renewables –directly or indirectly depend on natural gas. Under the second interpretation, it is felt by many authors, for example by the IEA (2002), that distributed generation can contribute to reduce the risks and costs of blackouts. Here, distributed generation is seen as an instrument that helps to reduce the private costs and risks for electricity customers of system failures. Others, like CIRED (1999)[2], claim that distributed generation does not contribute to system security. On the contrary, it would have a negative effect. Such a negative impact on the system security occurs when the share of non-dispatchable generation capacity increases. Examples of such units are wind turbines, photovoltaic systems and cogeneration units that are closely tied to heat demand. The latter units cannot be centrally controlled because of the natural variability of their power supply. As a consequence, there is an increased need for regulating (backup) power.<br>1]G. Pepermans, J. Driesen, D. Haeseldonckx, R. Belmans, W. D'haeseleer<br>Distributed generation: definition, benefits and issues<br>Energy Policy, Volume 33, Issue 6, April 2005, page 787-798<br>http://www.sciencedirect.com/science/article/pii/S0301421503003069<br>[2]CIRED (1999)<br>Disperse Generation<br>Preliminary Report of CIRED Working Group No.4<br>http://www.cired.be/WG04-Report%20.pdf<br>[1]page 794 right column lines 17-42<br>[2]page 5 left column lines 10-14 | Noted. Will check. Sources provided are old |
| 2863 | 9 | 6 | 10 | 6 | 10 | change ". . . Building . . ." to ". . . building . . ." | Editorial. |
| 6614 | 9 | 6 | 26 | | 30 | In terms of co-costs: what about loss in amenities due to efficient lighting, mercury pollution due to efficient lighting, inconvenience due to retrofit works? | Noted. Will consider |
| 16886 | 9 | 6 | 26 | | 30 | Seems redundant with previous paragraph. | Noted. Will consider |
| 6613 | 9 | 6 | 27 | | | It seems like CB and CR haven't been defined | Accepted. CSAs please check |
| 9426 | 9 | 6 | 32 | 6 | 33 | · Addition is needed for the description of "top runner".<br>· "Top runner" should be introduced as an example of Japanese high energy efficiency technologies, also in the executive summary. | Noted. Top runner approach is already included in Table 9.10. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6615 | 9 | 6 | 37 | 7 | 13 | Since the equation that is eventually used is the one on page 7, line 13, the discussion on other equations should be shortened or even removed from this summary | Noted. Will consider |
| 16887 | 9 | 6 | 37 | 7 | 27 | This is interesting but I wonder how useful it is to policymakers or those trying simply to see what can be done in this sector to lower emissions. Could you instead provide a sort of cost curve for the most cost effective means to lower energy use by building type, age, climate zone --- perhaps relate this to different levels of retail cost of electricity. | Rejected. Would be too simplified |
| 2862 | 9 | 6 | 46 | 6 | 46 | define the terms (Cffse) and (Crepe) | Accepted. CSAs please check |
| 16885 | 9 | 6 | 8 | | 15 | I would argue that the goal for buildings should not be net zero energy use, rather low emissions associated with energy use at the lowest total cost. It is cheaper to do zero energy in building retrofits? Or would it be less costly to decarbonize the energy system? | Noted. |
| 7852 | 9 | 6 | 8 | 6 | 15 | Only in reading this paragraph this approach becomes apparent. It is suggested that the other chapters (e.g. energy, transport, agriculture) make it also as visible as this chapter. Although this approach might look somehow different in the various chapters the terminology used should be the same throughout the whole volume!! | Noted. Liaise with other chapters |
| 7026 | 9 | 6 of 86 | 6 | 6 of 86 | 6 | Add "zero and" after the word "Delivering", around the middle of the line. | Accepted. CSAs please check |
| 2883 | 9 | 68 | 37 | | | insert new reference - Hughes, P. J. and J. A. Shonder (1998). The Evaluation of a 4000-home Geothermal Heat Pump Retrofit at Fort Polk, Louisiana: Final Report. Report No. ORNL/CON-460. Oak Ridge National Laboratory, Oak Ridge, TN. | Rejected. The reviewer has not indicated where this should be included in the text. Consequently not useful to include |
| 8352 | 9 | 7 | 1 | 7 | 27 | Kaya identity is shown in detail in chapter 5. I suggest this page be moved to p.26 in chapter 5. | Noted. Will consider |
| 4728 | 9 | 7 | 1 | | | Excecutive Summary looks good. But it doesn't summarizes body text.<br>・ There is no explanation about identity in body text.<br>・ There is no text about lifestyle (page5, Line20-23). | Noted. Will consider |
| 2188 | 9 | 7 | 1 | 7 | 27 | The conceptual equations mentioned in this alinea are not obvious (without a proper introduction and explanation of the different litteral symbols used in the equations). As they do not appear later on in the text of Chapter 9, their presence in the Executive Summary is somehow questionable. | Noted. Will consider |
| 11697 | 9 | 7 | 1 | 8 | | It is very easy to understand to classify all mitigation options such as BiRES and HPE into four major mitigation strategies; Carbon efficiency, Technological efficiency, Systemic/infrastrural efficiency and Demand Reduction. However, the description in sections 9.3, 9.4 are not correspond to these classifications. It is strongly recommended that rearrange sections 9.3, 9.4 depending on the four major mitigation strategies. | Accepted. Consider suggestion by Writing Team |
| 18858 | 9 | 7 | 13 | | | Consider to introduce an indice running over different energy devices for the last three factors | Noted. Will consider |
| 6616 | 9 | 7 | 14 | | 27 | This paragraph is too long | Editorial. CSAs please check |
| 18859 | 9 | 7 | 15 | | | Consider adding "for non on-site-generated energy see Ch.7" | Accepted. CSAs please check |
| 7027 | 9 | 7 of 86 | 14 | 7 of 86 | 14 | Add "zero and" after the words "fuel switch to", around the middle of the line. | Accepted. CSAs please check |
| 2884 | 9 | 79 | 26 | | | insert new reference - Shonder, J. A., and P. J. Hughes. (1997a). Electrical Energy and Demand Savings from a Geothermal Heat Pump Eneregy Savings Performance Contract at Fort Polk, Louisiana. ASHRAE Transactions, Vol 103, Part 2, pp 767-781. | Rejected. The reviewer has not indicated where this should be included in the text. Consequently not useful to include |
| 2885 | 9 | 79 | 26 | | | insert new reference - Shonder, J. A., and P. J. Hughes. (1997b). Estimated Maintenance Cost Savings From a Geothermal Heat Pump Energy Savings Performance Contract at Fort Polk, Louisiana.. ASHRAE Transactions, Vol 103, Part 2, pp 757-766. | Rejected. The reviewer has not indicated where this should be included in the text. Consequently not useful to include |
| 12574 | 9 | 8 | | | | Last row- last column: Building certificates & ratings seem to fit better under last row fouth column | Noted. CSAs please check |
| 2357 | 9 | 8 | | | | This is the key table people will look at. 1) Drive to fill all fields with best information (blank spaces look odd). 2) Add accompanying text that numbers include duplications (and must not be added), 3) work more on synthesis for potentials - do show synthesis ranges instead of examples 4) if you show cost, use common metric (eg. $/tCO2e) | Noted. Will consider |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10009 | 9 | 8 | | | | "Policies"should include "voluntary target scheme" because there are successful examples of "voluntary target scheme" in the world. Each industry in Japan has voluntary target and the voluntary target scheme has played a big role, as described in (Yamaguchi, 2012, page35 and 154), (Manuel, 2010, page 6 and 13), and (Yamaguchi, 2010, abstract). In addition, there is also a successful example of "voluntary target scheme" in Netherlands, as shown in (Martijin, 2002, page162). These reference sources are same as for No63.<br>On the other hand, market-based mechanism such as emission trading has several problems. Volatility of emission permit prices affects volatility of product prices as evidenced by fluctuating price developments in the EU-ETS. Therefore, the market-based policy tools of cap-and-trade cannot provide credible incentives for the technological change, as described in (Montgomery, 2005, abstract) and (Baldursson, 2009, page29). These literatures are listed in the No62 line of this table.<br>In addition, CO2 leakage caused by the implementation of the ETS happened actually through international transfer of industry , as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No50 line of this table. | Noted. I think the best place for describing "voluntary target scheme" is Table 9.10. |
| 4729 | 9 | 8 | 1 | | | Table9.1 shows Mitigation options such as High-performance building envelope, Efficient appliances, Efficient lighting and Efficient HVAC systems. Those items should be described in the body text. | Accepted. Will consider, given space allocated |
| 7028 | 9 | 8 of 86 | | 8 of 86 | | Substitute "industrialized" for "developed" in the first line of the fourth cell, in the fifth column. | Accepted. Substitude "industrialized" |
| 2864 | 9 | 9 | 13 | 9 | 13 | define "IT" - it is the first time used in the chapter | Accepted. |
| 3098 | 9 | 9 | 16 | | | passive house standard in Upper Austria - the 2006 figure is very out of date. I've seen figures of 25% for Austria (http://www.igpassivhaus.at/%C3%96sterreich/Wir%C3%BCberuns/tabid/63/language/de-DE/Default.aspx) | Accepted. But this material has been deleted |
| 6617 | 9 | 9 | 16 | | 17 | The sentence 'building design…mitigation strategies' reads unessential | Accepted. But this material has been |
| 12575 | 9 | 9 | 17 | | 21 | May be briefly touched upon as the same is almost repeated under section 9.2.1 | Accepted. Redundancies removed |
| 18861 | 9 | 9 | 17 | | | Grammar/orthography: "the key" instead of "be key" | Accepted. But this material has been |
| 6618 | 9 | 9 | 25 | | 27 | The last sentence of the paragraph reads unessential | Accepted. But this material has been |
| 9543 | 9 | 9 | 34 | | | Please, provide following information with text; buildings narrowly defined hold great potential for cost-effective energy savings. The IEA estimates that the energy savings potential in this sector in 2009 will be in the range of 20 exajoules (EJ) per year by 2030, which is the same as the current annual electricity consumption of the United States and Japan combined. (25 energy efficiency recommendation, IEA) | Noted. Integrated potentials are discussed in Section 9.9 |
| 15684 | 9 | 9 | 28 | | | The name "New developments in emission trends and drivers" is a bit misleading, since the section hardly deals with emissions (except for subsection 9.2.3). The section 9.2 is good as an introduction how buildings and energy use have developed. Following this section, I would put the current section 9.5, because it deals with the interaction between buildings and the climate. After making clear there is a strong interaction, section 9.3 and 9.4 follow naturally, since they deal with the results from this interaction. The costs and potentials are then discussed in section 9.6. | Noted. The links between energy drivers and trends and emissions drivers and trends can be more clearly stated. But the order and titles of the subsections are approved by the plenary and cannot be changed |
| 9544 | 9 | 9 | | | | Please, provide following infromation with text; residential appliances and equipment represent one of the fastest-growing energy loads; the IEA estimates that at least 3.7 EJ per year could be saved cost effectively by 2030. Lighting represents almost 20% of global electricity consumption. This consumption is similar to the amount of electricity generated by nuclear power. The latest IEA estimates show the total savings potential in residential and services lighting at more than 2.4 EJ per year by 2030. (25 energy efficiency recommendation, IEA) | Accepted. Include the text as suggested. This would not be the place to talk about energy efficiency and mitigation potentials. Regarding appliances, point 9.2.2.1 describes the trend on how having better living standards imply increasing demand for energy services in buildings. But this |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3489 | 9 | 9 of 86 | 8 | | | While AR4 mentions about mitigation technology options, AR5 with more profound knowledge of the systems integration approach should not use the word "options". This should also be highlighted in the suggested sub-session 9.1.2 "What's New". Please refer to {UNDP & GEF (2010). Promoting Energy efficiency in buildings: Lessons Learned from International Experience. New York: UNDP}, “great gains can also be achieved from a broader, more holistic approach to buildings. […] Large savings can be achieved by optimising the entire building system rather than improving elements individually. This can only be done at the beginning of the building’s life or during major renovations. The rest of the energy consumption is linked to the building use, through the performance of equipment used in the building (e.g., boilers, HVAC system, lighting, electrical appliances, etc.) and the behaviours of the people who use them (choice of temperature, turning off unused lights and appliances, etc.)” | Noted. The points about system approach are already covered in the discussion of the IDP. However, we cannot change the title of 9.3 |
| 3488 | 9 | 9 of 86 | | | | Although the sub-session 9.1.1 provides a good summary of AR4, details about what's new in AR5 are not clearly described.<br>It is suggested to add a sub-session (called 9.1.2), which highlights what's new in AR5. One of the items in “what's new” should be the emphasis on systems integration. This is because the concept has become more mature, and has been taken up widely in the practice. Therefore, it is worthwhile to make an assessment to its contribution to climate change mitigation from the building sector. | Accepted. |
| 11998 | 9 | all | | | | I suggest to mention the design change principle cradle to cradle (McDonough and Braungart) which is to shift from "doing less of the bad" to "doing things right already on the drawing board" i.e. About sustainable design, inexistence of the concept of waste in nature etc. | Rejected. We already highlight key issues pertaining to LCA and cite key literature. |
| 3486 | 9 | overall | | | | The Authors have done a great job for this first draft. The whole chapter provides comprehensive outline of the assessment to the building sector. It is recommended that the Authors should pay more attention to the following aspects:<br>(1) Imbalance in addressing the building sector in all climatic regions: Although the overall assessment shows the efforts to be at the global scale, many detailed analyses and discussions seem to focus much more on the building sector in temperate regions.<br>(2) The problem of using the term "options" for mitigation technologies and practices in the building sector: As the building-related professions recognised and are progressing deep into the integrated approach of building systems, many mitigation technologies and practices cannot be viewed as options nor optional. Many of them are part and parcel of larger systems that affect the energy and/or energy efficiency performance. The term "mitigation technology options", often appeared in Chapter 9 FOD, is therefore obsolete. The term can be seen as being associated with the "checklist-approach", which are outdated and known as barriers to deliver highly energy efficient buildings. Furthermore, many technologies, highlighted in Chapter 9 FOD, are not optional in the practices found in many places in the world. | Noted. We try very hard to focus also on other climates; literature is bounding this effort. 2. noted. The problem with the word is acknowledged; but no better word is found. "option" stands to replace "technology", recongising that our mitigation options are not only technologycal, but systemic, practice-wise, behavioural/cultural, etc. Team will look for more literature buildings in warmer climate zones |
| 12628 | 10 | | | | | I disagree with CCS having a high degree of risk. This needs to be clarified and referenced. | Accepted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 12671 | 10 | | | | | I disagree with CCS having a high degree of risk. This needs to be clarified and referenced. | comment is duplicate of 12628 |
| 16140 | 10 | | | | | Very interesting table 10.3. Maybe the process CO2 emissions such as those from cement production could be added in one line, as well as the total energy CO2 for comparison purpose. Or maybe combine with figure 10.3 for a single table ? | Rejected - Table 3 is for Non CO2 gases. |
| 2103 | 10 | | | | | Throughout chapter, the "EPA 2011" reference as used in the text is a different "EPA 2011" reference as listed in the references section. The EPA 2011 reference in the text appears to indicate the U.S. EPA Draft Report 430-D-11-003, "DRAFT: Global Anthropogenic Non-CO2 Greenhouse Gas Emissions: 1990-2030" August 2011. | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now been resolved |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2105 | 10 | | | | | Opportunities to reduce length of chapter: throughout chapter, less text on the services sector featuring tourism. For example, text on tourism could be reduced by half without sacrificing meaning. | Noted - cf. Response to comment 2279 |
| 2106 | 10 | | | | | Figure 10.6 does not illuminate the understanding greatly, and could be removed for chapter length reduction. | Accepted |
| 17526 | 10 | | | | | Green City | Fragment of comment 17525 |
| 17527 | 10 | | | | | Environmental and Social Responsibility in an Industrial Cluster | Fragment of comment 17525 |
| 17634 | 10 | | | | | The framing of this chapter, based significantly on the work of Allwood & Cullen is thoughtful and appropriate. Because materials extraction and processing are responsible for a disproportionate share of GHG emissions, it makes sense to take a materials-based perspective. However, some cross-cutting perspectives that capture aspects of industrial GHG emissions should also be presented. For example, emissions from semi-conductor manufacture. Also, the potential leverage provided by information and communication technology to reduce emissions is relevant. | Taken into consideration when revisiting section 10.4 |
| 17489 | 10 | | | | | The layout is confusing and nonstandard. The format of the table should make it obvious that there are 2 halves of the table side-by-side. Without such indication, readers will assume (at first) that information in the rows refers to one, single entry. | Accepted - layout has been improved in SOD |
| 17491 | 10 | | | | | As with table 10.1, the layout is confusing and nonstandard. The format of the table should make it obvious that there are 2 halves of the table side-by-side. Without such indication, readers will assume (at first) that information in the rows refers to one, single entry. | Accepted - layout has been improved in SOD |
| 17493 | 10 | | | | | Either fill in the missing value for SF6 (1990) or indicate that it is unavailable and why. | Accepted. The information is not available for 1990. Discussions underway on source data for non-CO2 gases (cf. Response to 7719). In the |
| 17499 | 10 | | | | | To what does (d) in the Total world row refer? | Was part of a footnote in the original source. The Table no longer appears in |
| 17504 | 10 | | | | | The explanation for "industrial synergies" should include a mention of geographic proximity as that is a defining feature of this notion. Otherwise there is no difference between "industrial synergies" and recycling. Also remove the caption from the original figure. | Taken into account - figure 10.5 is now deleted as the relevant ideas are covered in the intro to 10.4 |
| 17516 | 10 | | | | | To what regions and what periods do the data in this table refer? | Accepted - But table 10.5 has been |
| 17511 | 10 | | | | | Figure very difficult to read in black & white. | Noted - the figure has been deleted. The report's figures will be checked by a |
| 17537 | 10 | | | | | What is the column heading for 4th column? Horizontal alignment of entries needs more attention so that contents line up where it is appropriate and do not line up where a relationship is not meant to be inferred. Not all entries in the last column fit the label "Total" Table notes should define acronyms and abbreviations. | Accepted - Section has been revised thoroughly in SOD and will be further improved in Final Draft |
| 17513 | 10 | | | | | "Specific" needs to be defined or explained (in data legend) | Accepted - But figure 10.8 has been |
| 17520 | 10 | | | | | To what year(s) does this figure refer? | Accepted - But figure 10.9 has been |
| 17485 | 10 | | | | | Lines between boxes should indicate directionality, i.e., they should be arrows. | Rejected - this was considered but the chapter team agreed that giving |
| 17487 | 10 | | | | | Caption should include interpretative guidance. It should at least say that thickness of lines indicates magnitude of flow. | Noted - this valuable feedback will be used in completing the work of publishing this diagram. However, the position within the WG3 report will most |
| 17494 | 10 | | | | | Sections in small pie on left not readable | Accepted - but figure no longer appears |
| 17495 | 10 | | | | | Define acronyms used in figure in the table caption or a legend. Differences of sections of bars not discernable in black & white. | Accepted - will consider these comments when developing final figures |
| 7087 | 10 | | | | | It would be better to use a more up-to-date figure published by the World Resources Institute that was updated in 2012. - i.e. Baumert, K., Herzog, T., and Pershing, J. Navigating the Numbers: Greenhouse Gas Data and International Climate Policy (data updated in 2012). Washington DC: World Resources Institute, 2005 | Noted - this valuable feedback will be used in completing the work of publishing this diagram. However, the position within the WG3 report will most |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7088 | 10 | | | | | it is incorrect to attribute the land use change to specific sectors (as this figure does). The causes are seldom easy to identify and often involve multiple drivers. In the words of an FAO report (FAO 2010), "The causes of deforestation are multiple, complex and vary from location to location. Although deforestation at the global scale is "mainly due to conversion of forests to agricultural land…" (FAO, 2006), the underlying causes are less well understood. The most significant underlying factors contributing to deforestation are often identified as high population density and low per capita income (e.g. Uusivuori, 2002; Kauppi, 2006), but this view may obscure the complexity of the problem. (continued below) (references are shown two lines below) | Noted - this valuable feedback will be used in completing the work of publishing this diagram. However, the position within the WG3 report will most likely be changed and the diagram included in one of the framing chapters (chapter 5) |
| 7089 | 10 | | | | | (continued from above) The Scenarios Working Group of the Millennium Ecosystem Assessment (2005) reported that "Ten years of research within the international programme on land use and land cover change of [the International Global-Biosphere Programme] concluded that neither population nor poverty alone constituted the sole and major underlying causes of land cover change worldwide". The working group cited a meta-analysis of 152 case studies, which concluded that "The multiple factors intervening in tropical deforestation … make it particularly difficult to develop generic and widely applicable policies that best attempt to control the process. Many land-use policies are underlain by simplifications on the drivers of change…. From the results of the meta-analysis it is clear that any universal policy or global attempt to control deforestation (e.g. through poverty alleviation) is doomed to failure." (references below) | Noted - this valuable feedback will be used in completing the work of publishing this diagram. However, the position within the WG3 report will most likely be changed and the diagram included in one of the framing chapters (chapter 5) |
| 7090 | 10 | | | | | (continued from two previous rows - references for those rows)<br>-FAO. (2010). Impact of the global forest industry on atmospheric greenhouse gases: FAO Forestry Paper 159. Rome: United Nations Food and Agriculture Organization<br>- FAO. 2006. Global Forest Resources Assessment 2005 – Progress towards sustainable forest management. FAO Forestry Paper 147. Rome.<br>- Uusivuori, J.E. 2002. Population, income and ecological conditions as determinants of forest area variation in the tropics. Global Environmental Change, 12(4): 313–323.<br>- Kauppi, P.J. 2006. Returning forests analyzed with the forest identity. Washington, DC, USA, National Academy of Sciences of the United States of America<br>- Millennium Ecosystem Assessment. 2005. Ecosystems and human well-being, Vol. 2, Scenarios. Washington, DC, USA, Island Press. | Noted - this valuable feedback will be used in completing the work of publishing this diagram. However, the position within the WG3 report will most likely be changed and the diagram included in one of the framing chapters (chapter 5) |
| 7091 | 10 | | | | | The figure is incorrect in that is misses the large carbon sink attributable to the growth and expansion of forests - i.e. see Pan, Y., Birdsey, R., Fang, J., Houghton, R., Kauppi, P., Kurz, W., et al. (2011). A Large and Persistent Carbon Sink in the World's Forests. Science Vol. 333 , 988-993. - which documents a large net sink for global forests, which may be partly due to atmospheric fertilization and climate change but according to the Pan et. al. study is clearly largely due to other factors. | Rejected: figure focuses on emission and not mitigation options, discussion about the mitigation potential of forest growth is covered in chapter 11. In any case this feedback has been forwarded |
| 10631 | 10 | | | | | Chemicals; GHG Intensity, "polymer synthesis" should be replaced with "steam cracking", because the steam cracking is the most energy consuming process rather than polymer synthesis. | Accepted - But table 10.6 has been removed from SOD |
| 15266 | 10 | | | | | Table 10.7 indicates total additional investment from 2010-2050. I think those amount of the investment are very important indicators to access the feasibility of each of the mitigation measure. However, at the same time, I think that the figure have to be a firm one, not to mislead the readers to inappropriate direction in any case. Therefore, I believe that those figures will also indicate its error and uncertainty like other sinarios. | Taken into account when revising the section |
| 7523 | 10 | | | | | In general, balanced description of "Material Efficiency" and "Energy Efficiency" is of key importance. | Taken into consideration when revising |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7524 | 10 | | | | | It is little difficult to swallow "Material Efficiency", because policy measures for "Material Efficiency" could lead unexpected side-effects under the current complex competitiveness among materials.<br><br>The history in Former Soviet Union and China reveals the difficulty for "Material Efficiency".<br><br>See also:<br>Daniel Yergin, Joseph Stanislaw (1998). The Commanding Heights: The Battle between Government and the Marketplace. | Taken into consideration when revising the chapter |
| 2294 | 10 | | | | | Non-ferrous needs to consider more than just emission factors. The majority of the GHG generated in the Al industry is from the energy required for the process - not considered. Also other gases (PFCs) in Al are not quantified. Both of these areas are major considerations that were not explored. | PFC production is now quantified and indirect emissions are now discussed for aluminium production. |
| 2297 | 10 | | | | | under steel - I would either eliminate electrolysis or include note (actual GHG savings depend on carbon footprint of electricity used). Also under alternate fuels - H2? Under Al - note on inert electrodes? | Accepted but more relevant for section on mitigatino options - see revised |
| 2282 | 10 | | | | | should emphasize the role of in-process recycling, in-process capturing of energy (recuperation) - more life cycle approach | Rejected - space constraints do not allow to go into more details |
| 2299 | 10 | | | | | Can't read. Eliminate for condensing information. | Noted - but figure no longer appears in |
| 2300 | 10 | | | | | Figure and explanation in text - seem more like opinions than technical discussion - suggest eliminate | Accepted - table no longer appears in |
| 2283 | 10 | | | | | I found this diagram confusiing and not as applicable as some other types of similar diagrams. Figure 5.2.2 in chapter 5 shows all of the industries and the GHG from each - I would refer to it and eliminate this figure to save space. | Accepted - issue of double counting has been discussed among report authors as it is important for the whole report. The |
| 10202 | 10 | | | | | 1. Point 6 missing in graph, 2. waste from owners and users missing in graph | Accepted - figure 10.1 has been modified |
| 10204 | 10 | | | | | Lack reduced demand and material/resource use and reuse for textiles | Accepted - there is now a cross- |
| 15711 | 10 | | | | | I would recommend inlcuding some indication of what fraction of global anthropogenic emissions that these industry related emissions account for. It is important to the reader to understand the relative impact of these emissions to the total in terms of impact of emissions reductions. | Accepted - the relative contribution is explained in the Executive Summary, section 10.2 and FAQ 10.1 of the |
| 16048 | 10 | | | | | In cement production there can be reduced the GHG emissions more than 30% using CELITEMENT technology (http://www.celitement.de/en/celitement-binders.html) | Accepted - now mentioned in 10.7.1 |
| 3033 | 10 | | | | | Please improve the quality of the table. It is impossible to read it. Should we use a Table to depict several graphs? | Accepted |
| 3030 | 10 | | | | | I am not very comfortable with the idea of considering the Clean Air Act (or other command and control policies for local pollutants) as a barrier to industrial CHP. Local pollutants regulation is a requirement of societies and should not be removed as a barrier to mitigate GHG emissions. | Accepted -- reference to the CAA removed (note this is a repeat of comment 3029) |
| 4281 | 10 | | | | | Please note that Tanaka (2011) holds error from the reporting of policies from Sweden | Taken into consideration when revising the text. The figure used from Tanaka |
| 4531 | 10 | | | | | The reference list is missing. An incorrect reference list of another chapter has been added | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now |
| 4532 | 10 | | | | | The chapter states that it takes a "life-cycle" approach. While this could be interesting, the remainder of the report has a focus ons ectors. Taking this approach in a single chapter may result in doublecounting and other issues. Moreover, the approach has not been applied consistently | Taken into consideration - the discussion of double counting in the introduction of chapter 10 has been shifted to chapter 5 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4533 | 10 | | | | | The chapter now contains sections on the serices sector (most notably the "tourism industry"). This is ABSURD. This is totally inconsisent with previous reporting by IPCC, statistical data, and any other international reports on climate and energy. By moving these sections to those chapters were it belongs (i.e. buildings and transport) the chapter can be shortened considerably. All sections on these sectors should be deleted. Especially, as the sections that are included in this report are vague and lack any depth. | Accepted and substantial changes incorporated. Decision to include tourism was made by the IPCC plenary at ther very beginning of AR 5 process. In light of this and other reviewer comment and comments by review editors a detailed discussion took place. It was agreed to prioritise the balance and logical flow in the chapter which is primarily on the industry sector. The discussion on tourism was repositioned as a demand-side driver for industrial products and product services and now appears in the SOD as Box 10.2. Moreover we have improved and intensified coordination with the transport and buildings chapter. In the SOD tourism is used as one of two illustrative examples to show how |
| 4534 | 10 | | | | | It is strange to see that energy use to transport tourists is included in this chapter, while shipping of industrial products isn't. Hence, the life-cycle approch is is really used inconsistently. Moreover, it is absurd, to see this as part of industry. | cf. Response to comment 4533. Due to space constraints there is no room to discuss other transport related emissions having they origin in the industry sector. Chapter 8 covers the disucssion about |
| 4535 | 10 | | | | | The choice to include services and tourism in this chapter, makes that the data presented in this cahpter are incomparable to that report in statistics ans industry and in previous IPCC reports. This makes it virtually impossible to draw any conclusions by the reader on the changes in the overall knowledge basis on mitigating industrial GHG emissions. | Noted - cf. Response to comment 2279 |
| 4536 | 10 | | | | | The "life-cycle" approach is not used in a consistent manner in the various sections of the chapter. | Taken into consideration when revising |
| 4537 | 10 | | | | | Petroleum refining and coke production are currently not included in the report. In previous Ars it was finally included in the industry chapter, as the energy conversion chapter in reality hardly addresses thrse sectors (i.e. It focuses only on the power sector). I have not checked the chapter on the energy sector, but the reference list now included in cahpter 10 seems to come from the chapter on the energy sector. It does not contain any real references on petroleum refining.... | Rejected: the discussion of the provision of primary energy carriers is included in chapter 7 |
| 4538 | 10 | | | | | Throughout the report important claims are made, that are only based on a single reference. I do not thik that the IPCC can do this without reflecting on a wider body of literature. | Take into consideration: a broader set of literature has been considered when |
| 4544 | 10 | | | | | This is an example of where system boundaries become important. Are these figures with or without services, tourism.... I suspect without. This makes the whole chapter impossible to read, when the boundaries of reported data keep changing between different figures and tables. | Rejected - Table is clearly labeled as "manufacturing" |
| 4562 | 10 | | | | | The text and these tables are not clear. Just counting the number of policies and policy instruments does not give a good picture of the importance of policy as a driver in industry, especailly as regulation has been weakening in the period, but other voluntary programs have been implemented that have far less reach. | Accepted - figure no longer appears in SOD |
| 4541 | 10 | | | | | While I love this figure, I do not think it is appropriate for Chapter 10. It should be used in the more general chapters upfront in AR5 to show the interlinkages and distribution ovdr the various sectors. | Accepted - issue of double counting has been discussed among report authors as it is important for the whole report. The |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8856 | 10 | | | | | This is a very fragmented chapter. Coherence among sections needs to be enhanced. More data would be needed, while limitation/applicability of data presented needs to be clarified with consistency. it's important to compile/analyze/present data on the costs of conserved energy for efficiency measures in consistent manner, in comparisons with tranditional energy sources and emerging renewable energy addressed in other chapters (e.g. chapter 7). | Accepted - consistency has been improved and cost and potentials section (10.7) has been revised |
| 16137 | 10 | | | | | The approach of chapter 10 in AR5 is extremely interesting, because it widens the scope of policy with a systemic approach. This part should be kept (or even expanded) even in the case of cuts in the lengh of the text. | Noted |
| 2281 | 10 | | | | | Importance of recycling should be emphasized | Taken into consideration for revision of |
| 10282 | 10 | | | | | Consistent and no redundant descriptions with Chapters 13-15 will be needed. | Taken into consideration when revising |
| 3032 | 10 | | | | | Why is EU ETS analyzed in this section instead of in Section 10.10.2, since it includes not only energy efficiency measures and is focused on emission efficiency? | Taken into account - no specific discussion of EU ETS here, but in |
| 15270 | 10 | | | | | I strongly agree with the idea to improve the material efficiency with maintaining the amount of service, i.e., increasing the added value, to reduce the CO2 emission amount. However,someone like me would wonder if it is a realistic solution for further mitigation to reduce the amount of service per person,especially in developing countries. The economical effect of the service reduction policy need to be discussed here . | Taken into account - the issue has been considered in drafting box 10.2 but macroeconomic effects cannot be covered in this chapter in detail |
| 3653 | 10 | | | | | Delete or massively reduce to save space as overlapping with chapter 6. | Rejected: focus of the section is clearly on sector- specifc issues in light of |
| 17352 | 10 | | | | | The discussion regarding global tourism needs to be cross referencing with Chapter 8, the changes in lifestyle aking to substituting leisure for long distance tourism need to be discussed in light of current studies. The trends show there is little room for substitution, one is complementing the other (leisure at home vs tourism). Please coordinate with Chapter 8. | Noted - cf. Response to comment 2279. It is true that in the short term substitution potential are limited. However we are here discussing in a long-term perspective where such considerations are far less relevant. Consider how much tourism has changed in the last 50 years there are |
| 16258 | 10 | | | | | Chapter 12 also includes a section on waste management (although much shorter). Coordination may be useful to avoid too much overlap and cover all relevant aspects. | Accepted - coordination underway with Chapter 12 on overlapping issues |
| 8862 | 10 | | | | | 10.14. waste water section may benefit from technology characterizations (cost and savings potential) of emerging technologies applicable to this sector (Xu et al. 2011):<br>Xu, T., J. Slaa, J. Sathaye. 2011. Developing Information on Energy Savings and Associated Costs and Benefits of Energy Efficient Emerging Technologies Applicable in California. Lawrence Berkeley National Laboratory Report, LBNL-4434E. | Taken into account in Costs and potentials section (10.7) of SOD. Moreover reference used in wastewater subsection. |
| 15713 | 10 | | | | | The discussion of tourism seems to fit better in other chapters. As a minimum, the text does not need to be duplicated in several chapters and the sectoral accounting needs to be clarified. | cf. Response to comment 2279 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3016 | 10 | | | | | As a general comment, I would like to raise the need to consider novel and original options to curb GHG emissions in industry. I feel that this section is fine, in general, but lacks the opportunity to emphasize some interesting approaches that should be included in the portfolio of options, if we want to meet ambitious targets for GHG emission reductions. Among these options, it is crucial to consider the integration of exergy flows within process chains, which can increase overall efficiency of combined industrial processes from 4 to 30%. The same is valid for the integration of processes inside the same operation of industrial facilities; for instance, the report should have explored the possibility that in the medium term, the major developments include the integration of different distillation columns into one reactor (e.g. dividing-wall column) or the development of alternative processing routes allowing for combination of conversion and distillation (e.g. reactive distillation). Please see as an example: SCHULTZ, M. et al. Reduce Costs with Dividing-Wall Columns. Chemical Engineering Progress, n. 196, p. 64-71, May, 2002. As it is, I think the report lacks the opportunity of indicating novel and disruptive approaches to curb GHG emissions in industry. These approaches can be adopted in various industrial chains. I do recognize that some of these novel approaches (e.g. process intensification) were mentioned further in other sections of the document (e.g. Table 10.7 in page 42). Yet, they should have been mentioned in section 10.4.1 too. | Noted - but this is rather a general comment, followed by a reference to a particular technology. For now, we haven't made a specific change in response to this comment - but note to changes in cement section earlier, for an increased reference to novel technologies. |
| 3017 | 10 | | | | | I recommend include advanced process control as an important option to improve production reliability and thus increased product yield, curbing GHG emissions in industry. Modern control systems are often not solely designed for energy efficiency, but rather to improve productivity, product quality and efficiency of a production line. Control systems result in reduced down time, reduced maintenance costs, reduced processing time, and increased resource and energy efficiency, as well as improved emissions control. Large potentials remain to implement control systems. For instance, Worrell and Galitsky (2005) indicate savings potential varying from 2 to 18% for US refineries, using moisture, oxygen, air flow and temperature controls based on fuzzy logic or rule-based systems. | Accepted - control systems mentioned in Executive Summary and in various instances in section 10.4 |
| 3018 | 10 | | | | | It is worth listing some measures that can be applied by all industrial facilities in order to save fuel. Section 10.4.1. summarizes opportunities for “efficiency .. in the design and operation of systems using motors”, but did not summarize opportunities for heat integration, which is even more worthwhile in industrial facilities. These opportunities include: use of waste heat in absorption refrigeration systems; use of waste heat to pre-heat feeds (e.g., through the installation of waste heat boilers or heat recovery steam generators); heat and/or mass (water and hydrogen) integration; improvement of furnaces efficiencies combined with computer controlled combustion; direct feed of “intermediary products” to processes without cooling and storage, aiming at recovering the waste heat of these hot products; use of heat pumps; and decreased film temperature and increased turbulence on heat transfer surfaces. | See responses 12124 and 15885(a) |
| 3021 | 10 | | | | | I suggest stressing that fuel switching which favours natural gas has the side effect of also favouring CHP industrial facilities. This was the case in USA and Brazilian chemical plants. Please see SZKLO, A.S., SOARES, J.B., TOLMASQUIM, M.T., 2004, “Economic potential of natural gas-fired cogeneration--analysis of Brazil's chemical industry”, Energy Policy, v. 32, pp. 1415-1428. KHRUSHCH, M, WORRELL, E, PRICE, L, MARTIN, N, EINSTEIN, D 1999 ‘Carbon emissions reduction potential in the US chemicals and pulp and paper industries by applying CHP technologies’, In: Industry & innovation in the 21th century. Proceedings of the 1999 Aceee summer study on energy efficiency in industry. American council for an energy-efficient economy, Washington DC, Washington. | Taken into account - text revised: "These shares are forecast to change to 30% and 24% respectively by 2035 (IEA, 2011) resulting in lower emissions per unit of energy. Switching to natural gas also favours more efficient use of energy in industrial CHP installations. " |
| 4547 | 10 | | | | | It is amazing that the discussion of biomass is lacking from this section, especially as the pulp & paper industry today is one of the largest users of renewable energy in the form of biomass. Also, the development of biomass as a feedstock is slowly growing; see e.g. Li Shen, Ernst Worrell, Martin Patel. ’Present and future development in plastics from biomass” Biofuels, Bioproducts and Biorefining 1 4: 25 – 40 (2010). | Taken into account - thanks for this useful reference |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3022 | 10 | | | | | The issue of the green chemistry and the possibility of increasingly producing bio Platform Molecules (bPM – building block chemicals with potential use in the production of numerous value-added chemicals) were not stressed in the report. As I mention in another query (regarding disruptive technologies), the report lacks the opportunity of pointing out drastic changes that must be considered to the industrial sector. Green chemistry is part of the research that is being done in different countries, and there is already pilot and commercial plants producing plastics from biomass. See: Ren, T., 2009. Petrochemicals from Oil, Natural Gas, Coal and Biomass: Energy Use, Economics and Innovation. Ph.D. Thesis. Utrecht University, Copernicus Institute for Sustainable Development and Innovation. Utretch. Ren, T.,Patel, M., Blok, K., 2006. Olefins from conventional and heavy feedstocks: energy use in steam cracking and alternative processes. Energy 31, pp. 425-451. Those references are already listed in other section of the study. They should have been cited here too. | Taken into account - appropriate references to these reports have been added. |
| 17351 | 10 | | | | | This session should made cross-reference with Chapter 4 in production and consumption | Accepted - but we seemed to have lost the cross-reference during the final editing. Let's coordinate on this for the Final Draft. Some cross-links to chapter |
| 3025 | 10 | | | | | I suggest including a section for discussing briefly the case of ceramics, since in many developing countries this sector is still based on fuelwood from deforestation burnt in low-efficiency kilns. Please see as an example: Schwob, M., Henriques, M. Szklo, A. Technical potential for developing natural gas use in the Brazilian red ceramic industry. Applied Energy 86 (2009) 1524–1531 | Noted - thanks - but under space constraints we've been unable to do this. |
| 10281 | 10 | | | | | Current energy efficiency in iron & steel sector is important information in order to estimate the emission reduction potentials. Please cite the figure for energy efficiency in iron & steel sector for some countries estimated by Oda et al., Energy Policy, 2012 (http://www.sciencedirect.com/science/article/pii/S0301421512000298). | Accepted - The text has been revised to include the reference on the different specific energy intensities of regional BF-BOF production: "...furnaces before refining. The specific energy intensity of steel production varies by technology and region (Oda et al., 2012)" Reference: Oda, J., Akimoto, K., Tomoda, T., Nagashima, M., Wada, K., Sano, F. International comparisons of |
| 6740 | 10 | | | | | The section should be reduced and streamlined. What is the status, what has been done and the results followed with what can be done with risk and potential. | Noted - thanks, but risks and potentiasl are covered in other sections |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2292 | 10 | | | | | Steel production 1490 MT in 2011. Breakthough technologies could save more than 15% quoted (line 47 page 24) if carbon base is reduced or eliminated. The 32% reduction in electric furnace is questionable unless you are only talking about process. EAFs are much closer to running at just above the theoretical. One of the greatest potentials for CO2 savings is in fuel switching. In this case we are talking about reductant switching. The idea of switching to electolysis will greatly increase the energy use over current technologies and only reduces the overall GHG if there is carbonless energy industry. Aluminum has a much higher GHG footprint than iron and steel because it uses a similar electrolysis process. | Taken into account - Text revised to "1490 Mt in 2011. In 2011, China led steel production, producing 46% of the world's steel. Other significant producers include EU-27 (12%), USA (8%), Japan (7%), India (5%) and Russia (5%) (WSA, 2012) Reference: World Steel Association, 2012 Crude steel production 2011 http://www.worldsteel.org/dms/internetDocumentList/steel-stats/2011/Crude-steel-production-2011/document/2011%20steel%20updated%20Feb2012.pdf For the second comment, the Energetics Inc. source defines the opportunitiy for energy savings as the difference between today's current use and the |
| 4549 | 10 | | | | | I am a bit confused by this section. It cites a non-peer reviewed report for DOE, to state furtherdown that nothing can be said about ULCOS, as no "peer reviewed literature" is available. Birat has published a few papers (eg. In Revue de Metallurgie, albeit these are a few years old now). Note that the quoted Energetics report has been heavily criticized by a number of experts in the field. In the past a number of electrolytic processes have been proposed, but never became commercialized due to the price of power. Just referring to one particular process does not credit the other processes. | Noted - peer-reviewed literature on ULCOS will be considered for inclusion in FD |
| 6749 | 10 | | | | | For services in general and it services specifically the energy consumption is going down from technical innovation. Intel.com | Noted - but section on services has been removed in SOD (cf. Response to |
| 3652 | 10 | | | | | Alternatively delete chapter 10.4.2.11 to save space. | Accepted - cf. Response to comment |
| 3026 | 10 | | | | | I suggest including CHP as an option for trigeneration (or CCHP) in hospitals, malls, hotels and universities. Several studies have assessed this possibility and there are commercial plants installed in developed in emerging countries. | Noted - but section on services has been removed in SOD (cf. Response to comment 2279) |
| 6742 | 10 | | | | | Start with a status to remind the reader how important this sector is. | Noted |
| 4553 | 10 | | | | | This section is very superficial. Please also use D. Saygin, M.K. Patel, E. Worrell, C. Tam, D.J. Gielen. “Potential of best practice technology to improve energy efficiency in the global chemical and petrochemical sector Energy” Energy 36: 5779-5790 (2011). This section lacks a discussion on material efficiency, while several papers in the literature discuss plasic recycling, product optimization strategies for e.g. packaging, but also fertilizer use.. | Accepted - reference has been included. Section to be further improved. |
| 6743 | 10 | | | | | Relate the values to the total emissions from industry | Noted - The request is not clear, no page or lines specified. The values provided in page 29-line 20 are emissions per unit output from the European pulp and paper industry and therefore relating |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4554 | 10 | | | | | The report by Kramer mainly reports on commercially available technologies, not emerging technologies. Moreover, many papers have looked at paper recycling and optimization of (paper) packaging. For exampe, Laurijssen et al discuss the CO2 benefits of recycling over incinerating waste paper: Jobien Laurijssen, Marc Marsidi, Annita Westenbroek, Ernst Worrell and Andre Faaij. “Paper and Biomass for Energy? The Impact of Paper Recycling on Biomass Availability, Energy and CO2 Emissions” Resources, Conservation & Recycling 12 54: 1208–1218 (2010). | Taken into account - the term "emerging technologies" has been modified for "commercially available technologies". A brief reference to the suggested paper by Laurijssen et al has been added to the discussion. |
| 16261 | 10 | | | | | A publication that discusses the different mitigation options of the aluminium industry using a dynamic material stocks and flows model: Liu, Bangs and Müller (2012): Stock dynamics and emission pathways of the global aluminium cycle. Nature Climate Change. In press. | Accepted - the section now includes a focus on the shift from primary to secondary aluminium production and the |
| 2295 | 10 | | | | | I didn’t see reference to inert anodes (non C) and how it mininize process GHG for Al. This section is much weaker in depth when compared to the iron and steel section. | Inert anodes are mentioned at the end of the energy efficiency sub-section. |
| 4555 | 10 | | | | | The energy consumption figures for aluminium quoted in this section seem to vary with respect to system boundaries (e.g. Including alumina or not), and between primary and final energy use. Please be consistent, and specify what you use. | The system boundaries used in the referenced material is now clear in the text. |
| 4556 | 10 | | | | | The section on the food industry is primarily based on US reports. Some literaure from Europe is missing; for example papers by Ramirez. Why is there a discussion on anaerobic digestion of food wastes in MSW in this chapter. Shouldn't that be in the chapter on the waste sector? | Accepted - see comment 8860 |
| 6748 | 10 | | | | | Maybe this reference could add more possibilities in crushing equipment energy reduction. Hulthén, Erik: Real-Time Optimization of Cone Crushers. Göteborg : Chalmers University of Technology. Diss. ISBN/ISSN: 978 1 921522 28 4 http://publications.lib.chalmers.se/records/fulltext/128844.pdf or this work http://www.ceecthefuture.org/abstracts/early-rejection-of-gangue-how-much-energy-will-it-cost-to-save-energy | Noted |
| 4557 | 10 | | | | | This discussion is so generic, that it does not add any insights. Improve or delete... | Noted - section has been improved |
| 2296 | 10 | | | | | If looking for ways to reduce this chapter - I would suggest condensing this section | Accepted - section has been shortened |
| 15267 | 10 | | | | | It would be better to address the importance of assessment like life cycle assessment from “cradle to grave” ( Ref: A. Gunasekaran, A. Spalanzan, Int. J. Production Economics 140, 35-47(2012)),here . In order to achieve effective cross sectional implications, the whole supply chain assessment is necessary. | Accepted |
| 8861 | 10 | | | | | Cost of conserved energy information on steel, cement, pulp and paper, waste water management sectors can benefit from the publications listed in the comment column Chapter 10 (different sub-sections). | Accepted - some references included. Section has been revised thoroughly in SOD and will be further improved in |
| 17979 | 10 | | | | | I recommended to the other sector chapters to include similar introductory sentences with the second sentence slightly differently worded: "Co-benefits, co-costs, risks and uncertainties associated with alternative mitigation technologies as well as public perception thereof can affect investment decisions of companies and priority setting of governments." The usage of the term public perception was recommended by Chatper 2 LAs in Wellington to replace the terms "social acceptability" (heading of sub-section 10.8.3) or "public acceptability/acceptance" where possible to reflect some additional aspects discussed in Chapter 2. | Noted |
| 17981 | 10 | | | | | Please consider a broader discussion of risks and uncertainties along the classification of risks and uncertainties provided in Section 6.7. Please liaise with the other sector chapter LAs to discuss the process by which a more consistent approach can be reached. | Taken into account |
| 4559 | 10 | | | | | There is a ider body of literature on spill overs that is not used in this chapter, e.g. Papers by Michael Grubb or the paper by Vlasis Oikonomou, Martin Patel and Ernst Worrell. Climate Policy: Bucket or Drainer? Energy Policy 18 34 pp.3656-3668 (2006). | To be taken into account |
| 17982 | 10 | | | | | The usage of ther terms "social acceptability" or "social acceptance" is inconsistent with agreements made in Wellington (p.36) and should be replaced, if appropriate, with the term "public perception" (see earlier comment). | Accepted - terms replaced where relevant |
| 4560 | 10 | | | | | This section is extremely generic, and does not address any issues related to industry. I think this could be better discussed elseshere in the AR5 report. | Reject - section has been revised in SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17984 | 10 | | | | | An introductory sentence along the example of Chapter 9 referring to the agreement reached in Wellington (p. 36) might be helpful for readers: "Barriers and opportunities are referred to as conditions that hinder or facilitate the implementation of the analyzed measures." | Accepted -- included in initial sentence in this section |
| 4561 | 10 | | | | | I do not understand the organisation of section 10.9. Why is it discussed by sub-sector and not by barrier? I think the latter would make much more sense. In he current format a lot of literature is missed and a lot of doubling of text will happen. | Accepted -- this section draws from literature that addresses barriers to mitigation at different steps in the industry supply chain and not general barriers which are covered in general |
| 2298 | 10 | | | | | Some redundancy with other areas - condense | Accepted -- redundancy reduced (e.g. between chapter 7 and 10 on the topic |
| 3031 | 10 | | | | | This section should be improved. There are several barriers to implement GHG mitigation measures in the service sector. For example, for implementing CHP plants in hospitals in Brazil, Szklo et al (2004) found that Brazilian hospitals face the following barriers: availability of funds for investment; concern over the functioning of new items of equipment in existing facilities; professional skills levels among the administrators; and focus solely on health care services to the detriment of technical and economic feasibility analyses for hospital related engineering problems. [Szklo et al (2004). Energy consumption indicators and CHP technical potential in the Brazilian hospital sector. Energy Conversion and Management, 45 (2004) 2075–2091] | Accepted -- barriers to mitigation of emissions from buildings is covered in Chapter 9. |
| 7559 | 10 | | | | | Glass melting technology innovation has to be mentioned: Page 34 of http://www.wbcsd.org/Pages/Adm/Download.aspx?ID=276&ObjectTypeId=7<br>For example, insert the following sentences.<br>The glass production industry is energy-intensive and consumes more than 70% of the total energy in the glass melting process. The new technology called 'in-flight melting' has the potential of achieving large energy savings in the glass industry, which contributes to meeting the global goal of GHG emission reductions. The traditional process of melting materials (such as silica sand and soda ash) is done with fuel oil to keep the large melting tank at a high temperatures for many hours, which is required to manufacture homogenous glass without bubbles. The new technology involves bringing granulated raw materials, made by spray dry methods, into a much higher temperature environment, produced with an oxygen combustion burner and/or plasma. The process changes the granulated materials to glass instantly.<br>Estimates suggest that the energy required for glass melting with this technology could be up to almost 50% of the average energy required for melting most kinds of glass in Japan (WBCSD 2010). | Noted - thanks very much for offering this, but under pressure of space, we have had to remove this section. |
| 2280 | 10 | | | | | Items 20 - 22 are not supported at the same level (references?) as others - sound like opinions - suggest eliminate | Taken into account - section on waste (10.14) and on longterm pathways have been significantly revised in the SOD. Hence corresponding messages in the |
| 12951 | 10 | | | | | Very limited talk of carbon pricing as a necessary policy for driving abatement, while comlpementary measures have a dedicated paragraph. Carbon pricing should be more present as it is indispensable to creating the economic conditions for many of the key abatement measures discussed here | Rejected: carbon pricing is included in the overarching economic instruments in the ES. Due to space constraints no comprehensive discussion possible in the ES. Moreover, a general discussion |
| 6720 | 10 | 0 | | | | There do not seem to be a common way to describe emissions. CO2, CO2eq, CO2eg subscripted, CO2 Equivalents, etc | Accepted - mostly CO2eq is used in SOD, unless data refers only to CO2. Will be checked further in the future as |
| 6721 | 10 | 0 | | | | Do not use words as Billion or Trillion though they have different meaning in different countries. http://en.wikipedia.org/wiki/Long_and_short_scales | Accepted - only used in a few instances now. Will be checked further as part of |

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| 6722 | 10 | 0 | | | | The authors use often very great numbers to state energy reductions, improvements or other changes. This many times put in relation with something else, however to many times the number is left for the reader to try imagine the amount. | Accepted - context for the numbers has been provided in some instances in SOD. Will be considered further in next |
| 6757 | 10 | 0 | | | | To conclude my review: I think you should focus of the sector specific analyses, and cross sector Analyses to present specific mitigation tools, their risks and potential. Section 10.4.1 and 10.4.2 could be migrated to avoid having much information on two places. 10.7 to 10.9 can also be migrated. to sector specific chapter expand the policy chapter and make it clear what tools will impact how. | a) given the mandate from the IPCC plenary the general scope of the sector chapters is fixed. b) overlap between 10.4.1 and 10.4.2 has been reduced in SOD. Cobenefits, barriers sections and costs to certain extent try to discuss considering these mitigation options. Also Figures 10.1 and equation 10.1 have been clearly restated. c) context between costs, barriers and |
| 15870 | 10 | 0 | | | | • Need more consistent treatment/structure of each sector by providing similar format and information: e.g., include CO2/ton emission factors for each technology<br>• Omission of fossil fuel extractive industries (oil, gas, coal). Please coordinate with Chap. 7 and 8 since there are many similarities between mining (Chap. 10) and upstream oil/gas/coal and with manufacturing (Chap. 10) and oil refining and gas processing (LNG,NGLs, etc)<br>• More use of tables/graphs to summarize text. E.g., could show CO2 marginal abatement curves ($/tCO2 vs. tCO2 mitigation potential)<br>• Could use more quantitative data, especially costs, also case studies based on real performance<br><br>• Might include a discussion on the effectiveness of international standards for industry e.g., ISO 50001 (energy management), 14040 (life cycle analysis)<br>• Check missing references – noted in text body but not in reference section (e.g., UNIDO)<br>• Might include more industry references to strengthen doc: e.g., associations (IPIECA, ASME, etc), journals, UNIDO | a) Accepted - presentation of numbers in tables and figures has been improved and harmonized where possible b) Noted - there is a clear agreement with chapter 7 in terms of consideration of the extractive industries. Energy chapter will discuss energy carrier extraction in their chapter. References between the chapters have been improved c) Accepted - cost and potentials section has been revised and overview tables has been included d) cost and potential section has been improved and specific examples given. e) Standards are now mentioned in policy section but due to space limitations no in-depth analysis has been made. f) Accepted - due to an editorial problem chapter 10 had the |
| 15884 | 10 | 0 | | | | Sections to shorten in Chap. 10:<br>• Special focus on tourism seemed a little out of place – it is one of smallest service sectors (p.9). Instead, choose a sector with greater global impact as a focus item (e.g., food?) and one which also impacts basic sustainability. Or eliminate the focus item completely<br>• 10.8.2 – CCS discussion is somewhat long and is already covered in Chap. 7. CCS for power and industry is similar<br>• More use of graphs or streamlined tables to eliminate text | a) cf. Response to comment 2279. b) Accepted - CCS discussion has been substantially shortended and focus is now only on industry specific aspects. c) Accepted - we have used tables where possible, and tried to improve presentation style |
| 15885 | 10 | 0 | | | | Ch. 10 needs more coverage on other efficiency technology options, both existing and new ones. For example, (p. 21, line 2) – there are more than just motors and furnaces—waste heat recovery, advanced cooling systems, pinch analysis, load tracking, variable speed/frequency drives, nanotechnology, etc). The Cement sector well presented and could be used as a template for the others. Each sector should include energy performance chart, best practices, current state, challenges and costs | a) Taken into account - text at start of section 10.4 revised to indicate three categories: steam systems, process heating systems (furnaces an boilers), motor systems (…), with examples from USDOE reports. b) Taken into account- |
| 15886 | 10 | 0 | | | | Need to keep the audience in mind. The industry chapter may attract attention from company CEOs, CTOs, and plant managers. Questions they might ask: What is in this for me? How can this report help me? | Accepted - we have improved the reader guidance by a more focused executive summary. ES tries to focus on answers to the key questions the chapter is |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15887 | 10 | 0 | | | | • More specific case studies including actual data on CO2 saved, $ invested would be useful<br>o Only a few cases are included (p. 32- Taiwan/India , p.44 Philippines,…). Many other examples can be found in industry journals<br>o Try to cover data for both OECD and developing world – e.g., in some cases, only EU data are stated<br>o Careful to site actual data based on real performance, not "expected" performance touted before project is actually implemented since many times expectations are too optimistic and actual projects end up over budget and underperforming. | a) cf. Response to comment 15870. b) accepted - more case-studies can be found in SOD. c) accepted - despite the shortage of data for Non-OECD we have tried to present more information d) very good comment, we have tried to be more careful and explicit about this in SOD |
| 15890 | 10 | 0 | | | | Should include a discussion on water use in industry and associated energy (water-energy nexus). Also discuss the potential climate change impact on water availability for industry sector which uses a lot of water for power, cooling and processing. Might include the latter in a section on adaptation? | Noted - there are now at least two mentions of the water nexus, one in section 10.5 and one in a footnote in 10.6. While we consider the issue important, as stated in 10.6 the general impact issue (direct and indirect through resources) is dealt with in working group 2. The section is restricted to the potential impacts of climate change and |
| 15895 | 10 | 0 | | | | Lack of cost data in general in report. McKinsey is quoted several times (e.g., but I would add other sources for balance since McKinsey numbers are sometimes questionable. | Accepted. Additional information on Costs is has been provided in SOD. Mc Kinsey data has been used among other sources in section 10.7. Lack of access |
| 15902 | 10 | 0 | | | | Highlight what changed from AR4 at high level. More detailed lookback would be good | Accepted - introduction has been revised |
| 16949 | 10 | 0 | | | | I regret I have not had time to review the Sectoral chapters in depth. It may be interesting to clarify the extent to which industrial energy use is driven by rational "Domain 2" decisionmaking processes (the System 2 of the FOD Chapter 2), at least compared to decisionmaking in buildings and transport. This – within limits – is the broad suggestion laid out in the structure-setting Chapter 3 of Grubb, Hourcade and Neuhoff, Planetary Economics: the Three Domains of Sustainable Energy Development, Taylor & Francis forthcoming (Chapters 1 – 5 submitted, others in draft available on request).<br>This industry chapter might also find the data and analysis on distributional impacts of pricing in this book (Chapter 8) to be of particular interest.<br>Finally, an important source of analysis of industry internaitonal flows and policy options are the Carbon Trust reports, Tackling Carbon Leakage: specific approaches in a world of unequal carbon prices (2010); and Global Carbon Flows (2011) □ | Noted - factors affecting decision-making in the sector are partly considered in the barriers and sectoral policy section, but will be checked again and if necessary discussed more in detail. We acknowledge the importance of the other points in this comment - literature suggested to be studied further. |
| 8353 | 10 | 0 | | | | I suggest the summary of AR4 and what's new be added like Chapter. 9. | Accepted - introduction has been revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11661 | 10 | 0 | | | | Tourism is focused as one of the most dynamic service sectors, but emissions from tourism overlaps with those from transport sector. The differentiation between emissions in tourism and those in transport (Chapter 8) is not straightforward. | Accepted and substantial changes incorporated. Decision to include tourism was made by the IPCC plenary at ther very beginning of AR 5 process. In light of this and other reviewer comment and comments by review editors a detailed discussion took place. It was agreed to prioritise the balance and logical flow in the chapter which is primarily on the industry sector. The discussion on tourism was repositioned as a demand-side driver for industrial products and product services and now appears in the SOD as Box 10.2. Moreover we have improved and intensified coordination with the transport and buildings chapter. In the SOD tourism is used as one of two illustrative examples to show how |
| 2277 | 10 | 0 | | | | The chapter needs to use common units and basis for comparing the different industries and mitigation opportunities. Tons CO2 total and/or tons CO2 per ton of material suggested (LCA type of approach using GHG from raw materials, energy and process). Otherwise the reader is left with the wrong impression. Fig 10.5 showing emission factors for non-Fe metals make it appear that non-Fe are responsible for less GHG than Ferrous, concrete, etc. This is because the figure ignores the tremendous amount of electrical energy required to produce Al, Mg, etc. GHG production for Al is higher than other materials - this does not indicate it. | a) Accepted - units used are consistent where possible.b) Noted - relevance of indirect emissions (e.g. due to electricity consumption in the production process) is highlighted in the chapter and in ES. The table on non-Fe metals has been |
| 2279 | 10 | 0 | | | 12 | Tourism is emphasized too much in the chapter versus other major industry sectors (extractive too little) | Accepted and substantial changes incorporated. Decision to include tourism was made by the IPCC plenary at ther very beginning of AR 5 process. In light of this and other reviewer comment and comments by review editors a detailed discussion took place. It was agreed to prioritise the balance and logical flow in the chapter which is primarily on the industry sector. The discussion on tourism was repositioned as a demand-side driver for industrial products and product services and now appears in the SOD as Box 10.2. Moreover we have improved and intensified coordination with the transport and buildings chapter. In the SOD tourism is used as one of two illustrative examples to show how |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5215 | 10 | 0 | | | | Regarding the UNWTO 2008 report has later been published in reviewed papers:<br>Dubois, G., Ceron, J. P., Peeters, P., & Gössling, S. (2011). The future tourism mobility of the world population: emission growth versus climate policy Transportation Research - A, 45, 1031-1042.<br>Gössling, S., Hall, C. M., Peeters, P., & Scott, D. (2010). The Future of Tourism: Can Tourism Growth and Climate Policy be Reconciled? A Climate Change Mitigation Perspective. Tourism Recreation Research, 35, 119-130.<br>Peeters, P., & Landré, M. (2012). The emerging global tourism geography – an environmental sustainability perspective. Sustainability, 4, 42-71.<br>Peeters, P. M., & Dubois, G. (2010). Tourism travel under climate change mitigation constraints. Journal of Transport Geography, 18, 447–457.<br>Scott, D., Peeters, P., & Gössling, S. (2010). Can tourism deliver its 'aspirational' greenhouse gas emission reduction targets? Journal of Sustainable Tourism, 18, 393 - 408. | Noted - cf. Response to 2279. References will be updated if still appropriate in the new approach to the tourism sector. |
| 18535 | 10 | 0 | | | | The terminology that is used to present and discuss the different categories of mitigation options is often mixed throughout the chapter, which can be confusing. For example, energy efficiency is also referenced as energy intensity, and reducing energy requirements. GHG intensity is also refereed to as reducing emissions and fuel-switching. It would be useful to pick one set of terms and apply them throughout the chapter. Introduce and explain the alternative terminology up-front, but stick with the one. | Accepted - consistency check will be done for the whole chapter (consistent use of important terms) |
| 18552 | 10 | 0 | | | | The way that CCS is discussed in Chapter 10 (especially in Sections 10.8 and 10.9) is very similar to the coverage in Chapter 7. There doesn't seem to be a clear differentiation in what is covered in which chapter. To save space it may be useful simply to refer to their broader discussions of CCS, and focus all Ch 10 discussions on industry related CCS and how that differs in each relevant sub-section. | Accepted - CCS-related text in chapter 10 has been shortened and revised, with stronger focus on industry-specific aspects and more cross-references to |
| 18562 | 10 | 0 | | | | Across the chapter, a more consistent treatment of the different industries would be useful. | Accepted - we have tried our best to do |
| 18563 | 10 | 0 | | | | The Chapter is in a good state for the FOD, and has strongly implemented the kaya identity throughout its structure, though there are some opportunities to make sure that the sections adhere more strictly to this master structure. | Accepted - we have tried our best to do this in the SOD |
| 18564 | 10 | 0 | | | | The sections from which a reader would pull the meat of the output of the chapter (e.g. 10.7 and 10.11) have not yet been well developed. With the structure of the chapter well in place, it would be useful to focus SOD preprations on those sections. | Accepted - SOD includes fully revised sections |
| 3015 | 10 | 0 | | | | I suggest use t instead of ton as the abbreviation of tonne in all manuscript. The SI unit symbol for the tonne is "t". | Accepted - mostly t is used in SOD. Will be checked further as part of final copy- |
| 3168 | 10 | 0 | | | | This chapter has a note on p.7 about double counting. I think this should be addressed earlier in WG3—maybe in chapter 1.<br><br>This chapter is about industry but it is surprisingly thin on two things that really matter in industry: a) costs; and b) industrial organization (that is, the structure and ownership of industry and how those factors affect the design of policy and industrial investment decisions). | a) Accepted - issue of double counting has been discussed and the note has been transferred to chapter 5. b) section on cost is significantly revised in SOD c) consequences of specific ownership structure in the industry sector is partly considered in the barriers and sectorial policy section, but will be checked again and if necessary discussed more in detail |
| 18770 | 10 | 0 | | | | Please consider discussing planned obsolesence in context of sustainability - possibly discuss this also in such a general manner that this section can be referenced e.g. from Ch.8 and 9. | Accepted - Issue off product lifetime is now discussed in more in depth in SOD and refelcted in framing identity and |
| 17482 | 10 | 0 | 0 | 0 | 0 | Many of the figures in this chapter reproduce very poorly in black & white. I suspect many, if not most, readers will read chapters in the IPCC report as PDF documents, i.e., without benefit of color display or reproduction. If that is true, the figures need to be systematically reviewed to ensure that they can be understood without color. | Accepted. We have tried our best to make the figures readable this time. In Final Draft figures will be further elaborated with the help of a professional |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17483 | 10 | 0 | 0 | 0 | 0 | Many, many references are missing from reference throughout this chapter. This makes review difficult as the support for statements that reviewers may want to investigate cannot be assessed. | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now |
| 12340 | 10 | 1 | | 2 | | The heading should be renamed to for instance "Industry and services" to reflect the facto that service and tourism is included in the chapter. We think that reflects in a better way the content of the chapter | In the light of commenst from reviewers, services and tourism are dealt with very differently as compared FOD (cf. response to comment 2279), so we feel |
| 2284 | 10 | 10 | 14 | 10 | 20 | The wording and data for this paragraph need to be cleaned up and checked. Iron ore increased by 264% but steel only 153%? I found 1970 world production of 431 million tons (USGS database) and 1490 million in 2011 (WSA website) which is 246% increase in annual production for steel. Check data and rewrite to flow a better. | Accepted - Wording revised. Numbers revised and according to WSA and USGC are fine. |
| 4543 | 10 | 10 | 21 | 10 | 39 | The focus on copper and rare earth seems to be misplaced when you are concerned about the trends in industrial GHG emissions. These elements are important, but from a completely different perspective. | Mineral extraction is part of Chapter 10 so is mandatory to include it. Rare elements are mentioned because its increasing importance in energy. Mining is excluded from Table 1.2 to avoid |
| 15707 | 10 | 10 | 24 | 10 | 24 | The sentence is a little ackward in that South Africa produces about 75% of the worlds platinum as the top country, Chile produces about 30% of thw world's copper as the top county, but China only produces about 15% of the worlds gold as the top producer. Not a critical sentence but the distribution is much more important in this context than the largest producer for gold, silver, and copper. | Accepted - text revised |
| 2285 | 10 | 10 | 28 | 10 | 30 | Sentence does not make sense - "per capital production of what over what period?" Something missing in sentence structure. | Accepted – text revised |
| 8269 | 10 | 10 | 29 | | | China's per capita production increase (of what?) | Accepted - text revised |
| 15899 | 10 | 10 | 35 | | | add "energy storage" to list of technologies using rare minerals | Accepted - included |
| 8270 | 10 | 10 | 38 | | | "reveal increase reserves" - unclear | Accepted - text revised |
| 5746 | 10 | 10 | 4 | 10 | 5 | This is consistent with the (22+15)% found by the recent FAO report on Energy-Smart Food (http://www.fao.org/docrep/014/i2454e/i2454e00.pdf) | Noted - thanks for the link, this valuable feedback will be used in completing the work of publishing this diagram. However, the position within the WG3 report will most likely be changed and |
| 16138 | 10 | 10 | 40 | 11 | 17 | Paragraph difficult to read. Maybe a graph would help here. | Accepted - text revised |
| 5250 | 10 | 10 | 40 | 11 | 17 | There is no reflection here of 'embedded emissions'. So China only exported 5.3% of the rolled steel it produced - for what purposes was it used? What proportion of China's production of this and other products were used in manufatured goods for export? What was the scale of embedded emissions in those products imported by major industrialised countries. This is intellectually bogus analysis. | Noted - GHG emissions embodied in trade are discussed in Chapter 14, and a cross-reference to this chapter has been made in the section |
| 15708 | 10 | 10 | 42 | 11 | 17 | The production changes for steel, concrete, and potentially other goods is impacted by global trade. The text tends to imply that national consumption and production are directly linked and not impacted by global trade. I do not think this was the intention of the authors, so this needs to be clarified. Likewise, the implication to CO2 emisions from global transport of commodities is an imporatnt issue. | Noted - Most of China's production is for own consumption. Emissions related to trade are discussed n Chapter 14, , and a cross-reference to this chapter has |
| 12954 | 10 | 10 | 43 | 10 | 45 | Economic downturn deepened in 2009 not 2010. 2010 was a recovery year from the trough in 2009. | Accepted - text revised |
| 2286 | 10 | 11 | 1 | 11 | 17 | This section is one of the most important sections in this chapter. However, it does not flow well and needs to develop the theme better - currently it reads like a review of statistics and is not clear. | Accepted - text revised |
| 15903 | 10 | 11 | 18 | 11 | 28 | Interesting discussion on impact of trade, emissions offshoring/structural changes, leakages, BUT need to note that lowering footprint for one nation could increase that of another due to leakage, emissions offshoring | Noted - GHG emissions embodied in trade are discussed in Chapter 14, and a cross-reference to this chapter has been |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16139 | 10 | 11 | 36 | 12 | 2 | On tourism, the split in several parts (economic situation, emissions, policy) along the chapter make reading difficult. At least one should catch the share of transport or consumption in emissions, from the outset and not wait for the next development. | Accepted and substantial changes incorporated. Decision to include tourism was made by the IPCC plenary at ther very beginning of AR 5 process. In light of this and other reviewer comment and comments by review editors a detailed discussion took place. It was agreed to prioritise the balance and logical flow in the chapter which is primarily on the industry sector. The discussion on tourism was repositioned as a demand-side driver for industrial products and product services and now appears in the SOD as Box 10.2. Moreover we have improved and intensified coordination with the transport and buildings chapter. In the SOD tourism is used as one of two illustrative examples to show how |
| 15709 | 10 | 11 | 36 | 12 | 2 | The components of tourism that belong in Chapter 10 and other chapters needs to be clarified. The produciotn of goods that support tourism seem to fit well within Chapter 10 but emissions from the services of tourism see to fit better in other chapters. | cf. Response to comment 2279 |
| 7096 | 10 | 11 | 46 | 11 | 46 | Reference UNWTO and UNEP 2008 should be UNWTO, UNEP and WMO 2008 | Noted, thanks - but it has been deleted |
| 7097 | 10 | 11 | 47 | 12 | 2 | the WTTC might not be an appropriate source for economic estimates, as it is unclear what tourism as a sector is meant to comprise- often, this includes all sorts of associated industries and services. "word" is apparently meant to be "world". | Noted - see revised text on tourism in box 10.2 of SOD. UNWTO estimates that in 2012 of the contribution of tourism to world GDP is around 5% and |
| 17488 | 10 | 11 | footnote | 11 | footnote | Why is footnote 1 needed? | Accepted - footnote deleted |
| 12955 | 10 | 11 | 4 | 11 | 7 | The measures of tjhe share of production of these key commodities coming from developing countries is a key fact and should be in the executive summary in one form or another. | Taken into account - however due to space restrictions this was not included |
| 5216 | 10 | 12 | 2 | 12 | 2 | Be very careful with 'indirect' economic impacts: these are vulnerable to extensive double counting (toirism claims the whole aircraft manufactoring industry and the latter claim tourism as 'indirect' economy), ignore that, in case other sectors were growing at the expense of tourism, there would also be indirect activities, so the indirect impact is only relevant in comparison with alterantive economies or spendings. So, please keep these data to direct economic ones only. Eventually add input-output analysis to get a more comprehensive idea of tourism in the economy. analysis like | Taken into consideration: discussion about tourism is more foccused and repositioned (tourism will serve as one of two illustrative example to explain interaction between service/product demand and industry activities). cf. |
| 15282 | 10 | 12 | 2 | 12 | 2 | "word" to be "world" | Editorial - copyedit to be completed prior |
| 11046 | 10 | 13 | | 13 | | Unit is needed | This comment has been addressed to Ch.10 by error and is meant as a |
| 15881 | 10 | 13 | 1 | | | Add energy intensity in J/tonne (or J per unit activity) sinc ethis is more indicative of energy efficiency than kg/capita | Accepted in part - The section is on activity trends not energy or emissions, for energy indicators see section 10.3 |
| 6723 | 10 | 13 | 2 | 13 | 2 | The references to the Table were not found in the reference list. I could therefore not check the numbers. For example US steel kg/cap has a 90% decrease between 2005 and 2011. | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now |
| 10134 | 10 | 14 | 26 | | | "final energy use" is wrong in this context. It is "final fossil fuel use" | Rejected - This is final energy use as defined in footnote 3 of FOD (footnote 4 of the SOD). This is not just "final fossil |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10135 | 10 | 14 | 27 | | 29 | This sentence should be deleted as it delivers no relevant information. As is stated correctly, in the chemical industry most of the carbon contained in the fossil fuel used as raw material is transferred into chemical products. Only few processes exist, in which CO2 is produced as a by-product. Because the chemical industry is growing, the CO2 emissions from these processes are also growing. Alternatively it could be helpfull to add the following sentence: "Fossil fuels used as raw materials in the chemical industry cause emissions at the end of their life-span in the disposal phase. These emissions are accounted for in the waste disposal industry's emissions." | Accepted - sentence included in SOD |
| 15900 | 10 | 14 | 37 | | | footnote 3: how are electricity and heat flows allocated? | Question unclear - footnote 3 of the FOD (now footnote 4 in SOD) has a long |
| 17490 | 10 | 14 | 7 | 14 | 8 | Indicate the period of time that is encompassed by this statement. | Accepted - reference deleted as non |
| 18518 | 10 | 14 | 2 | | | This section includes nothing on the emissions of extractive industries, but covers only the energy consumption. Are there extractive industries that have more emissions than others? How do they compare? | Noted - see note under Table 10.3 in SOD: "Energy use for mining and quarrying is not included in the final and primary energy values; energy-related CO2 emissions from mining and quarrying, which are estimated to be less that 3% of total industry emissions, are included due to data limitations" (IEA detailed CO2 data for 2010 are not |
| 11131 | 10 | 14 | 31 | 14 | 37 | Line 32 implies that the levels of HFC-23 per tonne of HCFC-22 manufacture have doubled. This is not the case. It is the total quantity emitted that has doubled. | Accepted - text revised |
| 4792 | 10 | 14 | 37 | 14 | 38 | (Footnote 3), please change the sentence to "In order to calculate primary energy for non-fossil fuel (nuclear, hydro and other renewables)," as hydropower is a renewable energy source | Accepted - text revised |
| 15710 | 10 | 15 | 1 | 15 | 2 | The sentence addressing the sources of N2O needs to be clarified. Presumable, the sentence reference to the source of industrial emissions of N2O. Nitric acid and adipic acid manufacturing only make up about 6-7 percent of all anthropogenic N2O emissions. | Accepted - text revised |
| 17492 | 10 | 15 | 6 | 15 | 6 | What does "industry and non-energy industy" mean? | Accepted - revised to "energy and non- |
| 12956 | 10 | 15 | | | | Agree with proposition of making the table a stronger visual impact as the information is very important to communicate clearly but is very detailed as is. | Noted - will be considered in final draft when the help of a professional graphic |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 11132 | 10 | 16 | | 16 | | Table 10.3: Emissions of non-CO2 GHGs (EPA 2011) Emissions (MtCO2e)<br>Source 1990 2005 2010<br>HFC-23 from HCFC-22 production 91 177 309<br>Data from UNFCCC (CRF emissions from Annex A) 88 37 20<br>Data for Global emissions from Miller & Kuijpers (2011) and<br>Miller et al. (2010) 96 142 117<br>ODS Substitutes 0 73 93<br>Data from UNFCCC (CRF emissions from Annex A) 3 184 237<br><br>The above shows the first two rows of Table 10.3 (in bold), taken from the reference EPA (2011). In fact, this reference does not exist in the draft and I presume that it is actually:<br><br>Alsalam J., and S. Ragnauth. (2011). Draft Global Antropogenic Non-CO2 Greenhouse Gas Emissions: 23 1990-2030. US EPA, Washington. Available at: http://www.epa.gov/climatechange/economics.<br><br>I've compared the EPA numbers with the literature sources:<br><br>UNFCCC data, unfortunately only for Annex A because the main emitters (India and China) do not report, and<br><br>Ben Miller's papers on HFC-23 emissions:<br><br>Miller, B. R., Rigby, M., Kuijpers, L. J. M., Krummel, P. B., Steele, L. P., Leist, M., Fraser, P. J., McCulloch, A., Harth, C., Salameh, P., Muehle, J., Weiss, R. F., Prinn, R. G., Wang, R. H. J., O'Doherty, S., Greally, B. R., and Simmonds, P. G.: HFC-23 (CHF3) emission trend response to HCFC-22 (CHClF2) production and recent HFC-23 emission abatement measures, Atmos. Chem. Phys., 10, 7875-7890, doi:10.5194/acp-10-7875-2010, 2010.<br><br>Miller B. R. and Kuijpers L. J. M., Projecting future HFC-23 emissions, Atmos. Chem. Phys. Discuss., 11, 23081–23102, doi:10.5194/acpd-11-23081-2011, 2011<br><br>It is clear that the EPA data are completely at odds with Miller's numbers and this means that the EPA data are wrong. The emissions in the Miller papers are consistent with measured atmospheric concentrations; effectively they have been verified against measurements.<br><br>I also had a look at the numbers in the table for ODS substitutes. The last two rows of the table above show the direct comparison between the EPA data and the values reported by countries to UNFCCC. Again there are huge differences but, for the ODS substitutes, they are in the opposite direction - the EPA data are far too small. Verification of the UNFCCC data for the most abundant HFC (134a) against its atmospheric concentrations, as published by AGAGE showed that the UNFCCC data are closer to reality than the low EPA values | Noted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now been resolved. The data corresponded to the EPA 2011 draft report, which in the SOD has been updated to EPA 2012. Two sources are used for Non CO2 emissions in the SOD (EDGAR and US EPA). There are currently discussions underway on the discrepancies between the two sources. This comment will be considered in the discussion. |
| 6724 | 10 | 16 | 1 | 16 | 1 | Should the reference be (Alsalam J., and S. Ragnauth., 2011)? However in that document I cant find those numbers. Maybe another source? | Noted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now been resolved. The numbers corresponded to the EPA 2011 draft |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2287 | 10 | 16 | 3 | | | For iron and steel and cement industry, much of the CO2 emission arise from the chemical reactions not fossil fuel combustion. Sentence should be "CO2 emissions occur due to chemical reactions and fossil fuel combustion." CaCO3 = CaO + CO2 - calcining major source of CO2 for cement and for iron and steel, Fe2O3 + 2C + 1/2O2 = 2Fe + 2CO2 - major source of CO2 | Accepted - sentence changed to: Most of these manufacturing CO2 emissions arise due tochemical reactions and fossil fuel combustion largely used to provide the intense heat that is often required to bring about the physical and chemical |
| 7719 | 10 | 16 | 1 | | | The emissions from ODS substitutes should be updated by the 2012 TEAP Progress report or related Task Force Report to Decision XXIII/9 to make the present situation clearer. | Noted. Two sources are used for Non CO2 emissions in the SOD (EDGAR and US EPA). There are currently discussions underway on the |
| 11133 | 10 | 17 | | 17 | | As previous comments | cf. Response to comment 11132 |
| 18519 | 10 | 17 | | | | Please clarify which industries are included in 'other'. | Noted - the figure has been removed |
| 18520 | 10 | 17 | | | | Two comments: 1) Please clarify the abbreviations of the world regions to make the figure stand-alone; 2) As waste is covered in a separate, independent section to the chapter, it seems strange that waste emissions are included here. It may be more consistent to decouple these here to keep the discussion within the boundaries of this chapter section. | 1) Accepted - in Table 10.3 of the SOD the acronyms have been briefly spelt out and a note has been included in the caption: "For definitions of regions see Annex II (Metrics and Methodology)" 2) Figure 10.2 and Table 10.2 of SOD |
| 3014 | 10 | 17 | 11 | | 12 | The discussion about the relationship between trade and GHG emissions lacks important scientific contributions, for USA, Brazil and China. Please see the following papers LIU, H., XI, Y., LI, X., 2010, “Energy embodied in the international trade of China: An energy input-output analysis”, Energy Policy, v. 38, pp. 3957-3964. MACHADO, G., SCHAEFFER, R. E WORRELL, E., 2001, “Energy and carbon embodied in the international trade of Brazil: an input-output approach”, Ecological Economics, v. 39, pp. 409-424. WEBER, C. L., PETERS, P. P., 2009, “Climate change and international trade: Policy considerations in the US”, Energy Policy, v. 37, pp. 432-440. WTO, 2009, Trade and Climate Change: A report by the United Nations Environment Programme and the World Trade Organization. | Accepted - this paragraph has been significantly reduced in the SOD, referring readers to Chapter 14 where this issue is fully covered. |
| 6725 | 10 | 17 | 2 | 17 | 2 | The reference is not correct or found. | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now |
| 6726 | 10 | 17 | 3 | 17 | 4 | The F-gases use, is there possible a double counting or is it excluded in for example "Chemicals and petrochemicals" please clarify the note. | Noted - the figure has been removed |
| 12344 | 10 | 17 | 6 | | | Is the pie chart to the right releated to the figure to the left, or are they independent? Further explanation of the figure would ease the reading. | Noted - the figure has been removed |
| 15905 | 10 | 17 | 6 | | | Not clear why there are 2 pie wedges for F-gases | Noted - the figure has been removed |
| 6727 | 10 | 17 | 7 | | | Reference problem, see 6 | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now |
| 6728 | 10 | 17 | 8 | 18 | 16 | This part of trade could probable both use a table and an own sub-section to help reader to find how this impacts everything | Accepted - this paragraph has been significantly reduced in the SOD, referring readers to Chapter 14 where |
| 16141 | 10 | 17 | 8 | 18 | 13 | Important paragraph, maybe there should be a reference to international policy -or absence of- described in other chapters? | Accepted - this paragraph has been significantly reduced in the SOD, referring readers to Chapter 14 where |
| 15712 | 10 | 17 | 8 | 17 | 10 | The discussion of this issue needs to be better coordinated with Chapter 8 (Transport). | Accepted - this paragraph has been significantly reduced in the SOD, referring readers to Chapter 14 where |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12957 | 10 | 17 | | | | Graph legend needed. Who is REF? Who is MAF? | Accepted - in Table 10.3 of the SOD the acronyms have been briefly spelt out and a note has been included in the caption: "For definitions of regions see |
| 17496 | 10 | 18 | 1 | 18 | 2 | The sentence reads "In large economies of Western Europe net 1 imported emissions account for 20-50%,…" 20-50% of what? | Accepted - this paragraph has been significantly reduced in the SOD, referring readers to Chapter 14 where |
| 8271 | 10 | 18 | 12 | | | "CO2 emissions to grow in comparison" - missing "are expected" to grow | Editorial - copyedit to be completed prior |
| 17497 | 10 | 18 | 15 | 18 | 16 | "With regard to GHG emissions, service sector is less diverse, as it comprises only energy-related emissions" Are repair shops included in the category of service sector? If so, aren't there releases of refrigerants in this sector? I suggest having this read "as it generally comprises only ..." | Accepted - but coverage of services sector has been significantly reduced in SOD, cf. Response to comment 2279 |
| 5217 | 10 | 18 | 16 | 18 | 17 | I am unsure if the enerdata data given here include transportation related to the servioces sectorm, i.e. including all ourist's transport, but looking at the figures, it does not. Either include (would be my prefenrence) or make a clear note in this. | Note - the data from enerdata do not include within services the emissions related to transport. This section has been deleted as coverage of services |
| 6730 | 10 | 18 | 17 | 18 | 18 | What about Aircraft and combustion engines for transports? | cf. Comment 5217 |
| 15907 | 10 | 18 | 35 | 18 | 41 | service sector may lower emissions, but manufacturing related GHGs are then trasnfered to another country--> leakage | Noted - dealt with in same page (18), line 42 onwards |
| 8272 | 10 | 18 | 44 | | | missing "to" - "leads TO total energy use reduction" | Editorial - copyedit to be completed prior |
| 8273 | 10 | 18 | 45 | | | "as" is not needed | Editorial - copyedit to be completed prior |
| 15906 | 10 | 18 | | | | shorten this section | Accepted - cf. Response to comment |
| 8276 | 10 | 19 | | | | Table 10.4 does not reflect the text below: need to create a sub category - transportation | Accepted - but due to new approach (cf response 2279) table no longer appears |
| 18521 | 10 | 19 | | | | When discussing tourism emissions, it would be very useful to refer back to the discussion in Box 1 on double-counting emissions so that readers understand that emissions quantified here are also primarily accounted for in other chapters (Chapters 8 and 9). | Noted - Tourism is a human activity, a use of leisure time which, according to its different forms (touring, visiting friends and relatives…) more or less calls upon merchant services (catering, tour organisation etc). It has specific drivers and dynamics which cannot be caught by sectoral approaches (e.g. transport, building), an issue which is of some importance owing to its contribution to emissions. This justifies the bottom-up approach. It is not surprising that the question of the coherence between the bottom-up approach and the historically dominating top-down approach is posed. This is also relevant for services (e.g. education, health services etc). services (e.g. tourism) can be seen as end users and can be connected to the sectors that feed them through a Stankey diagram,. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 7102 | 10 | 19 | 1 | 19 | 7 | Best estimate share of tourism CO2 emissions is correct, suggest that section on share of tourism in radiative forcing (Scott et al. Reference) is moved up to follow directly after estimate on CO2. It is not necessarily correct that the share of tourism in national emissions is higher in affluent countries (see e.g. Australia; Dwyer et al. 2010, Journal of Sustainable Tourism), while in particular small island nations can have particularly high tourism emissions, though they may rank low in terms of GDP per capita. Note as well that all of the quoted studies on national emissions have different system boundaries. | Points taken into account. See response to comment 2279 on new approach to tourism in SOD. |
| 2288 | 10 | 19 | 14 | 19 | 16 | The reference is one of the only references to using a life cycle perspective. The importance of this to reducing GHGs should be emphasized. | Noted in general for the chapter which has attempted to give this perspective |
| 6729 | 10 | 19 | 19 | | | Shouldn't it be possible to update the table to today's value. Ask same organisation to redo analyse? | Noted - updated sources used. Table no longer appears in SOD. |
| 7104 | 10 | 19 | 19 | | | Table should be moved up, the sentence "the origins of emissions…" should be re-written (sounds odd) and integrated in first section. The reference to table 10.4 should be UNWTO, UNEP and WMO 2008. | Accepted - but due to new approach (cf response 2279) table no longer appears |
| 7105 | 10 | 19 | 24 | 19 | 31 | not sure this is relevant? | Accepted - revised to "981MT from transport" - but due to new approach (cf response 2279) table and text no longer |
| 8277 | 10 | 19 | 24 | | | Total of 981Mt (table 10.4 shows 1302MT) or need to clarify "world total of TRANSPORTATION emissions from tourism" | Accepted - but due to new approach (cf response 2279) table and text no longer |
| 15908 | 10 | 19 | 25 | | | "hundred"???? | Accepted - revised to "same day visitors 133MT" - but due to new approach (cf response 2279) table and text no longer |
| 8278 | 10 | 19 | 25 | | | Overnight stays 844Mt (table 10.4 shows 274Mt from accomodation) | Rejected - 844 Mt sums transport, accommodation and activities related to overnight stays. Due to new approach |
| 8279 | 10 | 19 | 31 | | | global figure of 981Mt - need to show in the table that 981 is the sum of air transport, car and other transport | Accepted - but due to new approach (cf response 2279) table and text no longer |
| 17498 | 10 | 19 | 6 | 19 | 6 | Aviation's role in tourism should have been introduced earlier, rather than as an aside in this quantitative statement. | Rejected - The importance of aviation is made as clear as possible though it is not stated in the first four lines, see table and text below. See response to |
| 8274 | 10 | 19 | 6 | | | from 5.2% in which year? | Accepted- changed "from" to "between", the figures state a margin of error. See response to comment 2279 on new |
| 8275 | 10 | 19 | 6 | | | 5.4% and 8.3% in which years? | cf.response to 8274 |
| 5218 | 10 | 19 | 8 | 19 | 10 | Cruise tourism is in the UNWTO report not included in 'other tourism' but in accommodations. This because cruises tend not to bring tourists somewhere, but are the destination itself, though a mobile one. Flights to and from ports are included in (air) transport. | Accepted - deleted "and included in other transport". See response to comment 2279 on new approach to |
| 5219 | 10 | 19 | 8 | 19 | 10 | Another issue: recommend strongly to include cruises not in a description of total emissions, but in an assessment of individual per tourist trip and per tourist night emissions for different forms of tourism to show the very large range and the high evels for most cruises and also with an eye on the large opportunities this diversit gives. In effect a minority of trips causes the majority of emissions and thus policies might be best directed at this minority (also because these minority trips trend to grow very fast at this moment). | Noted - it would be quite a good idea if we had space to devote to a more detailed analysis of cruise tourism. The unequal repartition of emissions is dealt with in the first paragraph next page |
| 7103 | 10 | 19 | 9 | 19 | 9 | "and included in "other transport"" - difficult to understand, remove, or rewrite to read "Cruise travel represents about 1.5% of global emissions of CO2 (e.g. Gössling 2012, Carbon Management, Routledge); it is the most energy intense form of tourism if calculated on a per tourist basis. Cruise travel has grown at an average annual rate... | Accepted - removed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12958 | 10 | 19 | 2 | 19 | 4 | figures missing for France, Switzerland; | Rejected - the French and Swiss sources make the same case as the others, yet the figures they give (e.g. emissions from transport only) are not comparable to the other studies and so |
| 12959 | 10 | 19 | 5 | 19 | 7 | There seems to be an inconsistency between the claim that GHG emissions associated with tourism represent 12.5% of CO2eq and the Sankey diagram in figure 10.2. The latter implies that Tourism and leisure together accou nt for around 5% of global GHGs in CO2eq in 2008. IF this is not a discrepancy it should be explained why not as its not clear. | Noted - regarding tourism the two sources are rather coherent, it is quite good news to see different approaches meet. TheUNWTO data include overnight stays (strictly tourism) and same day visits (i.e. part of leisure). They do not include all leisure near the home. Yet they point that transport is the greater part of emissions and that the weight of activities is much lower. Thus |
| 3651 | 10 | 2 | 1 | 2 | 1 | If the service sector is included in the analysis, please consider to add it to the title of the chapter. | cf. response to comment 12340 |
| 7106 | 10 | 20 | 1 | 20 | 3 | these are references to national studies, an overview of studies indicating unequal distribution in per capita emissions is provided in Gössling et al. 2009. It is also unclear what the references refer to? | Rejected - Gossling et al 2009 is quoted in the paragraph. It also seems important to refer back to national studies since they not all refered to in |
| 16143 | 10 | 20 | 14 | 20 | 15 | This line is controversial : there are several radical technologies being explored such as innovative cement processes or changes in the steelmaking. Although they are not yet in industrial scale, they suggest that paths are not necessarily incremental in large energy intensive industries. | Rejected - but if there is space we could add comments to illustrate the lack of evidence such claims. |
| 4545 | 10 | 20 | 14 | 20 | 25 | This is not a Kaya-identity. The Kaya-identity differentates between economic growth, economic structure and intensity changes. The formula 1 does not do this, as strucutre of demand is lacking. | Taken into account in revisions and identity shifted forwards in the chapter |
| 18522 | 10 | 20 | 20 | | 25 | It may be more useful to place this equation right up front next to Figure 10.1 to clarify in detail how the two fit together. The description here doesn't make it crystal clear. It might be useful to e.g. include the green circled numbers from Figure 10.1 in this equation as well to better clarify exactly which components represent energy efficiency, materials use efficiency, reduction of demand, etc.. | Accepted - Taken into account in revisions and identity shifted forwards in the chapter to be near to the structuring figure 10.1 |
| 3019 | 10 | 20 | 20 | | | Please fix the word off-shire. I think you intended to write offshore. | Editorial - copyedit to be completed prior |
| 15909 | 10 | 20 | 37 | | | offshore not offshire | Editorial - copyedit to be completed prior |
| 8280 | 10 | 20 | 37 | | | off-shire should be off-shore | Editorial - copyedit to be completed prior |
| 10414 | 10 | 20 | 37 | | | "off-shore" is got wrong here as "off-shire" | Editorial - copyedit to be completed prior |
| 16142 | 10 | 20 | 8 | 20 | 11 | Excellent paragraph that sums the problem | Noted, thanks. |
| 7112 | 10 | 20 | 9 | | | Bows et al. 2009: does not focus on tourism? | Looking at the title: "Air transport, climate change and tourism." it seeems |
| 6731 | 10 | 20 | | | | I would like a better structure in this part that would be the same for all sub-sections. What is the status, what has been done and the results followed with what can be done with risk and potential. | Taken into account, cf. Response to comment 18534 |
| 18534 | 10 | 20 | | | | The overall structure of the section is very useful (using 10.4.1 to explain the over-arching options and 104.2 how they apply to different industries). It is, however, inconsistently applied in 10.4.2, with some sections (e.g. steel and cement) following very closely, and others (e.g. food and textiles) following only to a very limited extent. It would be useful to have a consistent application throughout that section. Where that is not possible, please explain why, e.g. is there no option for material substitution in that industry? | Taken into account - it has been used as consistently as possible, but for several sectors, no published evidence related to some of the options was found. In revising the report, we have tried to |
| 18526 | 10 | 20 | | | | One option to shorten 10.4.1 (and thereby the chapter), would be to cut industry-specific examples to the relevant sections of 10.4.2. | Accepted - 10.4.1 has been shortened to summarise the five approaches, with all sector specific examples inserted into |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8501 | 10 | 20 | 12 | 24 | 30 | The section 10.4.1 can be simplified and make it as general statement since the specific elaboration has been detailised in section 10.4.2 according to sectors. Therefore a few pages can be extracted in order to achieve target number of pages for this chapter. Repeation of statements in section 10.4.1 and 10.4.2 can be misleading and inaccurate in technicalities. It also good to combined section 10.4.1 and 10.4.2 with introduction of table when explainingtypes of mitigation according to sector specific. | Accepted - 10.4.1 has been shortened to summarise the five approaches, with all sector specific examples inserted into the relevant sections of 10.4.2 |
| 12124 | 10 | 20 | 27 | 20 | 29 | Sector Wide Mitigation Opportunities is missing many strategies - 1) waste heat loss minimisation and waste heat recovery Reference for this - US DOE (2008) Waste Heat Recovery: Technology and Opportunities in U.S. Industry. US DOE at http://www1.eere.energy.gov/manufacturing/intensiveprocesses/pdfs/waste_heat_recovery.pdf + US DOE (2004) Waste Heat Reduction and Recovery for Improving Furnace Efficiency Productivity and Emissions Performance. A Best Practices Process Heating Technical Brief. US DOE. http://www1.eere.energy.gov/manufacturing/tech_deployment/pdfs/35876.pdf - 2) Combined Heat and Power - Co/Tri Generation - Ref Oland, C. (2004) Guide to Combined Heat and Power. Prepared for the U.S. Department of Energy. Industrial Technologies Program. Prepared by Oak Ridge National Laboratory. At http://www1.eere.energy.gov/manufacturing/tech_deployment/pdfs/guide_chp_boiler.pdf | Accepted - References added at the start of section 10.4 (U.S. DOE, 2008; U.S. DOE, 2004) and within the costs and potentials section 10.7 (Oland, 2004) |
| 12125 | 10 | 20 | 27 | 20 | 29 | Sector wide Mitigation Opportunities - missing many strategies - 3) improving the operational energy efficiency of manufactured products, appliances, IT vehicles, industrial and commercial cooking equipment. Whilst energy efficiency of product manufacturing processes is important, it is important to note that that life cycle analysis shows that for most “energy using” manufactured products (vehicles, computers, electric motors, appliances, engines, toner cartridges and buildings) over 70% of the total life cycle energy use occurs over the 5-30 plus years of operation<br><br>For example - Product, % of lifecycle energy usage from operation , reference.<br>Cars, SUVs, pickups, buses - 65-74% (Chester, M.V. and Horvath, A. (2009) Environmental assessment of passenger transportation should include infrastructure and supply chains. Environmental Research Letters, vol. 4, no. 2, pp. 1-8)<br>US Family Sedan 85% (Sullivan, J. L., et al., 1998, Life cycle inventory of a generic U.S. family sedan – Overview of results USCAR AMP Project, proceedings of Total Life Cycle Conference Land, Sea and Air Mobility, SAE International P-339, pp.114)<br>Passenger transportation (private and public): 63-70% 63-70% (Chester, M.V., Horvath, A. and Madanat, S. (2010) Comparison of life-cycle energy and emissions footprints of passenger transportation in metropolitan regions. Atmospheric Environment, vol. 44, no. 8, pp. 1071-1079.))<br>Aircraft 69-79% (Chester, M.V., Horvath, A. and Madanat, S. (2010) Comparison of life-cycle energy and emissions footprints of passenger transportation in metropolitan regions. Atmospheric Environment, vol. 44, no. 8, pp. 1071-1079.))<br>Residential Buildings 80-90% (Ramesh, T., Prakash, R. and Shukla, K.K. (2010) Life cycle energy analysis of buildings: an overview. Energy and Buildings, vol. 42, no. 10, pp. 1592-1600)<br><br>Lighting – All Forms 98%<br>Office Buildings 86%<br>ICT network and mobile phones (e.g., 2G and 3G, not office network): 84%<br>79 -84% | Noted - but the absolutely valid point about use/embodied energy is dealt with by the overall structure of the WG3 report. The use of buildings and appliances is dealt with in the section on buildings and the use of vehicles is dealt with in the section on transport. This chapter covers only the industrial emissions related to making buildings, vehicles, equipment and other goods (i.e the other ~30% not listed by the reviewer). |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12126 | 10 | 20 | 27 | 20 | 29 | Sector wide Mitigation Opportunities is missing many strategies - Reducing GHG through core industrial/manufacturing process innovation. I can send refs and text to support this strategy if interested. | Noted – but this chapter can not attempt to review every technology which is currently under development, and given the space limitations of the |
| 12127 | 10 | 20 | 27 | 20 | 29 | Sector wide Mitigation Opportunities is missing many strategies - Renewable Energy is missing. Renewable Energy is relevant for all these sectors including mining. Many mining sites are in remote areas off the grid and highly suitable to renewable energy. | Noted - section 10.4 does mention this briefly, but the main discussion on renewable energy in WG3 is in Chapter |
| 6732 | 10 | 21 | 1 | 21 | 9 | I am missing out risks and costs for the improvements. | Noted - this is discussed in sections |
| 16146 | 10 | 21 | 10 | 21 | 24 | This paragraph is too prudent and contradicts other parts of the chapter. Line 22 the "asymptote" of efficiency does not mean the potential is not there, especially in an industry with a limited number of players. For example, the Wuppertal Institut has shown that furnaces in the German Steel Industry nearly did not move in efficiency for 20 years, although technology did not stay idle... | Taken into account - cf. Response to comment 4546 |
| 17501 | 10 | 21 | 10 | 21 | 10 | Spell out acronyms at first use in chapter. What is EOR? | Editorial - copyedit to be completed prior |
| 8281 | 10 | 21 | 10 | | | What does it mean "within a factor of two of the absolute theoretical limit defined by Gibbs" | Accepted - text revised, theoretical limits now only discussed in general |
| 4546 | 10 | 21 | 10 | 21 | 24 | This section mixes up best practice, best available technology and technical limits, and makes for a confused story. The argument also builds on only 3 references. The argument should first state what savings are between current average practice and best practices (and BAT). Next to this it can then look at future technologies, beyond BAT. The thermodynamic limits are still far away fro many processes. The last sentence of this paragraph is incorrect, given all the mateial described above and withut definition of the word "future". Saygin et al. (2011) look at current best available technologies, but note that savings are possible in areas not included in BAT (e.g. process integration, CHP, recycling). | Taken into account: this paragraph has been rewritten in response, and more references added. |
| 16145 | 10 | 21 | 11 | 21 | 12 | Word missing (if?) | Editorial - copyedit to be completed prior |
| 17502 | 10 | 21 | 12 | 21 | 12 | Another reference that would be appropriate here: Brent, G. F., D. J. Allen, B. R. Eichler, J. G. Petrie, J. P. Mann, and B. S. Haynes. 2012. Mineral Carbonation as the Core of an Industrial Symbiosis for Energy-Intensive Minerals Conversion. Journal of Industrial Ecology 16(1): 94-104. | Accepted but due to space restrictions the statement was deleted |
| 6733 | 10 | 21 | 13 | 21 | 20 | EJ and PJ are to big numbers to grab. Use relative values. 54 PJ lacks a comparable number. | Accepted - context for the numbers has been provided in some instances in SOD. Will be considered further in next |
| 17503 | 10 | 21 | 13 | 21 | 31 | To what does "its" refer? | Editorial - copyedit to be completed prior |
| 8282 | 10 | 21 | 13 | | | annual GLOBAL energy savings? | Accepted but due to space restrictions the statement was deleted - section 10.7 now includes a reference to mitigation |
| 8283 | 10 | 21 | 15 | | | 19 to 32% - why a range? | Accepted but due to space restrictions the statement was deleted - most mitigation potential data can now be |
| 15910 | 10 | 21 | 2 | | | Add "boilers" after "furnaces. There are more technologies to consider—waste heat recovery, advanced cooling systems, pinch analysis, load tracking, variable speed/frequency drives, nanotechnology, etc) | Noted - cf. Response to comment 15885 |
| 17500 | 10 | 21 | 21 | 21 | 21 | A new paragraph should start with the sentence "Similar limits…" or the sentences should be edited to provide a segue. | Taken into account |
| 16147 | 10 | 21 | 22 | 21 | 24 | Radical technology, e.g. direct reduction of iron oxyde for steel, or radical cements do exist, even if they are still to implement. Thus this sentence may be misleading. Maybe add "in the short term" | Noted - some mentions have been adde, e.g new cement technologies. However chapter is concerned with general trends and possibilities; it does not address specific technologies which are currently |
| 8284 | 10 | 21 | 23 | | | "is the limit to likely future .." should be "is likely the limit to future…" | Reject |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15911 | 10 | 21 | 26 | | | coal and oil for industry mostly used in developing nations, not OECD. OECD uses mainly nat gas | Noted - but this pattern reflects the decision by developed countries to reduce their production of basic materials (such as steel) in favour of lower-energy downstream manufacturing - such as car making. So, it isn't clear |
| 6735 | 10 | 21 | 29 | 21 | 30 | What is the potential with three to four times more biofuel, how much could that decrease total emissions from energy in the industry. | Noted - section 10.4 does mention this briefly, but the main discussion on renewable energy in WG3 is in Chapter |
| 6734 | 10 | 21 | 33 | 21 | 39 | Try to find numbers to show the potential otherwise remove the part with "if power is decarbonised…" | Noted - see response 12345 |
| 12345 | 10 | 21 | 33 | 21 | 36 | Wider use of heat pumps can be implemended independetly of decarbonized power generation, because the heat pumps have efficiency rates of producing heat >1. Please reflect this fact. | Reject - the Unido report cited by the reviewer makes two arguements which suggest that decarbonisation of the electricty grid is required to any significant savings from heat pumps. Firstly, page 37 clearly points out that the effcieincy of electricity generation must me considered when comparing heat pump technologues to other options, such as direct combustion fo the fuel. "So, for example, if the electricity comes from fossil fuel generation with an efficiency of 40%, the coefficient of performance of the heat pump needs to be higher than 2.5 if the pump is to save primary energy and be considered as providing renewable heat." (i.e. a COP >2.5 for the heat pump is required for the heat pump to start saving CO2). Secondly, page 39 explains the efficiency of heat pumps fall quickly when producing high temperature heat (governed by Carnots Law),making heat pump technology more suited for low temperature heat in |
| 15912 | 10 | 21 | 33 | 21 | 39 | issues for using renewable sinclude intermittency andarea footprint which are limitations for indsutry | Noted - but the main discussion on renewable energy in WG3 is in Chapter |
| 9535 | 10 | 21 | 33 | 21 | 36 | Good comment | Noted |
| 10014 | 10 | 21 | 33 | 21 | 36 | This part should be kept in SOD because "heat pump technology" has huge potential to reduce GHG emission from industrial sectors, as described in (IEA/OECD, 2010, page65-83) and (UNIDO, page38, Fig14). These literatures are listed in the No47 line of this table. | See response to comment 12345 |
| 9541 | 10 | 21 | 36 | | | Please, add the following; the analysis has identified the potential for heat pumps to meet 4.87EJ/yr of industry's process heat demands in 2050.(renewable energy in industrial applications, UNIDO) | See response to comment 12345 |
| 16148 | 10 | 21 | 38 | | | Maybe precise "large scale" solar systems in use in industries. | Noted - but the main discussion on renewable energy in WG3 is in Chapter |
| 16144 | 10 | 21 | 4 | | | The list does not include explicitly the efficiency of the motor itself. Maybe add "in addition to improvements to the motors themselves." | Taken into account - changed to "motor systems" which includes motors |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16149 | 10 | 21 | 44 | | | The desctruction of HFC23 as a CDM benefit is controversial, this should show in the sentence, for example with "the controversial destruction of HFC-23 is the major source…" | Noted. This is now mentioned only in section 10.11. The statement reflects a fact: HFC23 destruction is a major source of CDM credits. The controversy is not related to this fact, but has been discussed by the chapter team who will |
| 7510 | 10 | 21 | 25 | 22 | 26 | It should be explained that CCS requires huge energy for capture and strage of CO2. As far as carbon free energy is not available, additional CO2 emission is inevitable. High costs of CCS is stated at line 25 of page 22. And it should be added that for industry, the issue is "Who will pay for the cost of CCS?" and how the cost should be passed on to the consumer. | Noted - but most of the CCS text in chapter 10 has been removed and cross-reference is made to chapter 7 on energy which covers the issue in more |
| 11134 | 10 | 21 | 41 | 21 | 41 | mistyping. Should say "hydrochlorofluorocarbons" | Editorial - copyedit to be completed prior |
| 15913 | 10 | 22 | 13 | 22 | 26 | CCS for indsutry assume sthat plants will be around for long term - may not be true for many industries and might preclude CCS from these sectors | Noted and disucssed in section 10.9 on barriers |
| 3020 | 10 | 22 | 17 | | 18 | I suggest including ethanol and sugar production as one of the major sources of cheap and pure CO2 that can be easily captured and, depending on the location of the industrial facility, used as a refrigerant fluid or as an input to food and beverage industries. CO2 in ethanol distilleries can also in the future be an input for producing succinic acid, which is a valuable bioplatform to produce different chemical products. | Taken into consideration, if we find literature than it couod be included in section 10.5 cross industry cooperation |
| 2289 | 10 | 22 | 19 | 22 | 20 | Check data. The offgas from iron and steel is typically much lower in CO2 content than from power plants. EAF especially much lower (use baghouses with air cooling reducing to very low CO2 levels) versus typical ESP for powerplants where CO2 is much higher. | Accepted - comparison with power plants ommitted |
| 12627 | 10 | 22 | 24 | 22 | 26 | This statement is factually incorrect. There are very well known and accepted assessment techniques for geological storage potential, CCS on a $/tonne of co2 basis is cost competitive with many renewables and other technologies, most CCS projects globally have not experienced public engagement issues beyond what is common for large industrial projects, there is 5 large-scale proof of concept projects each storing in the order of 1 million tonnes of CO2 per year. | Noted - see section 10.9.2 which now summarises barriers on CCS for industry. The statement that the costs are uncertain is factually correct, because there are so few installations operating to date. The reviewers comment that there are "5 large-scale |
| 12670 | 10 | 22 | 24 | 22 | 26 | This statement is factually incorrect. There are very well known and accepted assessment techniques for geological storage potential, CCS on a $/tonne of co2 basis is cost competitive with many renewables and other technologies, most CCS projects globally have not experienced public engagement issues beyond what is common for large industrial projects, there is 5 large-scale proof of concept projects each storing in the order of 1 million tonnes of CO2 per year. | Duplicate of comment 12627 |
| 8909 | 10 | 22 | 26 | | | The reference for "high costs" of CCS should be deleted. High costs relative to what? Offshore wind turbines are an extremely high cost way of mitigating CO2, as are many other technologies. The reason that the IEA blue map scenario contains a large proportion of CCS is that overall it is an extremely cost-effective method of CO2 abatement, particularly when issues of grid stability and balancing are taken into account. From the IEA CCS roadmap "Carbon capture and storage (CCS) is an important part of the lowest-cost greenhouse gas (GHG) mitigation portfolio. IEA analysis suggests that without CCS, overall costs to reduce emissions to 2005 levels by 2050 increase by 70%."http://www.iea.org/papers/2009/CCS_Roadmap.pdf | Taken into account - text revised to: "their comparitively high costs", based on the IEA's BLUE map marginal abatement curve (Figure 2.34 and 2.35, pg109-110, IEA (2009b). Energy Technology Perspectives 2010. Scenarios and Strategies to 2050. International Energy Agency, Paris.) which shows 37% of the abatement potential in industry coming from CCS, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 11999 | 10 | 22 | 26 | | | It is wrong that there is no large-scale proof of concept for the CCS: Look at the Sleipner project in the Northern Sea where Statoil has been injecting 1 million of CO2 per year cince 1990. It works very well and CCS has suffered from way too much scaring and generalization from generalists. The CO2 contained in the combined fossil fuel reserves known today is over 2600 Gt. CCS is feasible and defendable provided the necessary Quality assurance is applied throughout the whole process. We have overcome bigger challenges and should definitely use CCS much more in the future. We cannot afford not to use it and there is nothing speaking against using it if done professionally. | Taken into consideration - there are some large scale storage projects (Sleipner, In Dsalah, Weyburn), but not large scale project connected with industry processes |
| 9914 | 10 | 22 | 27 | | | The standard ISO 14051 "Material Flow Cost Accounting" released by the end of 2011 should be referred to as a guidance document to assist decision makers in companies in reducting both their material and their energy use. | Rejected - not related to the context mentioned |
| 10136 | 10 | 22 | 4 | | 8 | To clarify the statement the following reformulation is recommeded: "... was too small, to become a significant means for mitigating climate change. Due to the large energy amount that is necessary to transform the low-energy-content CO2 molecule into other chemical products, the overall CO2 balance for reactions using CO2 as raw material depends on the carbon-factor of the energy used. A recent analysis....". The sentence in lines 6 to 8 should be deleted as it creates a wrong impression. CO2 as raw material for urea production is not a pilot or demonstration project, but a long-established process. Pilot projects on CO2 as building blocks for polymers do exist because they make commercial sense for reasons very specific to each project. The carbon emission avoidance of these projects depends on the primary energy source used. | Noted - but most of the CCS text in chapter 10 has been removed and cross-reference is made to chapter 7 on energy which covers the issue in more detail |
| 6736 | 10 | 23 | 11 | 23 | 12 | The chapter could have a section for re-use. It has a lot of potential if products were made of more standardized parts designed for disassembly. | Rejected - reuse is discussed in section 10.4.1.3 |
| 5457 | 10 | 23 | 16 | 23 | 17 | Kiln drying process of wood products uses more energy than sawing process etc., but it could not be called "energy intensive", comparing metal material processing energy. | Taken into account. The statement has been changed to "but is in effect still energy intensive due to kiln drying and the need for greater volumes of wood to |
| 6737 | 10 | 23 | 24 | 23 | 24 | This could be avoided with smarter design for manufacturing. | Accepted - the statement now reads "This could be reduced by process |
| 15914 | 10 | 23 | 24 | | | add after "process innovations" , "and better product energy management" | Taken into account - covered in section 10.4.2.1 - heat and energy recovery in the iron and steel sector. The authors do not feel that better product energy management would contribute to an |
| 7093 | 10 | 23 | 24 | 23 | 24 | change "avoided" to "reduced" | accepted |
| 17507 | 10 | 23 | 27 | 23 | 27 | A word is missing in this sentence. | MYR: Editorial - copyedit to be |
| 8285 | 10 | 23 | 27 | | | A more in depth discussion could be found in the ... | MYR: Editorial - copyedit to be |
| 17506 | 10 | 23 | 28 | 23 | 28 | While cement cannot be recycled as such, cement in concrete is recycled when concrete debris is downcycled into civil engineering applications. | Taken into account - text revised to "There is no recycling possible for cement although concrete can be |
| 10138 | 10 | 23 | 28 | | 29 | Delete "plastics recycling is greatly inhibited by the wide variety of incompatible compositions" and exchange with: "for plastics recycling different possibilities are in practice depending on the cleanliness and conformity of the plastics waste". See comment reffering to page 67 lines 16 to 23 for more details. | Taken into account. Text will be modified to convey right message. there are clear limits to future possible recycling of plastics due to the high variety of plastics in use, regardless of the cleanliness of plastics waste. The reality is that plastics are useful precisely because they can be tailored easily to |

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| 12009 | 10 | 23 | 28 | 23 | 29 | The statement is too simple and misleading. A very important reason why there exist variety of plastics is to serve best to the needs. For example, wrapping and containers require shielding, damper, protection and other performance and specific needs widely differ by applications. The best suit plastics much contribute to resource and energy saving. Product specific recycling systems have been developed to enhance recycling. See more info on the following webs.<br>http://www.plasticseurope.co.uk/<br>http://www.jpif.gr.jp/7teigen/teigen.htm | Noted - but the reviewer's comment does not contradict what is written |
| 7094 | 10 | 23 | 29 | 23 | 30 | Recycling may also reduce GHGs by reducing methane emissions from landfills, but the size of this avoided emission depends on the amounts of paper that would have been landfilled if not recycled. For instance, see FAO. (2010). Impact of the global forest industry on atmospheric greenhouse gases: FAO Forestry Paper 159. Rome: United Nations Food and Agriculture Organization (FAO). | Noted- it is clear that paper recycling could also reduce GHGs if paper waste is diverted from landfill, but this would not necessarily be the case if paper was incinerated and used as an energy source instead of landfilled. The statement in page 23-line 29 "...it does not always reduce emissions..." acknowledges this fact, but it also refers to the fact that virgin paper production is commonly fueled with biomass, whereas recycling is not, which means that in |
| 2290 | 10 | 23 | 4 | 23 | 24 | lighter weight advanced high strength steels reduce the amount of steel required to make products and hence GHGs. The last sentence ignores many of the advances made in the metals industry in near net shape products resulting in very high yields (90+%) - thin slab casters, direct strip production, beam blanks production, etc. | Taken into account - the important role of yield improvements through technologies such as these are already covered in this section. |
| 17505 | 10 | 23 | 7 | 23 | 7 | Improvement of manufacturing yields is not a form of material substitution. | Rejected - the sub-heading for this section is not just material substitution. |
| 10137 | 10 | 23 | 7 | | 8 | Delete the sentence "For plastics…." and substitute it with the following more differentiated paragraph: "For plastics, a substitution of oil as feedstock by renewable ressource has been discussed as GHG mitigation option. LCA studies show that other environmental parameters like eutrophication and stratospheric ozone are often influenced negatively and additional land use impacts, such as the potential loss of biodiversity, soil carbon depletion, soil erosion, deforestation, as well as greenhouse gas emissions from indirect land use change are often not quantified. Additionally, the studies show a large variability depending on the process analysed. This underlines the conclusion that feedstock change for plastics has to be analyzed based on various criteria and individually for each process over the complete life-cycle in order to assess the sustainability of this GHG mitigation potential." (Source: A Review of the Environmental Impacts of Biobased Materials, Martin Weiss et al., Journal of Industrial Ecology, Special Issue: Meta-Analysis of Life Cycle Assessments, Volume 16, Issue Supplement s1, pages S169–S181, April 2012.) For more details on the negative GHG emission effect of land use change for the plantation of bio-raw materials refer to the following source: Quantifying global greenhouse gas emissions from land-use change for crop production, HELEN C FLYNN et al., Global Change Biology (2012). | Taken into account: there isn't space to delve into the LCA study debate, but we have modified the statement to acknowledge that although feedstock substitution is technically feasible, it would require huge amounts of land, which has implications for food production, and CO2 emissions from changing land use, etc. |
| 4548 | 10 | 23 | 8 | | | Vegetable oil??? You must be kidding..... | Noted - but this is an issue of language. "Vegetable oil" and "crop-derived renewable substitute for fossil oil" have |

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| 6606 | 10 | 23 | 26 | 23 | 27 | Delete this sentence.<br><br>Cooperation between steel production of electric ark furnace (EAF) and blast furnace (BF) can establish the circulation system and iron and steel contributes for society as recycling oriented material.<br>However, some people say “changing production of BF into EAF can achieve GHG reduction.”<br><br>The idea that promoting electric arc furnace instead of blast furnace is more environmental friendly is totally incorrect since it does not consider that production from iron ore by BF is and will be required for satisfaction of world steel deand for a long time and scrap was originally made by BF which has emitted GHG in the past. That means this idea handles only a portion of a huge circulating system.<br><br>As you know, from a longer-term perspective, steel production is expected to exceeding 2 billion tons in 2050 in analysis of IEA and RITE.<br><br>This simplistic interpretation which has high risk of misleading shall not be included IPCC report.<br><br>See Steel's contribution to a low carbon future by worldsteel.<br>The simplistic thinking can be removed by this position paper.<br>http://www.worldsteel.org/publications/bookshop?bookID=26c4d914-f159-4468-8933-94404015861b | Taken into account - it is not the intention of this section to suggest that production of steel via the EAF route should be promoted over the BF-BOF route, due to the constraint of scrap availability. However, all available scrap should be recycled to reduce overall steel sector emissions i.e. less primary production is required to replace lost scrap. The text has been revised to clarify the issue: Recycling of available scrap is already widely applied for metals as a means to use less energy, and is an additional GHG mitigation option if more scrap can be collected in future. " |
| 7511 | 10 | 23 | 25 | 24 | 8 | There is diffeence in recycling situation betwen steel and alminum. Separate explanation is required. Post consumer scrap of steel is over 50% of recycled scrap in case of steel with around 85 % end-of life recycling rate of post consumer scrap. Despite high-grade steel like steel sheeet for automobile requires virgin iron from iron ore, obsolete scrap is successsfully used for production of steel for various usage as same sa the virgin material. The steel scrap is successfully recycled. | Taken into account - more detail on recycling will be provided in section 10.14 on waste |
| 8003 | 10 | 23 | 25 | 24 | 8 | It is not appropriate to discuss both steel and aluminum in a common manner. Steel's case is described in the following site: http://www.worldsteel.org/publications/fact-sheets.html | Rejected - This chapter is concerned with general trends and possibilities and as such, there are common lessons to |
| 5019 | 10 | 23 | 25 | 24 | 8 | The global rate of recycling of steel is 83% and some specific steel use sector shows much higher recycle rate. Reality and future of the recycling of steel is described in deteil in the following site of worldsteel association: http://www.worldsteel.org/publications/fact-sheets.html | Taken into account - covered in the section on waste. |
| 7095 | 10 | 24 | 13 | 24 | 15 | The completely "paperless" offices may not be realistic, but it is wrong to downplay the reduction in demand for printing and writing papers attributable to electronic communications devices.<br>See, for instance, http://www.risiinfo.com/blogs/North-American-copy-paper-trends-at-home-vs-the-office-u2013-less-paper-but-far-from-paperless.html?source=rss | Noted - although paper production and consumption might be declining in North America, this is not the case for global production and consumption. Data from FAO (http://www.fao.org/forestry/46203/en/) for writing and printing paper clearly show that although production fell during the 2008 financial crisis, production levels have recovered now to the same |
| 16150 | 10 | 24 | 18 | | | "sustainable consumption" is a key issue and rightly mentioned. But section 10.11 is still in progress and not up to that ambitious -and new in AR5- direction for policy. | Noted - actually the report could have benefited from a whole chapter on demand and sustainable consumption - but the structure was determined at |

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| 8286 | 10 | 24 | 22 | | | backed BY | Editorial - copyedit to be completed prior |
| 14262 | 10 | 24 | 23 | 24 | 23 | Does 'Clear' have some specific meaning or conotation? | Taken into account |
| 17508 | 10 | 24 | 28 | 24 | 29 | There is an emerging literature on "degrowth." See http://degrowth.org/publications | Noted - but we have limited space to |
| 16151 | 10 | 24 | 29 | | | Excellent use of (Jackson 2011), but the term "last resort" is wrong here. If policy of decreased usage can be developed, it is by an optimising the distribution channels (e.g. replacing a product by a service, organizing the share or productions, or by complex patterns of change in consumption. A "last resort" suggests that only a crisis of large scale will bring this evolution, when it is only one possibility. | Accepted - see SOD box 10.2 for more on service demand reduction |
| 2291 | 10 | 24 | 3 | 24 | 8 | Recycling is more prevalent than indicated - especially in the steel industry. Most recycling of steel is aftermarket - not scrap generated in production. In the US and other developed countries - the majority of the feedstock is recycled materials. The quality of liquid steel from recycled material in the steel industry is no different than virgin material due to refining techniques. Agreed, there are differences in the aluminum and other metals industries - less recycling because of problems separating the metals (steel is magnetic and easy to separate) and liquid metal in aluminum is lower quality. | Rejected - not supported by the peer-reviewed published literature (Cullen et al., 2012) - this shows that post-consumer scrap is a smaller scrap input than scrap generated in production. While the US has a high proportion of EAF steel production and the majority of the input is recycled material, the global |
| 12128 | 10 | 24 | 33 | 25 | 10 | Steel - As the Australian Prime Minister's Taskforce on Energy Efficiency clearly states<br>"R&D from the Australian steel industry and CSIRO has the potential to reduce emissions by 50% in existing BOF plants. Since 2006, the Australian steel industry (BlueScope Steel and OneSteel) and CSIRO (Minerals Down Under Flagship) have been collaborating under the Australian CO2 Breakthrough Program. They have invested around $7 million to develop breakthrough technologies for reductions in net emissions from the industry. This R&D program covers two focus areas — biomass and dry granulation of slags —which, if successful and implemented, could more than halve the greenhouse gas emissions from the industry. Furthermore, the technologies under development could be in widespread implementation in three to seven years' time, once the R&D is completed." Government report is at http://www.climatechange.gov.au/~/media/submissions/pm-taskforce/report-prime-minister-task-group-energy-efficiency.pdf □ | Noted - the abatement options suggested in this report (biomass, waste heat recovery, by-product utilisation etc.) are already covered by this section (energy efficiency, emissions efficiency, fuel switching etc.), however the timescales suggested in the report are much shorter than those anticipated in the peer-reviewed literature. |
| 16152 | 10 | 24 | 42 | 25 | 16 | The ambition of ULCOS was described in many publications in the trade journals. IPCC does not have to snub the program because it does not fit in the upscale journals. | Noted - peer-reviewed literature on ULCOS will be considered for inclusion |
| 7526 | 10 | 24 | 46 | 24 | 48 | The diffusion of existing energy efficient technologies is important no-regret option as a first step. More detail description is beneficial for world-wide readers and policy makers. Policy makers are interested in current policies rather than future possibility.<br><br>IEA ETPs indicate energy/CO2 saving potentials. In addition, Oda et al., (2012) indicates specific energy consumption of BF-BOF route among countries. These specific materials can lead more comprehensive and objective IPCC Report. | Taken into account - this chapter is concerned with general trends and possibilities so more detailed descriptions of existing energy efficiency options are not included. The text has been revised to include the reference on the different specific energy intensities of regional BF-BOF production: (page 24 line 40) "...furnaces before refining. The specific energy intensity of steel production varies by technology and region (Oda et al., 2012)" Reference: |
| 17509 | 10 | 24 | 47 | 24 | 47 | Explain/define "specific energy" | Accepted - text added "specific energy consumption (GJ/tonne product)" |
| 6738 | 10 | 24 | 5 | 24 | 5 | Add a reference to the 20 %. | Accepted - Referenced added - paper is currently under review - with the original source of this in Aluminium for future generations/2008 update; International Aluminium Association: London, 2008; |
| 8819 | 10 | 24 | 9 | 24 | 29 | Good to see these options at least considered. | Noted - thanks |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12010 | 10 | 24 | 9 | | | It should be noted that durability of goods enables longer use and thus contribute to demand saving. | Noted - however very few products (mainly just infrasturcture) are replaced |
| 2104 | 10 | 24 | | 24 | | This section, "Reducing demand for product services" does not reflect consumption patterns in either the developed or developing world, and should be removed. No society in modern times has willingly reduced consumption for the greater good except perhaps in times of war. | Rejected - it doesn't attempt to reflect consumption patterns but to recognise that demand reduction has serious |
| 4265 | 10 | 24 | | | | This section seems very thin given the recent public debate about the limits to economic growth as an indicator of economic success - rather than being a strategy of 'last resort' it should be considered as a serious policy option deserving of more study and emphasis | Accepted - see response to comment 16151 |
| 15915 | 10 | 24 | 20 | | | happiness vs consumption discussion could be controversial. Recommend relooking at this section | Noted - but given that there is no chapter on sustainable consumption, this is the only place we can mention |
| 14261 | 10 | 24 | 20 | | | This concept is more difficult for me to understand than the other four. The explanation little helps me further understand. More explanation with other examples is expected. | Taken into account - we have added some examples. |
| 15916 | 10 | 24 | 30 | | | Recommend including consistent format for indsutry sector, using cement section as a template for the others. Each sector should include energy performance chart, best practices, current state, challenges and costs. Include figures like Fig. 10.6 for all sectors | See response to comment 18534 |
| 12012 | 10 | 24 | 30 | | | It should be mentioned that cascade heat/energy use among factories in an industrial park (Kombinat) can enable significant energy saving. See http://www.meti.go.jp/committee/materials/downloadfiles/g70528a17j.pdf | Noted - this is covered in section 10.5.1 |
| 11662 | 10 | 24 | 33 | 25 | 16 | It should be emphasized that the diffusion of existing technologies will play an important role in improving energy efficiency before implementing break-through technologies. For example, Oda et al. (2012) show a large potential improvement in energy intensity when the existing technologies are diffused across regions. Reference: J. Oda et al. (2012) International comparison of energy efficiency in power, steel and cement industries, Energy Policy, 44, pp.118-129 | Taken into account in section 10.10 |
| 6594 | 10 | 24 | 7 | 24 | 10 | Delete "in short term" from this sentence. Coke dry quenching has a great effort on emission reduction not only in a short period, but also in a long-term. | Accepted - text revised: "short-term" removed |
| 6593 | 10 | 24 | 7 | thye | 10 | Cooperation between steel production of electric ark furnace (EAF) and blast furnace (BF) can establish the circulation system and iron and steel contributes for society as recycling oriented material.<br>However, some people say “changing production of BF into EAF can achieve GHG reduction.”<br><br>The idea that promoting electric arc furnace instead of blast furnace is more environmental friendly is totally incorrect since it does not consider that production from iron ore by BF is and will be required for satisfaction of world steel deand for a long time and scrap was originally made by BF which has emitted GHG in the past. That means this idea handles only a portion of a huge circulating system.<br><br>As you know, from a longer-term perspective, steel production is expected to exceeding 2 billion tons in 2050 in analysis of IEA and RITE.<br><br>This simplistic interpretation which has high risk of misleading shall not be included IPCC report.<br><br>See Steel's contribution to a low carbon future by worldsteel.<br>The simplistic thinking can be removed by this position paper.<br>http://www.worldsteel.org/publications/bookshop?bookID=26c4d914-f159-4468-8933-94404015861b | cf. Response to comment 6606 |

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| 12346 | 10 | 24 | 30 | | | This is a very important and relevant section, and efforts should be made to impove it even more. Every sector has a description of its mitigation possibilites. The mitigation options are divided into groups like energy efficiency, emissions efficiency and fuel switching etc. Whitin the main groups of mitigation options more numbers on the magnitude of the emission reduction potentials, would be useful. More figures to illustrate would also improve the presentation. There could also be discussion of the mitigation groups compared to each other. For instance, within the iron and steel sector; what are the most important mitigation options of material efficiency and energy efficieny? Where are the potentials? CCS could also be added as a group of mitigation options, like for iron and steel and cement. | Taken into account. CCS is alread discuss ed. Section 10.7 aims to define costs and potentials -but it is so far relatively difficult to define potentials for material efficiency, as the option has to date had so little attention. |
| 17510 | 10 | 25 | 11 | 25 | 11 | What is the date by which the 50% reductions are to occur? | Accepted - it should say "emissions |
| 3023 | 10 | 25 | 20 | | | The study of Henriques et al. (2011) and Gouvello (2010), both focused on the Brazilian case, stressed the huge potential for curbing GHG emissions in steel production by replacing coal and charcoal derived from deforestation with charcoal from planted forestry. I suggest including this option, which can be an opportunity for emerging countries. The references are: DE GOUVELLO, C., 2010, Brazil Low-carbon Country Case Study. World Bank, Sustainable Development Department of the Latin America and Caribbean Region. HENRIQUES JR., M.F., DANTAS, F., SCHAEFER, R., 2010, “Potential for reduction of CO2 emissions and a low-carbon scenario for the Brazilian industrial sector”, Energy Policy, v. 38, pp. 1946–1961. | Accepted - texted revised "notably in Brazil (Taibi et al, n.d., De Gouvello, 2010, Henriques et al., 2010) References: DE GOUVELLO, C., 2010, Brazil Low-carbon Country Case Study. World Bank, Sustainable Development Department of the Latin America and Caribbean Region. HENRIQUES JR., M.F., DANTAS, F., SCHAEFER, R., 2010, “Potential for reduction of CO2 |
| 12347 | 10 | 25 | 24 | 25 | 25 | Hydrogen can be produced by emission-free sources today. If emission-free renewables are used to produce electricity, hydrogen can be produced emission-free from that power. | Taken into account - text revised to indicate that a renewbale energy soruce for hydrogen production is not currently available or economic at the scales required. New text: "Hydrogen fuel might reduce emissions if a cost |
| 6739 | 10 | 25 | 26 | 25 | 29 | I do not feel this paragraphs trustfully. Leave out until it is a better proven technology. | Rejected - the technology is at the early stages of development, but this is clearly |
| 4550 | 10 | 25 | 30 | | | While I am extremely happy to see that the report pays tribute to material efficiency as a mitigation opportunity currently not fully addressed in analyses, the authors should be careful with statements as "large potentials", especially after first "downsizing" the opportunities for energy efficiency improvements... | Accpepted - changed to "significant potential for emissions reductions " |
| 2293 | 10 | 25 | 37 | 25 | 38 | Check context of Cooper reference. Reuse of 30% of all steel is questionable. Auto 100% recycled currently - could not be reused. White goods - 90% recycled currently - reuse. Buildings, bridges, etc. - high of reuse possible. Did reference talk about structural shape reuse? If so should spelled out. | Noted - Cooper et al. estimate a figure of 30% reuse of all steel products. This estimate is based on different strategies of reuse, not necessarily reuse in the same application. For example, automotive body sheet could be used to |
| 6597 | 10 | 25 | 14 | 25 | 15 | Energy saving technologies such as coke dry quenching have positive economical impacts besides energy saving, i.e. water-saving, less demand for fuel and others. It should be noted that CCS has no enough economical incentives to diffuse widely in steel industry unlike other energy saving technologies with positive economical impacts. | Taken into account - text added: "…emissions reduction with additional benefits of reduced water and fuel demand" |
| 6596 | 10 | 25 | 25 | 25 | 26 | Add "as COURSE 50" in the end or rewrite as follows: Hydrogen reduction is being investigated in the US 26 (Pinegar et al. 2011) and Japan as COURSE 50 (Matsumiya 2011). For reference: http://www.jisf.or.jp/course50/index_en.html | Accepted - text added: "and Japan as COURSE50" |
| 8005 | 10 | 25 | 25 | 25 | 26 | Hydrogen reduction is being investigated in the US and also in Japan in the national project named "COURSE50"(Matsuyama 2011). Details are reported in the following url: http://www.jisf.or.jp/course50/index_en.html | Accepted - text added: "and Japan as COURSE50" |

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| 11663 | 10 | 25 | 30 | 25 | 38 | As some studies have already considered the material efficiency improvement in BAU scenario, implementing additional material efficiency improvement will lead to double counting in the potential emission reductions. For example, according to the ETP by IEA (2012), steel and cement production will be decoupled from population rise and economic growth, which implies an inclusion of material efficiency in BAU scenario. | Noted - but we have not tried to make numerical predictions of the combined effects of the different strategies, so hope that such double counting will not |
| 7513 | 10 | 25 | 30 | 25 | 34 | This paragraph should be revised. It is correct that material efficiency offers the potential for emissions. However, since material efficiency is one biggest component of production cost, not only steel producers but desighners of cars and other products made of steel have competed each other to reduce material loss. This sentences are mis-leading and not worthy for IPCC report. | Taken into account - we have added the sentence "However, a significant challenge to the adoption of material efficiency in the use of steel (and other basic materials) is that bulk materials are relatively cheap in comparison to labour, and this difference is amplified by tax policy, so economic logic currently drives a preference for material |
| 7514 | 10 | 25 | 34 | 25 | 38 | It is questionable. | Noted - but the text claims a potential |
| 6595 | 10 | 25 | 39 | 25 | 46 | Delete all sentences regarding "reduced product and service demand" in terms of steel experts' view and business impact.<br><br>Indeed, one of the key contribution from the steel industry is to work closely with its customers in optimising the design and use of steel in steel-using products and to consider steel life cycle.<br>However, discussion about reduction of steel production and demand only for GHG reduction is too simplistic thinking and has enormous damage for steel business.<br><br>This simplistic interpretation which has high risk of misleading shall not be included IPCC report.<br><br>See Steel's contribution to a low carbon future by worldsteel.<br>The simplistic thinking can be removed by this position paper.<br>http://www.worldsteel.org/publications/bookshop?bookID=26c4d914-f159-4468-8933-94404015861b | See response to comment 7513 |
| 7515 | 10 | 25 | 39 | 25 | 41 | 30% reduction is queswtionable. All design is performed to reduce material weight. Car weight reduction by high strength steel application has not only reduced steel demand but also improved fuel efficiency by reducing the car weight and reduced consequetial CO2 emission. | Noted - however Carruth et al. 2011 performed a case study on a car bodies and found a weight reduction potential of 17.5-25%, which was in-line with major car manufacturer targets. Evidence on construction in the UK suggests the figure for commercial buildings will be much higher. The average figure of 30% arises from the application of general weight-saving principles. Unfortunately, to date despite the increased use of high |
| 7512 | 10 | 25 | 9 | 25 | 9 | Delete "in short term" from this sentence. Coke dry quenching has a great effort on emission reduction not only in a short period, but also in a long-term. | Taken into account - text revised: "short-term" removed |
| 6741 | 10 | 26 | 2 | 26 | 4 | Use relative values and compare to total industry emissions. | Accepted. Changed sentence to: CO2 emissions from cement production in 2006 totalled 1.9 Gt CO2: 1.1 Gt CO2 from process emissions (calcination) and 0.8 Gt CO2 from fuel emissions (IEA 2009b), and a small contribution from grinding and transport (Bosoaga et al., |

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| 7494 | 10 | 26 | 2 | 26 | 4 | “CO2 emissions from cement production in 2006 totaled 1.9 Gt CO2: 1.1 Gt CO2 from process emissions (calcination) and 0.8 Gt CO2 from fuel emissions (IEA 2009b), and a small contribution from grinding and transport”. When cement or concrete sets some CO2 is reabsorbed, especially on the skin of the cement. Also, in some areas, charcoal is used for cement manufacture and firewood used for lime burning. In several developing countries, burnt bricks are used in place of concrete and mortar is used as a binder (lime plus aggregate). Brick kilns/stacks are generally fired with wood. | Comment noted, however Collins (2010) reports that carbonation (absorbtion of carbon into cement) is "almost negligible" compared with production emissions. Need peer-reviewed literature citations to include comments regarding charcoal and burnt bricks. [Ref: Collins, F; "Inclusion of carbonation during the life cycle of built and recycled concrete: |
| 18527 | 10 | 26 | 5 | 26 | 22 | Is there any option to improve the energy efficiency in the cement industry further? Or have we already approached the theoretical limits? | See 12129 |
| 10015 | 10 | 26 | 5 | 26 | 6 | In the footnote No.7, the losses associated with conversion of fuels into electricity are 67%. But this "67%" should be revised with recent data. The average 2001-2005 efficiencies of all fossil fired electricity production in OECD countries are 39%, as described in (Taylor, 2008, page17, Figure6).<br><br><Reference><br>[1] Taylor, P., O. Lavagne d’Ortigue, N. Trudeau, & M. Francoeur (2008). Energy Efficiency Indicators for Public Electricity Production from Fossil Fuels, IEA Information Paper. | Accepted - the loss percentage figure from the footnote has been deleted |
| 9376 | 10 | 26 | footnote7 | | | Replace 67% with the latest figure. | see 10015 |
| 12011 | 10 | 26 | | | | Japan is also a major country to use municipal wastes for cement production.<br>Http://www.jcassoc.or.jp/cement/2eng/eh3.html | Taken into account - while this is may be true, it is not supported by a peer-reviewed source. Text revised to "…countries (for example The |
| 7527 | 10 | 26 | 1 | | | The draft about “Energy efficiency” and “Emissions efficiency and fuel switching” is really excellent.<br><br>For further grade up, trade-off between alternative fuels and energy efficiency is highly suggestive. The use of waste plastics requires additional electricity consumption for chlorine (Cl) bypass and removal system (Oda et al., 2012). Japan Cement Association and Dr. Izumi (yoshito-izumi@jcassoc.or.jp) have an actual data as for the trade-offs. | Taken into account - text revised to " Even though processing alternative fuels requires additional electricity consumption (Oda et al., 2012), using alternative fuels can still reduce cement sector emissions by 0.16 Gt CO2e per year by 2030 (Vattenfall, 2007). |
| 12129 | 10 | 26 | 1 | 27 | 33 | Cement - completely ignores low carbon cement technologies - eg: The company Zeobond, in Australia, has pioneered the commercialisation of geopolymer cement technologies which achieve up to 80% reductions in the energy intensity and GHG emissions of portand cement, and can be used for many major purposes for which Portland cement is currently used. Extensive Peer reviewed literature on the geopolymer cements being manufactured and sold by Zeobond Pty Ltd in Australia - based on 20 years of research at the University of Melbourne are available at http://www.chemeng.unimelb.edu.au/geopolymer/publications.html | Taken into account. Added "There are also a number of emerging technologies or measures which are still under development or recently commercialised that focus on improving energy efficiency and reducing the emissions from cement and concrete production (Hasanbeigi et al., 2012). However, there are regulatory, supply chain, product |
| 9302 | 10 | 26 | 26 | 27 | 7 | Toward a sustainable society, the cement industry contributes to recycle many of resources to establish a recycling based society. However, it should be recognized that the recycling processes in the cement plant require further additional energy for a primarily treatment including drying and cutting.<br>(http://www.jcassoc.or.jp/cement/2eng/eh1.html ) | See 7527 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12348 | 10 | 26 | 1 | | | The calcination is adressed in the introduction as contributing 1.1 Gt CO2 from cement production globally. However, emissions from calcination is not really adressed in the mitgation options discussed, apart from measures in the material efficiency part and the reduce product and service demand. Since emissions from calcination is the major source of emissions from the cement industry, we would appreciate if measures to reduce these emissions was furter investigated. EG. is it possible to use CCS? | Taken into account - CCS for cement kilns is covered in lines 11-14 on page 27 |
| 16153 | 10 | 27 | 15 | 27 | 25 | This paragraph should mention the reuse of parts (cars) or bottles (glass) as possible gains in other industries. | Taken into account - reuse of steel is covered in section 10.4.2.1. Glass falls into section 10.4.2.8 but has not been |
| 8287 | 10 | 27 | 23 | 28 | 7 | In Canada waste tires have been used as an alternative fuel in the cement industry.<br>Reference: http://cieedac.sfu.ca/media/publications/Cement_report_2011__2010_data__Final.pdf<br>Energy Use and Related Data: Canadian Cement Manufacturing Industry 1990 to 2010<br>John Nyboer, Michelle Bennett<br>prepared for Cement Association of Canada | Noted:- The list is just illustrative and doesn't include many countries with lower alternative fuel use ratios. |
| 4552 | 10 | 27 | 26 | 27 | 33 | Blending is not equal to reduced product and service demand. I would discuss blending above, similarly as recycling within an industry would be discussed. | Accepted - text moved to previous paragraph, which now reads: "...concretes (Muller and Harnish, 2008). Demand for clinker can be reduced by reducing the clinker-to-cement ratio. Portland cement is comprised of 95% clinker and 5% gypsum. Cement can be produced with lower ratios of clinker use additives such as blast furnace slag from steel mills, fly ash from power plants, limestone, and natural or artificial pozzolans. The weighted average clinker-to-cement ratio for the companies participating in the WBCSD GNR |
| 4551 | 10 | 27 | 4 | 27 | 5 | The comment on one company in India has no meaning without further understanding of the context of this plant. Propose to delete this sentence. | Accepted - sentence removed |
| 3024 | 10 | 27 | 7 | | | I suggest considering the fact that in some countries the use of residual fuel oil and petcoke by cement facilities is increasing. The oversupply of high-sulphur petcoke in the Atlantic Basin, due to recent investments in delayed coking units in petroleum refineries, explains this fact. Hence, although the "cement industry could use up to 70% alternative fuels", the availability of low-cost residual fuels can undermine this opportunity. | Taken into account: The phrase that this comment refers to ("cement industry could use up to 70% alternative fuels") has been deleted. Would need peer reviewed literature to include this |
| 9303 | 10 | 27 | 7 | 27 | 7 | This is completely mistakes. "Cement Technology Roadmap" studied by IEA shows "alternative fuel costs are likely to increase with high CO2 costs". Therefore, it dose not say "the cement industry could use up to 70% alternative fuels by 2050" but "it will be economically viable for the cement industry to use alternative fuels until 2030, when prices will reach about 30% of conventional fuel costs, increasing to 70% by 2050. So, please align this principle with the sentence.<br>I would suggest to rewrite to "the cement industry in developed regions could use up to 60% alternative fuels by 2050 and in developing regions to 35%. | See response to comment 7527 |
| 9304 | 10 | 27 | 8 | 27 | 10 | Good figure. This shows accurate regional estimation on energy efficiency (GJ per ton of clinker) as well as utilization of alternative fuels. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10148 | 10 | 28 | | | | Insert a paragraph on "emissions per unit energy" and add here: "Increasing the share of power from combined heat and power plants in the chemcial and petrochemical sector from currently 10 to 25% in most countries to 100% would result in energy savings up to 2 EJ for the activity level in 2006." (Source: IEA as quoted in comment 8)." | Accepted. Added "A theoretical estimate suggest that increasing the share of power from combined heat and power plants in the chemical and petrochemical sector from current levels |
| 10139 | 10 | 28 | 11 | | 13 | Delete sentence and substitute it with the more specific sentence: "The global GHG emissions attributable to the chemical industry have been estimated to be about 1.81 GtCO2 e (CO2, N2O, F-gases, CH4). (Source: http://www.wri.org/publication/world-greenhouse-gas-emissions-in-2005: World Greenhouse Gas Emissions in 2005 is a comprehensive view of global, anthropogenic greenhouse gas (GHG) emissions. The chart in this working paper is an updated version of the original chart, which appeared in Navigating the Numbers: Greenhouse Gas Data and International Climate Policy (WRI, 2005).) About 80% of the direct greenhouse gas emissions of the chemical industry are caused by the following products/processes: Nitric acid, cracker products, ammonia, adipic acid, hydrogen/syngas (including methanol), soda ash, aromatics, carbon black, with the first three products/procees being responsible for more than 50%. (Source: Methodology for the free allocation of emissions allowanced n the EU ETS post 2012 - sector report for the chemical industry, Ecofys (Study leader), Nov. 2009, EU Study contract: 07.0307/2008/515770/ETU/C2). It has been estimated that the worldwide energy saving potential related to the chemical and petrochemical sector in 2006 was about 35% as compared to reported final energy use in energy statistics. The saving potential stems from implementation of Best practice technology (1,8 EJ/yr primary energy savings), increased use of CHP (2 EJ/yr), process integration (0.9 EJ/yr), processing of post-consumer waste from products originating from the chemical and petrochemical sector (recycling and energy recovery, 2.4 EJ/yr). Additional potential for GHG emission reduction stems from fuel switch from coal to natural gas in China and India." (Source: Chemical and petrochemical sector - Potential of best practice technology and other measures for improving energy effiency, IEA information patepr, Saygin et al., 2009) | Noted - although the suggested replacement simply seems to be a restatement of what is already in the text - albeit with the addition of a few other chemicals. |
| 10140 | 10 | 28 | 15 | | | Insert: "Additionally the synthesis of chlorine in the chlor-alkali electrolysis is responsible for about 40% of the electricity demand of the chemical industry, which causes indirect emissions for electricity production." (Source: Arn Mike et al., Estimating the carbon footprint of the worldwide chemical industry, Menlo Park, California: SRI Consulting, 2007). Delete the last sentence in line 15, as this does not refer to the emissions caused by the manufacturing of chemicals. It would belong to section 10.5., but then a general discussion of the value chain emissions of the chemical industry in general should be included there instead of just picking out one example. | Accepted |
| 10141 | 10 | 28 | 16 | 29 | 2 | The whole following paragraphs should be structured based on "GHG efficiency and energy efficiency of processes", "emissions per unit energy" and "Efficiency in use" according to the scheme on page 20. Within the first part on "GHG efficiency of processes" the options should be analysed according to their share of GHG emissions in the chemical industry (see comment above). Accordingly opportunities to reduce N2O emissions from nitric acid and adipic acid production would be discussed first (lines 28-32 and 41-47). Ethylene/Cracker products would be discussed second (lines 18-24) and ammonia/fertilizer production third (lines 24-28 and 39-41 and 47 ff.) See following comments for details. In general the references given in these paragraphs could not be found in the references section on page 70 ff. | Noted. Due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now been resolved |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10628 | 10 | 28 | 16 | 28 | 19 | The sentences; "The majority of energy use in the production of ethylene is in the steam cracking process, which produces ethylene from a variety of hydrocarbon feedstocks. Steam cracking processes were responsible for emissions of around 180MtCO2/year (Ren et al. 2006), and consumed about 65% of the total energy used in ethylene production." should be repalced with the following sentences;<br>"Steam cracking for the production of light olefins, such as ethylene and propylene, is the most energy consuming process in the chemical industry, which is responsible for emissions of around 180Mt CO2/year, and the pyrolysis section of steam cracking consumes about 65% of the total process energy (Ren et al. 2006)."<br>The steam cracking consists of three sections; pyrolysis section (thermal cracking of hydrocabons such as naphtha), fractionation and Compression section and separation section (recovery of light olefins such as ethylene and propylene). It should be clarified that pyrolysis section is the most energy consuming section in the course of steam cracking. | Accepted - but with the absolute number removed as it had no date |
| 17512 | 10 | 28 | 18 | 28 | 19 | To what period do these figures apply? | Absolute emissions number now removed - see response to comment |
| 10143 | 10 | 28 | 18 | | | To which year does the figure refer? | See above |
| 10144 | 10 | 28 | 22 | | 24 | Unclear what is meant with this statement. Concerning the use of biomass see comment no. 6 above. Potentially the study by Ren and Patel from 2009 did not include the quite recent findings on the influence of indirect land use change, yet. Unfortunately this cannot be checked as the reference cannot be found on page 70 ff. | Noted - see below, and also: due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now been resolved |
| 10629 | 10 | 28 | 23 | 28 | 24 | The sentence; "avoided CO2 emissions are due to “electricity co-generation” should be replaced with the following sentence;<br>"fossil energy use could be avoided because biomass energy is used to produce electricity (electricity co-generation), resulting in reduction of CO2 emission."<br>Because, "the electricity co-generation" is not self-explanatory. | Accepted. Changed to "Switching to a biomass-based route as an alternative to steam cracking could reduce total CO2 emissions per ton of output (Ren and Patel 2009) but with significantly higher |
| 10145 | 10 | 28 | 26 | | 28 | 43% energy savings in ammonia production are mentioned as being possible in these lines, whereas in line 39 to 41 it is stated that technological innovation within the current process of ammonia production is limited. | Changed to "with further savings possible by applying best available |
| 10142 | 10 | 28 | 31 | | 32 | The comment also refers to lines 41 to 47. Sentence should be changed to "The N2O decomposition technology allows reduction of emissions between 85% and 98% depending on the exact plant setup." The following sentence should be added: "While implementation of this technology has been largely completed in regions incentivicing carbon emission reduction like e.g. the EU through the ETS or China through CDM, the implementation of this technology still offers large mitigation potential in other regions like the former soviet union and the US." (Source: Industrial N2O Projects Under the CDM: The Case of Nitric Acid Production, Anja Kollmuss, Michael Lazarus, November 2010, Stockholm Environment Institute<br>Working Paper WP-US-1007). | Accepted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10147 | 10 | 28 | 33 | | 36 | Efficiency in Use: Delete the end of the first sentence "to the use of plastics as a means of demand reduction" and substitute by "to chemicals". Delete the sentence on recycling. Instead insert: "In the chemical production itself the integration of plants producing excess heat with plants requiring heat in a large plant verbund has shown to be able to reduce energy demand and GHG emissions considerably. Efforts to reduce the material input per product depend on chemical companies changing from material providers to solution providers, which is a trend observed in the industry. Chemical companies e.g. develop advanced fertilizers containing N2O-inhibiting components and train farmers on the efficient use of them. This results both in reduced...." (Source: BASF report 2011 reviewed by auditors, page 98 states: The Verbund system is an important component of our energy efficiency concept. Waste heat from one plant's production processes is used as energy in other plants. In this way, BASF saves more than 18 million MWh each year, which corresponds to savings of 3.7 million metric tons worth of carbon emissions annually. Furthermore, the by-products of one plant can be used as feedstock elsewhere, thus helping us to use raw materials more efficiently.) | Noted - this form of energy exchange between industries is discussed in section 10.5 |
| 10630 | 10 | 28 | 34 | 28 | 36 | The sentence; "To produce a high value recycled material with favourable properties, a pure waste stream is required, as impurities in inputs to the recycling process greatly degrade the properties of the recycled material." should be deleted, because a pure waste stream is not always the solution for recycling of plastics, ie, in Asian countries including Japan, a mixture of polyethylene and polypropylene is used for recycling. | Taken into account. Added " Although some plastics can be produced from mixed waste streams, these generally have a lower value than virgin material." |
| 10146 | 10 | 28 | 47 | 29 | 2 | Does this paragraph refer to fuel switch? This most important option to reduce GHG emissions in the chemical industry is missing so far. The beginning should therefore read: "Fuel switch from coal to natural gas has a large impact on the emissions from chemical plants in general. E.g. the fuel switch in ammonia production plants can lead to the following significant GHG emission savings; for example….GHG emission savings….". | Accepted - the section restructured to give fuel-switching more priority earlier on. |
| 16154 | 10 | 28 | 8 | | | Reduced demand or "Sobrieté" is described by authors such as Salomon et al. 2003 "A newagatt scenario for 2005-2050" ECEEE Stockholm. The European ECEEE has devoted important energy in its recent referenced publications (ECEE summer studies) to publish peer-reviewed studies on policy regarding patterns of consumption. Maybe it deserves to be quoted here. | Noted - while the suggested reference is interesting, it is not directly relevant to this chapter as it focuses on energy use in other sectors rather than in industry. |
| 7720 | 10 | 28 | 30 | 28 | 32 | The data on emissions N2O from industries are too old and outdated. Update should be necessary. | Accepted - has been updated |
| 18528 | 10 | 28 | 9 | | | This section contains good information, but the topics are often intermixed - i.e. it would be clearer for the reader if the section were to adhere to the exact categorization of the other sections (e.g. material efficiency, emissions efficiency and fuel switching, etc.) with clear deliniations of text accordingly. | Noted - the section has been restructured |
| 15917 | 10 | 29 | 11 | | | might use pulp and paper figure for world, not just EU | Noted - We are currently unaware of any published global figures for this. In any case, the example is useful to point out that there are limits to energy efficiency even in the most developed nations |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7495 | 10 | 29 | 31 | 30 | 4 | “Black Liquor Gasification which uses the by-product of the chemical pulping process has the potential to replace the commonly used Tomlinson recovery boiler as an alternative technology to increase safety, flexibility and energy efficiency of pulp and paper mills (Naqvi et al. 2010). With commercial maturity expected in 10-15 years (Eriksson and Harvey 2004), Black Liquor Gasification can be utilized as a waste-to-energy method with the potential to achieve higher overall energy efficiency (38% for electricity generation) than the conventional recovery boiler (9-14% efficiency) while generating an energy-rich syngas from the liquor (Naqvi et al. 2010). The syngas can also be utilized as a feedstock for chemical production or to produce dimethyl ether, which can be used as a diesel substitute in road transport (Pettersson and Harvey 2012; Takeishi 2010)”. I think in Canada, methanol is made from black liquor. | Accepted - Yes, methanol can be produced from black liquor. This has been added to the text. |
| 18530 | 10 | 29 | 4 | 29 | 19 | This is a useful example from Europe, but what about the rest of the world? They won't have the same efficiencies. How do they compare to this European example? | Noted - We are unaware of any published global figures for this. In any case, the example is useful to point out that there are limits to energy efficiency even in the most developed nations |
| 18531 | 10 | 29 | 20 | 30 | 4 | It seems that much of this discussion would actually belong under the category 'energy efficiency'. | Taken into account - The section has been re-structured to be consistent with |
| 18529 | 10 | 29 | 3 | | | This section misses an introduction to the pulp and paper industry that the preceding sections have, clarifying e.g. % of emissions, some basics of the process, etc. This would be useful, and would also then allow a clear deliniation of the beginning of the energy efficiency discussion. | Accepted - A short introduction has been added to the section. |
| 17514 | 10 | 30 | 18 | 30 | 19 | The substitution of electronic media for paper media produces mixed environmental outcomes. Contrary to the statement here, there is substantial research on this. See, e.g., Gard, D. L. and G. A. Keoleian. 2002. Digital versus print: Energy performance in the selection and use of scholarly journals. Journal of Industrial Ecology 6(2): 115-132; Reichart, I. and R. Hischier. 2002. The environmental impact of getting the news: A comparison of on-line, television, and newspaper information delivery. Journal of Industrial Ecology 6(3-4): 185-200. | Taken into account - the text has been modified to reflect the fact that there has been some research done in the area. |
| 6744 | 10 | 30 | 2 | 30 | 4 | State the potential with the proposed action. | Noted - No quantifiable potential is provided in the reviewed references. |
| 17515 | 10 | 30 | 21 | 30 | 21 | Isn't there a more recent reference than 2003? The metals industry has been changing rapidly. I tried checking the citation indices, but could not locate the reference by Sjardin. | Noted - We are continuing to try and find more recent data, however this is currenty the most comprehensive list of consistent sytem boundary emission factors found. Moreover: due to an editorial problem chapter 10 had the |
| 6745 | 10 | 30 | 22 | 30 | 23 | Use relative values and compare to total industry emissions. | Taken into account: Aluminium production (by mass) is now contrasted |
| 6746 | 10 | 30 | 25 | 30 | 25 | Use relative values and compare to total industry emissions. | As above |
| 12350 | 10 | 30 | 32 | | | The emission factors in the table; do they apply for 100 % fossile reductants? Please specify what reductants the factors are based on. | Take into account: The emission factors are based on the average mix of reductants used in industry. Table has |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12349 | 10 | 30 | 20 | | | There are no description of mitigation options for PFCs. PFCs from aluminium production can be reduced substantially by process control. | Accepted - has been included. However, the ability to drastically reduce the production of PFCs is still limitted by new process developments (such as inert anaodes) and these remain eleusive. Many details of PFC production were covered in section 3.5.4.2. - Working Group III: Climate Change 2001: Mitigation. Where possible |
| 17517 | 10 | 31 | 1 | 31 | 1 | what is "te"? | Accetped - it should have been 't' |
| 17519 | 10 | 31 | 18 | 31 | 18 | What is "net site electricity"? | Changed to net electricity (site). Definition of net electricity from EIA is: 'Net Electricity' is obtained by summing purchases, transfers in, and generation from noncombustible renewable resources, minus quantities sold and transferred out. It does not include electricity inputs from onsite cogeneration or generation from |
| 17518 | 10 | 31 | 27 | 31 | 29 | 19%, 15%, 14% -- of what? The energy use in the food industry? What makes up the other 50%? What dates are covered? | Accepted - of total energy use in the industry |
| 18532 | 10 | 31 | 27 | 31 | 46 | Is this US example representative for the rest of the world? If not, how does it vary? | Accepted - we don't know - so have clarified that we only have US data. |
| 16155 | 10 | 31 | 47 | 32 | 13 | Important paragraph, explicit findings. But does it not duplicate with chapter on agriculture? | Noted - we will coordinate with the Agriculture chapter on this for the final |
| 5747 | 10 | 31 | 48 | 31 | 48 | this loss is equivalent to around 1/3 of other resources like energy needed for example (http://www.fao.org/docrep/014/i2454e/i2454e00.pdf) | Accepted - sentence added "Therefore apparently one third of food related energy demand and associated |
| 9621 | 10 | 31 | | | | Please, insert this; the survey in 18 countries shows introducing heat pumps reduce CO2 emissions by 49 Mt per year.[1]<br>[1]Yasuhiro Sakamoto, Masanobu Sasaki(2011), Analysis Methodology Proposal for CO2 and Primary Energy Reductions Potential with Heat Pump Technologies in the Food and Beverage Sector and its Results in Major Countries<br>https://www.jstage.jst.go.jp/article/jee/6/4/6_4_830/_pdf | Noted - this seems to replicate the point, but is difficult to use as the 49Mt must be relative to total emissions for this sector in those countries, and be relative to a particular year. |
| 10016 | 10 | 31 | | | | This section should include a good example; A total reduction of 49 Mt-CO2 per year can be expected for the 18 countries in the food and beverage sector, by substituting heat pumps for steam boilers among applications operating at an end use temperature below 100℃, as described in (Sakamoto, 2011, page840).<br><br><Reference><br>[1] Sakamoto et al (2011). Analysis Methodology Proposal for CO2 and Primary Energy Reductions Potential with Heat Pump Technologies in the Food and Beverage Sector and its Results in Major Countries. Available at: https://www.jstage.jst.go.jp/article/jee/6/4/6_4_830/_pdf | Noted - this seems to replicate the point, but is difficult to use as the 49Mt must be relative to total emissions for this sector in those countries, and be relative to a particular year. |
| 6747 | 10 | 32 | 1 | 32 | 13 | This is important statements; however should it be placed under technology mitigation possibilities, maybe it could be move to policies. | Noted - but section 10.4 is the only section going into sufficient sector-specific detail. Moreover policy section must be based on assessments of policy effectiveness where possible. We will |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15918 | 10 | 32 | 13 | | | sugesting that people eat less meat and milk could be controversial. Suggest revisiting this statement | Noted - but all of the statements made with regards to the possible reductions in emissions by reducing consumption of |
| 8288 | 10 | 32 | 23 | | | Figure 10.9 does not provide much of an insight, could be removed to save the space, with text below slightly modified | Accepted |
| 16156 | 10 | 32 | 30 | | | The figure in absolute terms is not very meaningful. Maybe a percentage would be more helpful | Sentence changed to: Hong et al. (2010) reports energy savings of CO2 emissions reductions of about 1% the Taiwan's textile industry following the adoption of energy-saving measures in 303 firms (which was less than 10% of |
| 8289 | 10 | 32 | 30 | | | 140 kt/CO2 - what is that unit? | Noted - but no longer relevant as the number has been replaced by a %, as |
| 16157 | 10 | 33 | 15 | 33 | 17 | Essential line in favour of recycling (link with paragraph on waste?) | Noted - thank you. |
| 15879 | 10 | 33 | 4 | | | Mining sector section could be expanded (e.g., use of solar thermal energy in Chilean copper mines, also in heavy oil (e.g., see Chevron's solar to steam facility in their Coalinga oil operations in California) . Other mitigation options not discussed include switching to cleaner fuels for mining trucks, electrification of mines, etc | Noted - however mining is not a priority sector, because its total energy use is relatively low. Potentially we could expand figure 10.2 to demonstrate this. |
| 11135 | 10 | 34 | | 34 | | Word "strong" is not an appropriate definition | Accepted - changed to "GHGs with high GWP". But table 10.6 has been |
| 11136 | 10 | 34 | | 34 | | Under "Chemicals" should include HFC-23 in section on non-energy emissions | Accepted - But table 10.6 has been |
| 17521 | 10 | 34 | | 34 | | Column 1: Explain "Pure 'Kaya'"; What does the heading "Industry Kaya" mean? Columns 2-4: Activity is not a good label for these 3 columns -- many of the entries are not activities. Column 3, Chemicals row: "more intense use" is NOT equivalent to more efficient use. Increased intensity means more materials per dollar output. | Accepted - But table 10.6 has been removed from SOD |
| 10149 | 10 | 34 | | | | First row "sector-wide", columnc "material input/output": Put biomass-based feedstock as last option in brackets and add "sustainable". Row "Chemicals": Column "products/services": add as first issue "cooperation with costumers to develop complete solutions", column "material input/product": delete bio-based materials and add as first issue "development of improved materials", column "energy/material": delete current entry and substitute by "increase energy efficiency of processes (steam cracking, ammonia, chlorine production etc.), integration of several chemical plants in a verbund site", column "emisisons/energy": delete and write instead "CHP, renewable power, fuel switch from coal to gas/waste". | Accepted - But table 10.6 has been removed from SOD |
| 18533 | 10 | 34 | | | | This table is very useful! The order is the only puzzling bit - i.e. why does it vary with the order of options presented in 10.4.1? I.e. why wouldn't energy intensity appear in the left-most column? | Accepted - But table 10.6 has been removed from SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10017 | 10 | 34 | | | | "Heat pump" should be mentioned not only in food and beverages sector but also in other industrial sectors. There are many cases where heat pump technology is applied in industrial sectors, as described in (IEA/OECD, 2010, page65-83) and (UNIDO, page38, Fig14). In addition, the column of "GHG INTENSITY" should explain that CCS has problems such as high cost, difficulties in site selection, and difficulties in public acceptance, as shown in (Finkenrath, 2011, page7), (Rubin, 2007, page4447, Table3), and (Zobacka, 2012, Abstract).<br><br><Reference><br>[1] IEA/OECD Heat Pump Centre (2010). Special Task: Case Studies. Available at: http://www.heatpumpcentre.org/en/projects/specialtasks/casestudies/Documents/Case%20Studies%20report.pdf<br>[2] UNIDO. Renewable Energy in Industrial Applications: An assessment of the 2050 potential.<br>[3] Finkenrath, M (2011). Cost and Performance of Carbon Dioxide Capture from Power Generation, International Energy Agency.<br>[4] Rubin, E.S., C. Chen & A.B. Rao (2007). Cost and performance of fossil fuel power plants with CO2 capture and storage. Energy Policy 35, 4444–4454.<br>[5] Zobacka, M.D. & S.M. Gorelick (2012). Earthquake triggering and large-scale geologic storage of carbon dioxide. Available at: http://www.pnas.org/content/early/2012/06/13/1202473109.abstract | See response to comment 12345 |
| 12351 | 10 | 34 | 2 | | | The cells "GHG intensity","emissions/energy" regarding Non-ferrous metals is empty. PFC-reduction from aluminiumproduction is an important option here, since PFCs from aluminium production can be reduced substantially by process control. Fuel-switching is also important for non-ferrous metals. Fuel-switching can lead to reductions from aluminium production by substituting fossile fuel used for casting. Fuel-switching is also relevant for other non-ferrous metals like silicomanganese, silicon and ferromanganese. | See response to comment 12349. Table 10.6 has been removed. |
| 15896 | 10 | 34 | 2 | | | Simplify table 10.6. Some repetition between sectors | Noted - but table 10.6 has been |
| 9305 | 10 | 34 | 2 | 34 | | Reader may confuse cement with concrete. Cement-row in this table shows that a Production/service-column is "concrete" performance but other columns are "cement" characteristics such as Energy intensity and GHG intensity. Therefore, in order to align with column of other sectors in the Table, I would strongly suggest to leave "blank" in the cell instead of concrete characteristics. | Taken into account - new text added to 10.4.2.2 to clarify this "Concrete is formed by mixing specific proportions of cement, water, sand and aggregates. Almost all cement is used in this form to construct buildings and infrastructure (van Oss & Padovani, 2002)" [Ref: Oss HG, Padovani AC. "Cement Manufacture and the Environment: Part |
| 7110 | 10 | 35 | 17 | | | There is a whole book dedicated to mitigation in tourism: Gössling, S. 2010, Carbon Management in Tourism, Routledge. | Taken into account |
| 17522 | 10 | 35 | 21 | 35 | 22 | Define/explain acronyms - WTTC, ETC, UNWTD. | Accepted - acronyms now defined |
| 7111 | 10 | 35 | 22 | | | if this is a quote, " are missing plus page number in reference (Scott et al. 2010) | Accepted |
| 16158 | 10 | 35 | 25 | 35 | 26 | Sentence is not clear. Does the target put a burden on other sectors? Or the opposite? | Noted - the idea is that "the current emission targets" proposed by the stakeholders (stated above) would |
| 5220 | 10 | 35 | 26 | 35 | 26 | As Scott et al. 2010 show, by 2050, the burden cannot be taken up by other sectors because it exceeds the target emission level avoidingdanerous climate change. It seems important to mention this at this place. Also, this is the place to put emphasis on the fact that by reducing demand in some small subsectors of tourism (long haul, cruises) effective emission reduction may be reached with a minimum of damage to then sector. and may be refer to Peeters, P. M., & Dubois, G. (2010). Tourism travel under climate change mitigation constraints. Journal of Transport Geography, 18, 447–457. | Accetped - text modified “some research and found using the current target would put in additional unstirred unsustainable burden on other sectors of the economy, why some authors also point that by reducing demand in some small subsectors of tourism (long haul, cruises) effective emission reduction |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17523 | 10 | 35 | 30 | 35 | 30 | Use consistent terminology. Is "industry" a sector or is it composed of sectors? Does "industry" refer only to manufacturing or is it used more broadly? This a problem throughout the chapter. | Taken into account - the revised introduction (10.1) aims to define the |
| 17524 | 10 | 35 | 37 | 35 | 37 | The phrase "or reuse of waste or byproducts" is redundant as that is a defining characteristics of symbiosis and eco-industrial networks. Change "or" to "i.e." or "e.g." | Accepted - but sentence no longer in SOD |
| 10150 | 10 | 35 | 42 | 36 | 29 | The example of chemical industrial parks (so called chemical "Verbund Sites") should be related. These have been proven to reduce energy and ressources consumption and reduce the risks, costs and emissions from chemicals transportation for a long time allready. (Source: see comment 16) | Noted - however due to very limited space we cannot address many specific examples |
| 9075 | 10 | 35 | 27 | 38 | 2 | 10.5 Infrastructure and systemic perspectives can be deleted due to limitations on the nos of pages | Rejected: the structure of the sectoral chapters is defined by the IPCC plenary. Moreover, this section is very important to underline mitigation options through |
| 17525 | 10 | 36 | 10 | 36 | 11 | Additional reference - Brazil: Ferrer, G. S. Cortezia, and J. M. Neumann. 2012 Green City: Enviornmental and Social Responsibility in an Industrial Cluster. Journal of Industrial Ecology 16:1: 142-152. | Noted: We have updated this section and unfortunately do not have more |
| 8290 | 10 | 36 | 13 | | | Reference Ghosh and Roy 2011 is not listed in the References section. There are other references missing (e.g. Geng et al) | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now |
| 17528 | 10 | 36 | 25 | 36 | 29 | Indicate the period of time that is encompassed by this statement. | Accepted - text revised. The Chinese case is from 2002 to 2005, while the |
| 5021 | 10 | 36 | 30 | 36 | 36 | It is widely recognised that the by-product slags from brast furnace for steelmaking replaces cement klinker, which need to use massive energy to produce, thus replacing klinker by BF slags can reduce CO2 emission in a massive scale. | Noted - We have very limited space to introduce every details in our draft and here the cement case is just one example. We believe that one sentence for one example is enough here. See |
| 15920 | 10 | 36 | 31 | 36 | 50 | burning of municipal waste can have air pollution impacts if not controlled | Noted - waste and waste handling are dealt with in section 10.13 |
| 16159 | 10 | 36 | 44 | 36 | 48 | Very long sentence, could be split for clarity | Editorial - copyedit to be completed prior |
| 15919 | 10 | 36 | 9 | 36 | 11 | there are SME clusters in US too: IT in California, biotech in Boston, energy in Houston, etc | Noted: Due to space limits, we have shortened our introduction on SMEs, but with a strong focus on industrial |
| 8004 | 10 | 36 | 30 | 36 | 36 | It is widely recognised and reported quantitatively that cement clinker can be replaced by the blast furnce slags and it makes eliminating CO2 emissions from CaCO3 cracking and saving energy for cement kiln. | Noted - We have very limited space to introduce every details in our draft and here the cement case is just one example. We believe that one sentence for one example is enough here. See |
| 17529 | 10 | 37 | 1 | 37 | 7 | Better wording: "The reuse of materials recovered from urban infrastructure…" While term "urban mining" is unfortunately used inconsistently, the appropriate usage refers to recovering materials from in-use stocks (either actively used stocks or dormant stocks). That is, it does not refer to recycling of discards. See Klinglmair, M. and J. Fellner. 2010. Urban mining in times of raw material shortage: Exemplified by copper management in Austria during World War I. Journal of Industrial Ecology 14(4): 666-679. The wording in this paragraph should be more precise if the intention is to describe urban mining rather than just recycling. | Accepted |
| 10151 | 10 | 37 | 21 | | 23 | Change sentence to: "These materials cause GHG emissions at the time of manufacturing, but the avoidance of emissions in the use phase is larger by factors between 1:2 (polymers for packaging) and 1:230 (materials for thermal insulation of buildings)." | Rejected - no reference provided |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10152 | 10 | 37 | 23 | | 28 | Delete these sentences and write instead: " To unlock the full innovation potential for GHG emission mitigation and in order to avoid counterproductive actions, full value chain analyses are required on product as well as on corporate level. Standards and best practices for this are evolving." (Source: The Greenhouse Gas Protocol, http://www.ghgprotocol.org/) | Accepted - text revised partly based on suggestion |
| 16160 | 10 | 37 | 29 | 37 | 38 | Suggestion : note that recent building standards such as in France or Switzerland do take into accounr the embodied emissions, called here "grey energy". | Accepted - but due to space limitations only a limited number of examples kept |
| 17530 | 10 | 37 | 47 | 37 | 48 | it is not true that "the quality of many metals is maintained SOLELY through addition of pure primary materials" Effective sorting plays an important role as well. The sentence should be reworded. | Accepted and will add this point (in Final Draft) |
| 3865 | 10 | 37 | 7 | 37 | 8 | Do we really need large scale bioenergy production to significantly mitigate climate change. See Pacca and Moreira, 2011 - Pacca, S. and J. R. Moreira, 2011. A Biorefinery for Mobility? Environ Sci Technol. 2011 Nov 15;45(22):9498-505. | Noted - while we consider bioenergy important, it is discussed in Chapter 7 (Energy). |
| 10018 | 10 | 37 | 8 | 37 | 15 | This paragraph should be deleted totally or explain that CCS is costly and has technical uncertainty, even if CO2 sources and sinks were clustered. CCS has problems such as high cost, difficulties in site selection, and difficulties in public acceptance, as shown in (Finkenrath, 2011, page39) and (Zobacka, 2012, Abstract). These literatures are listed in the No47 line of this table. | Accepted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in chapter 7 (Energy) |
| 5020 | 10 | 37 | 16 | 37 | 38 | One example of the necessity for coss sectoral implications is shown by WorldAutoSteel project. Fuel efficiency policy of automobiles usually only focus on tail-pipe emissions. In this study (by University of California Davis), total lifecycle emission from automobiles can be saved more by using advanced high-strength steel and innovative desigin/forming technologies, even though tail-pipe emission shows slightly higer emission as compared with other materials such as Aluminium. Social level mitigation can only be achieved such a cross-sectroal lufe-cycle analysis. See following: http://www.worldautosteel.org/life-cycle-thinking/greenhouse-gas-materials-comparison-model/ | Accepted |
| 10153 | 10 | 38 | 11 | | | Substitue "cement" by "materials" as a large variety of materials (including speciality chemicals) is used for building embankments | Accepted |
| 8291 | 10 | 38 | 15 | 38 | 19 | Repeating sentences | Editorial - copyedit to be completed prior |
| 10205 | 10 | 38 | 15 | 38 | 19 | These two sentences can be combined | Editorial - copyedit to be completed prior |
| 5697 | 10 | 38 | 20 | 38 | 27 | An example of temperature increase feedback on tourism adaptation should be mentioned here. I suggest: "An increase in summer tourism activities is already observed in alpine areas during hot temperature episodes (Serquet and Rebetez, 2011) whereas winter activities may disappear due to more frequent rain instead of snow (Serquet et al., 2011)." Serquet G, Rebetez M 2011. Relationship between tourism demand in the Swiss Alps and hot summer air temperatures associated with climate change. Clim. Change 108 (1-2): 291-300. Serquet G, Marty C, Dulex JP, Rebetez M, 2011. Seasonal trends and temperature dependance of the snowfall/precipiation day ratio in Switzerland. Geophys. Res. Lett. 38, L07703, doi:10.1029/2011GL046976 | Rejected - the section deals with the potential impacts of climate change and adaptation measures on mitigation options for the sector, not with the impact of climate change on adaptation. The remark may be relevant to tourism discussion in WG2 |
| 7098 | 10 | 38 | 23 | 38 | 23 | References missing in reference list - I am however doubtful they adequatly confirm the point made about desalination. "induces growing demand" - of what? | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now been resolved. That segment of text no |
| 7099 | 10 | 38 | 24 | 38 | 26 | Another example is… - unsubstantiated, not sure "pilgrimage" makes sense in this sentence? Handmer et al. 2012 - not in references. A comprehensive volume on tourism and climate change interactions is Scott, D., Hall, C.M. and Gössling, S. 2012. Tourism and Climate Change, Routledge. | Accepted |
| 17531 | 10 | 38 | 24 | 38 | 25 | Is snowmaking really used to maintain pilgrimages? | Accepted |
| 10206 | 10 | 38 | 25 | 38 | 27 | Unclear and not specific enough | Accepted |
| 17532 | 10 | 38 | 31 | 38 | 33 | This sentence is garbled. | Editorial - copyedit to be completed prior |
| 8292 | 10 | 38 | 40 | | | underStand | Editorial - copyedit to be completed prior |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9536 | 10 | 38 | 46 | | | Please, clarify here as probability of an 80% chance is different from that 26-78% (mean 54%) in Chapter 1. (AR5 FOD, p.22 L13) | Accepted - text has been revised thoroughly in SOD and will be further |
| 6750 | 10 | 38 | 7 | 38 | 13 | This part is very speculative and lacks trust. Rewrite, add source or leave out. | Noted - we have made it clearer in the SOD that there is no literature to back |
| 18536 | 10 | 38 | | | | This is admittedly a very difficult section, but seems to be in a much more preliminary state than the preceeding sections. It would need more effort to assure<br>1) a clear step-wise development from the AR4 (clarifying differences in approach and methodology where relevant, and also what has changed since the AR4) and<br>2) adherence to agreements in Wellington (e.g. discussion of historical cost trends, and presentation of figures in terms of $/GJ or $/CO2-eq where possible). | Accepted - text has been revised thoroughly in SOD and will be further improved in Final Draft |
| 18537 | 10 | 38 | | | | Please note that all costs should be presented in terms of 2010US$, as agreed for use across the AR5. | Accepted |
| 13062 | 10 | 38 | 28 | 40 | 10 | On the Costs & Potentials issues it is difficult for the reader to access the bigger picture of the cost & potential information. Each sector has its own approach to costs and potentials, which is appropriate as each sector has its own unique qualities and considerations. Nonetheless, the information that will be most relevant to take-away for policy-makers is overarching cost information that brings these different pieces together. To help policy-makers access this information, it should be important to highlighting market realization, but also the policy aspects of cost (by policy it is meant institutional frameworks and/or market frameworks and/or capacity building arrangements, etc...). In both developing and developed countries policy can have a strong impact on cost. Simply looking across the costs & potentials sections of the sector chapters, the reader could miss this message, although the information on policies and measures is there in the chapter. Therefore it could be important to make sure that these informations are put in perspective appropriately. | Accepted - text has been revised thoroughly in SOD and will be further improved in Final Draft |
| 17533 | 10 | 39 | 10 | 39 | 10 | What former IEA report? Provide a reference. | Accepted - energy Technology Transitions for Industry IEA 2009. |
| 10154 | 10 | 39 | 15 | | 16 | Unclear what is meant. It is assumed that the sentence refers to the source quoted on page 86, line 21/22, and in this soucre table 1.4. on page 34 is summarized. A clearer statement would be: "Two sectors (Iron and steel and Chemical and petrochemical) contribute more than 80% to the total industry CO2 emissions reductions potential by 2020 of 969 MtCO2." | Accepted - text has been revised thoroughly in SOD and will be further improved in Final Draft |
| 16161 | 10 | 39 | 18 | | | Missing word in the sentence | Editorial - copyedit to be completed prior |
| 8293 | 10 | 39 | 18 | | | China and ??? | Editorial - copyedit to be completed prior |
| 3027 | 10 | 39 | 18 | | | A word is missing in the sentence after “and”: “Akashi, Hanaoka et al. 2011 also indicate that the largest potential for CO2 emissions savings for some energy intensive industries comes from China and.” | Editorial - copyedit to be completed prior to publication |
| 15921 | 10 | 39 | 19 | | | "$100/tCO2" --> need a reference for this | Accepted - text has been revised thoroughly in SOD and will be further |
| 15922 | 10 | 39 | 22 | 39 | 24 | unlikely that 60% can be achieved at negative cost because it would have been done. Should use more than McKinsey for cost refrences since McKinsey generally presents a very optimistic viewpoint. | Accepted - references other than McKinsey have been used in SOD |
| 17534 | 10 | 39 | 22 | 39 | 22 | What is a MAC study? | Accepted - acronym now defined |
| 10155 | 10 | 39 | 22 | | | The quoted reference cannot be found on page 70 ff. Assuming that the Mc Kinsey "Pathways to a low carbon economy" is referred to, the sentence should be clarified as follows: "MAC sudies show that the highest potential within the industrial sector excluding power is in....." | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10632 | 10 | 39 | 22 | 39 | 24 | The sentences; "MAC studies also show the highest potential is in chemicals, followed by iron and steel and cement: 2, 1.5 and 0.9 GtCO2/year respectively. 60% of this potential can be achieved at negative costs or at a cost less than 20 euro/tCO2 (McKinsey Company 2009)." should be replaced with the following sentences; "MAC studies also show the highest potential is in iron and steel, followed by chemicals and cement: 2.4, 1.9 and 1.0 GtCO2/year respectively. 75% of this potential can be achieved at negative costs or at a cost less than 20 euro/tCO2 (McKinsey Company 2010)." Revised report is published by McKinsey in 2010 as follows; (See pages 8 and 9 of the revised report) http://solutions.mckinsey.com/climatedesk/default/en-us/Files/wp211154643/ImpactOfTheFinancialCrisisOnCarbonEconomics_GHGcostcurveV2.1.pdf | Accepted - text has been changed. Section has been revised thoroughly in SOD and will be further improved in Final Draft |
| 15268 | 10 | 39 | 31 | 39 | 35 | The importance in the mitigation evaluation for each sector of whole value chain like LCA( Ref: A. Gunasekaran, A. Spalanzan, Int. J. Production Economics 140, 35-47(2012)) will be very important and should be noted here. | Taken into account in "gaps in knowledge" section (10.12) |
| 17535 | 10 | 39 | 32 | 39 | 33 | What is non renewable biomass? | Accepted - Non renewable biomass refered to wood and biomass from |
| 17536 | 10 | 39 | 43 | 39 | 44 | See also Masanet, E. 2010. Energy benefits of electronic controls at small and medium sized U.S. manufacturers. Journal of Industrial Ecology 14(5): 696-702. | Accepted, reference has been used. |
| 16162 | 10 | 39 | 48 | | | This paragraph should mention the horizon of saving, and clarify if the goals. | Accepted - text has been changed. Section has been revised thoroughly in SOD and will be further improved in |
| 4558 | 10 | 39 | 48 | | | The statement that future "enhancement of potentials in the same direction may be expensive" is not based on references | Accepted - Section has been revised thoroughly in SOD and will be further |
| 16163 | 10 | 40 | 5 | 40 | 7 | In the case of cement, radical technology such as Novacement, is a possibility with a bigger jump in efficiency without CCS. | Accepted - alternatives to cement now mentioned in several instances in the |
| 16164 | 10 | 41 | | 42 | | Table 10.7 is not very clear, it does not help assessing the different scales of potential both in share and in absolute. | Accepted - Section has been revised thoroughly in SOD and will be further |
| 6607 | 10 | 41 | | 41 | | Delete "Increased recycling and use of scrap" from Steel. Increased recycling and use of scrap are not refferred in original reference (ETP2012). | Accepted - Section has been revised thoroughly in SOD and will be further |
| 10019 | 10 | 41 | | 42 | | "Heat pump" should be included in each industrial sector. There are many cases where heat pump technology is applied in industrial sectors, as described in (IEA/OECD, 2010, page65-83) and (UNIDO, page38, Fig14). In addition, the column of "CO2 intensity" should explain that CCS has problems such as high cost, difficulties in site selection, and difficulties in public acceptance, as shown in (Finkenrath, 2011, page7), (Rubin, 2007, page4447, Table3), and (Zobacka, 2012, Abstract). These literatures are listed in the No47 line of this table. | A) accepted - heat pumps now mentioned. B) CCS-related text has been shortened in chapter 10 and discussion is now concentrated in chapter 7 (Energy) |
| 15897 | 10 | 41 | 1 | | | streamline table 10.7. might include challenges. Also, add mitigation costs ($/tonne CO2) | Accepted - Section has been revised thoroughly in SOD and will be further |
| 18538 | 10 | 41 | 1 | | | A lot of the information here is the same as presented in Table 10.6. It may be useful to focus mitigation options in Table 10.6 (cutting them from this table), and focus this table on costs and potentials as was done in the AR4 (table 7.8 page 474-475). | Taken into account - Table 10.6 no longer appears in SOD |
| 18539 | 10 | 41 | 1 | | | A reader would expect indicators for chemicals, pulp&paper, and aluminum as is done for cement and steel. | Accepted - included in SOD |
| 11004 | 10 | 41 | | | | Heat pumps should be also added as one of the measures to reduce energy and CO2. | Accepted - heat pumps mentioned in |
| 10156 | 10 | 42 | | | | N2O abatement opportunities (large and cheap!!) are missing. Or the headline of the table has to be changed to "CO2 mitigation options: costs and potentials". The problem with bio-based raw materials has been discussed in the above comments. | Accepted - non-CO2 gases now considered in costs and potentials section of SOD |
| 18555 | 10 | 42 | | | | It's very useful that the structure reflects the mitigation options presented earlier in the chapter. Despite this similar structure, the last point (non-CO2 GHG) doesn't appear in that master structure, so the reader is left wondering why it then appears here. | Accepted -- sentence added to explain contribution of Non-CO2 emissions to process emissions at start on subsection |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18556 | 10 | 42 | | | | The barriers introduced early in the section (technological, institutional, legal, cultural and financial) are useful, but aren't implemented clearly in the subsequent sub-sections, especially in 10.9.1.4, 10.9.1.5 and 10.9.2. | Accepted -- barrier categories are explicitly assigned to identified barriers in table 10.9 |
| 16165 | 10 | 43 | | | | Is behaviour change so risky if price signals and regulations are in place? See for example the average ration of fish or meat in the plates of Europeans, in marked decrease in ten years. | Noted |
| 7516 | 10 | 43 | | 43 | | Degree of Risk of CCS is very high mainly because of public acceptance and how to pass it's high cost to the customer. | Noted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 18553 | 10 | 43 | | | | This section failed to adhere to the agreement in Wellington to structure the discussion along the four categories 1) socio-economic effects; 2) environmental and health effects; 3) technological risks; and 4) public perception. The current structure should be amended accordingly. This would also help to better align the sub-sections with what is presented in Table 10.8. | Accepted - structure amended in agreement with Vigo Accord |
| 15888 | 10 | 43 | 1 | | | Co-benefits discussion would benefit from more quantitative examples | Accepted - section has been revised |
| 12013 | 10 | 43 | 1 | | | It should be clearly stated that uncertainty of future, which derives from future market structures, demand and government regulations to name a few, makes any options risky. Even energy efficiency measures are not well explored due to uncertainties. | Taken into account |
| 12035 | 10 | 44 | 13 | | | "On the other hand…." is not a relevant statement to follow the spill-over issues. At least, "public" needs to be clearly defined. The spill-over effects can be easily underestimated as various factors influences investment decisions. Quantatively, it is necessary to analyze changes embedded CO2 associated with export/import of goods. As sated earlier in the chapter, the shift from industrialised to developing countires is quite significant. As the competition becomes more global and the economic situation uncertain in the future long term investment decisions have become more difficult, failing to explore large amount of efficiency improvement potentials. | Noted - trade-related issues are discussed in chapter 14 |
| 17539 | 10 | 44 | 15 | 44 | 22 | Claims on such a controversial topic should be very carefully supported with multiple references! | Taken into account |
| 10020 | 10 | 44 | 15 | 44 | 19 | This part should be deleted totally or revised to explain that CO2 leakage caused by the implementation of the ETS happened actually through transfer of industry from one country to others. Market mechanisms at least under Kyoto-like international scheme, where the condition of all countries' meaningful participation is not met, does not work well. This information is described in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1).<br><br><Reference><br>[1] Rosendahl, K.E. & J. Strand (2011). Carbon Leakage from the Clean Development Mechanism. Energy Journal, Volume 32, Number 4.<br>[2] Aichele, R. & G. Felbermayr (2012). Kyoto and the carbon footprint of nations. Journal of Environmental Economics and Management, Volume 63, Issue 3, pp. 336-354.<br>[3] Peters, G.P., J.C. Minx, C.L. Weber, & O. Edenhofer (2011). Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences. DOI: 10.1073/pnas.1006388108. | Noted - ETS discussed in chapter 15 |
| 17540 | 10 | 44 | 23 | 44 | 31 | This paragraph needs a segue (from the previous paragraph) and also needs context. Does it belong in this section? | Accepted |
| 18554 | 10 | 44 | 23 | 44 | 31 | Note in Wellington it was agreed to avoid the term trade-off - this paragraph has made trade-off a focus. | Taken into account |
| 15923 | 10 | 44 | 27 | | | Chemical indsutry is also emerging at large user of biomass for biochem since much more value added and higher returns on products | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5221 | 10 | 44 | 27 | 44 | 28 | One important blockage in the scientific discussion of tourism's reduction of emissions (by reducing long haul trips) is the assumed adverse impact of this on the economies of the least developed countries. From a paper under review we wrote, it may be learned that this effect is limited to a special kind of LDC's: small, remote islands. In general other LDC's economies do suffer from increased distances travelled - or may gain from a reduction - in tourism because they will loos part of their neighbour country tourism, without an increase of long haul to fully compensate for this. Overall it appears that the impact is neutral to both LDC's and nonLDC in terms of total trips and for scenarios where travel distances are limited to up to only 1500 km one-way (theoreticlly of course). Menion of the conflict development of poor countries and long haul tourism can be found in: Gössling, S., Peeters, P., & Scott, D. (2008). Consequences of climate policy for international tourist arrivals in developing countries. Third World Quarterly, 29, 873-901.<br>Peeters, P. (2009). Pro-poor tourism, climate change and sustainable development. Tourism Recreation Research, 34, 203-205. | Noted. Due to re-organisation of SOD text the text on tourism in this section has been deleted (cf. Response to comment 2279) |
| 3028 | 10 | 44 | 27 | | | Please note that chemicals from biorefineries not mandatorily compete with fuels, heat and power produced in those industrial facilities. Chemicals and biopolymers can improve the profitability of biorefineries and, hence, increase the competitiveness of fuels produced in it. Interestingly, this is the case for sugar cane distilleries, which produce sugar, ethanol (fuel and solvent) and heat and power from biomass. The co-production of various energy and non-energy goods increases the profitability of the facility. This is scope economy is found in mulit-products plants, such as petroleum refineries (the classical example). Therefore, I don´t think that biorefineries are good examples of potential competition between biomass applications, as stressed in the report. | Noted |
| 16166 | 10 | 44 | 28 | | | The conflict beween development and mitigation should be described. | Rejected - it is not for industry chapter to describe it in full, see framing chapters |
| 15924 | 10 | 44 | 28 | 44 | 31 | tradeoffs btw GHG mitigation/energy effiicency and production, environment, safety, relaibility are very common and generally GHGs come last… | Noted |
| 15462 | 10 | 44 | 33 | 45 | 6 | One signficant technical risk that has not bee n widely addressed is security concerning technologies related to the smart grid. In spite of their potential to great enhance transmission and distribution efficiency, so-called smart technologies are vulnerable due to their large reliance on software controls, that are prone to cyber hacking. These need to be addressed so that residents will be assured to their security but also their privacy. See ref: http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=5452993&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D5452993 | Rejected - not relevant to industry chapter, see Energy chapter for this. |
| 12629 | 10 | 44 | 45 | 44 | 47 | CCS is commercially available today in certain circumstances in industrial applications - see the Sleipner and Snohvit projects and Weyburn Project. CCS may not necessarily have any greater risks and uncertainties than other technologies. | Noted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 12672 | 10 | 44 | 45 | 44 | 47 | CCS is commercially available today in certain circumstances in industrial applications - see the Sleipner and Snohvit projects and Weyburn Project. CCS may not necessarily have any greater risks and uncertainties than other technologies. | Noted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 16167 | 10 | 44 | 45 | 45 | 6 | This paragraph with a sober assessment of CCS is on point. But does it not contradict the more lenient parts on CCS in chapter 7? | Noted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 12352 | 10 | 44 | 45 | 44 | 46 | All of the (individual) components of integrated CCS Systems exist and are in use today in different sectors. The risk is probably not a technological risk, but an economic risk. The current knowledge of CCS and the challenges related to it, is thoroughly described in the Energy Chapter (chapter 7, page 31, line 5 to 7) and should be the basis also for the description in the Industry chapter (as it provides a more updated view). | Noted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in chapter 7 (Energy) |
| 11783 | 10 | 44 | 45 | 45 | 6 | These are reasonable. | Noted |
| 6763 | 10 | 44 | 45 | | 6 | Good description. It's very important. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10667 | 10 | 44 | 45 | 45 | 6 | Support this statement. | Noted |
| 6608 | 10 | 44 | 46 | 44 | 47 | Important- Should not be deleted. | Noted |
| 12353 | 10 | 44 | 49 | 45 | 1 | A lot of work on storage capacity in the North Sea has been undertaken (Norway/UK) since 2007. Please include some of these later studies. E.g. CO2 Storage Atlas. www.npd.no (2012) | Noted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 17538 | 10 | 44 | 7 | 44 | 7 | "despite being the most costly option" for what? GHG mitigation? | Accepted - sentence has been clarified |
| 17980 | 10 | 44 | 8 | 44 | 22 | Since spill-over effects might play a less important role in this section than agreed in Wellington, this paragraph might be shortened. If it was to be kept, additional literature would have to be added to substantiate the claims made. | noted |
| 6752 | 10 | 45 | 1 | 45 | 6 | Last part in this section is too speculative without references. | Noted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 17542 | 10 | 45 | 19 | 45 | 21 | Why does regional variation lead to public acceptance?? | Accepted - sentence deleted |
| 12354 | 10 | 45 | 2 | 45 | 5 | The description of geology (challenges) comes out too negative. This is a matter of carefully selection of suitable storage sites. It may not be problems with regard to occuping underground space if depleted gas reservoars are used for storage, or if storage sites are offshore. | Noted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 6753 | 10 | 45 | 22 | 45 | 35 | This has been discussed. Keep discussion of CCS on one place in one section to avoid writing the same information multiple times. | Accepted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 16168 | 10 | 45 | 22 | 45 | 35 | Very insteresting part. | Noted |
| 9284 | 10 | 45 | 22 | 45 | 24 | The following statement seems subjective and unsubstantiated: "Industrial CCS does not provide environmental co-benefits, moreover for many people the technology is connected with safety risks. Given the halting of several research projects for CCS due to local opposition, public concerns for safety are often seen as a future barrier to this technology."<br><br>Industrial CCS can permanently prevent anthropogenically produced CO2 from being released to atmosphere which in itself bestows multiple environmental co-benefits (in regards to climate change, bio-diversity, more sustainable production processes). The statement should either more accurately reference what aspect of CCS public opinion seems to be uncertain or it should be deleted. For example, it is mostly the storage aspect (not the capture or transport) and is dependant on the specifics of each storage location (both in terms of national regulations, geological site characterisation and proximity to urban centres). For instance, in the Netherlands it refers to on-shore storage (not off-shore storage). And in many other parts of the world, regulations in place that ensure compliance with a high level of environmental integrity and occupational heath and safety outcomes.<br><br>Indeed, the recent acceptance of CCS as an eligible project activity in the United Nations Framework Convention on Climate Change's (UNFCCC) Clean Development Mechanism (CDM) demonstrates that CCS related abatement is easily institutionalised and rewarded within market mechanisms, and is also consistent with the notion of sustainable and equitable development in developing countries. | Accepted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in chapter 7 (Energy) |
| 15925 | 10 | 45 | 22 | 45 | 35 | CCS is well covered in Chap. 7 - might coordinate to avoid duplication since CCS for powergen is similar to CCS for indsutry | Accepted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 17543 | 10 | 45 | 30 | 45 | 35 | These two sentences appear to be contradictory. The first sentence refers to less favorable public acceptance with increased information provision. The second sentence states "In line with this…" and points to value of public engagement. Clarifcation is needed. | Accepted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 17544 | 10 | 45 | 36 | 45 | 39 | 150 conflicts over what period? | Noted - will be checked |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12630 | 10 | 45 | 4 | 45 | 6 | As described in teh IPCC CCS Special report, CO2 stored in a properly selected and characterised geological formation will not have any of the risks described here at a high level. | Noted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 12673 | 10 | 45 | 4 | 45 | 6 | As described in teh IPCC CCS Special report, CO2 stored in a properly selected and characterised geological formation will not have any of the risks described here at a high level. | comment is duplicate of 12630 |
| 9915 | 10 | 45 | 42 | | | An analysis of 104 empirical studies of innovation to change showed the following barriers, that could refine and structure the discussion of barriers:<br>Issues of resourcing (76%), for instance, “not enough resources” (Post and Altman 1994), “lack of adequate resources such as time and staff” (Adams and McNicholas 2007), limited or no budgeting (e.g. Harris 2000 and Anumba et al. 2006), access to capital and lack of time (Rohdin and Thollander 2006).<br>Issues of capabilities (75%), for instance, “low technology literacy” (Stewart, Mohamed and Marosszeky 2004), “ill-equipped in terms of training and expertise” (Whitaker 1987), “employees are not trained” (Tamimi and Sebastianelli 1998), “lack of understanding” (Waldron 2005), “lack of technical skills” (Rohdin and Thollander 2006), “lack of skill, knowledge and expertise” (Kirkland and Thompson 1999), etc.<br>Issues of communication (64%), for instance, “communication barriers” (Heide, Grønhaug and Johannessen 2002), “communication overload and distortion” (Allen 2002), “lack of communication within the team” (Attaran and Nguyen 1999), “lack of communication among those sharing responsibility for different aspects” (Kunda and Brooks 2000), “poor communication practices that damaged employee commitment to projects” (Jacobs et al. 2006), “tension among departments arising from the incompatibility of actual or desired responses” (Aggarwal 2003), etc.<br>Issues of organizational structure (62%), for instance, bureaucracy (e.g. Molinsky 1999; Borins 2000; Abdul-Hadi, Al-Sudairi and Alqahtani 2005), “salary structure” (Al-Qirim 2007), “complexity, centralization, and formalization”(e.g. Allen 2002), “rigid organizational boundaries” (Butler 2006), “departmental fortresses” (Cicmil 1999), and organizational structure (e.g. Scarbrough and Lannon 1988; McGaughey and Snyde 1994; Yauch and Steudel 2002).<br>Abdul-Hadi, N., Al-Sudairi, A. und Alqahtani, S. (2005): Prioritizing barriers to successful business process re-engineering (BPR) efforts in Saudi Arabian construction industry, In: Construction Management \& Economics, Vol. 23, Nr. 3, S. 305-315.<br>Adams, C.A. und McNicholas, P. (2007): Making a difference: Sustainability reporting, accountability and organisational change, In: Accounting, Auditing and Accountability Journal, Vol. 20, Nr. 3, S. 382-402.<br>Aggarwal, N. (2003): Organizational Barriers to Market Orientation, In: Journal of Management Research, Vol. 3, Nr. 2, S. 87-97.<br>Allen, R.Y.W. (2002): Assessing the impediments to organizational change: A view of community policing, In: Journal of Criminal Justic, Vol. 30, Nr. 6, S. 511-517.<br>Al-Qirim, N. (2007): The adoption and diffusion of E-commerce in developing countries: The case of an NGO in Jordan, In: Information Technology for Development, Vol. 13, Nr. 2, S. 107-131.<br>Anumba, C.E.H., et al. (2006): Understanding structural and cultural impediments to ICT system integration: A GIS-based case study, In: Engineering Construction & Architectural Management, Vol. 13, Nr. 6, S. 616-633.<br>Attaran, M. und Nguyen, T.T. (1999): Design and implementation of self-directed process teams, In: Management Decision, Vol. 37, Nr. 7, S. 553-561.<br>Borins, S. (2000): What Border? Public Management Innovation in the United States and Canada, In: Journal of Policy Analysis and Management, Vol. 19, Nr. 1, S. 46-74.<br>Butler, J.C. (2006): Ten Lessons Learned: Data Warehouse Development Project, California Department of Fish and Game, In: CrossTalk: The Journal of Defense Software Engineering, Vol. 19, Nr. 10, S. 16-20 | Accepted -- the barriers highlighted in the comment are contained in the general types of barriers outlined at the start of 10.9; while the references suggested address barriers to business and industry generally, they are mostly not specific to mitigation of GHGs and therefore are not useful in this section. |
| 12631 | 10 | 45 | 7 | 45 | 35 | Of the 35+ CCS projects operating today there are many more projects that have had neutral to positive public support than have negative. | Noted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 12674 | 10 | 45 | 7 | 45 | 35 | Of the 35+ CCS projects operating today there are many more projects that have had neutral to positive public support than have negative. | comment is duplicate of 12631 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17541 | 10 | 45 | 8 | 45 | 8 | In what way are the impacts asymmetric? | Accepted - text revised |
| 17983 | 10 | 45 | 22 | 45 | 35 | Please provide a cross-reference to and liaise with Chapter 7 to bring the different discussions of CCS impacts across chapters (5, 6, 7, and 11) together. | Accepted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 16169 | 10 | 45 | | | | Many parts in this section are repeating the previous ones. Maybe the plan of the chapter could be modified to give the same information without coming back to the same topics, and thus saving pages. | Accepted -- redundancy reduced |
| 17545 | 10 | 46 | 14 | 46 | 19 | These statements are familiar platitudes and could be cut for length. | Accepted -- deleted |
| 8294 | 10 | 46 | 35 | 46 | 36 | Rohdin compiled barriers reported access to capital - needs to be reworded - unclear | Accepted -- reworded |
| 9537 | 10 | 46 | 39 | 47 | 8 | Please, move to other related chapter as this is general idea of CHP, rather than a specific industry sector. (CHP – whether applied in industry, in buildings or integrated with DHC networks – offers policy makers a very significant opportunity to achieve a number of energy and environmental goal s at relatively low cost compared to alternatives. (Cogeneration and district energy, 2009, IEA, p31) | Noted -- this section only deals with barriers to industrial use of CHP |
| 10021 | 10 | 46 | 39 | 46 | 42 | This part should be deleted or revised to explain that the energy efficiency of cogeneration depends on heat demand and that its efficiency would be low if heat is not utilized effectively. This claim is shown in (Pedro, 2012, page82). In addition, this part should also explain the huge potential of "heat pump technology", as described in (IEA, 2011, page16) and (IEA/OECD, 2010, page65-83).<br><br><Reference><br>[1] Pedro J. Mago, Amanda D. Smith (2012). Evaluation of the potential emissions reductions from the use of CHP systems in different commercial buildings,<br>Building and Environment 53, 74-82<br>[2] IEA (2011). Technology Roadmap: Energy-efficient Buildings: Heating and Cooling Equipment. Available at: http://www.iea.org/papers/2011/buildings_roadmap.pdf<br>[3] IEA/OECD Heat Pump Centre (2010). Special Task: Case Studies. Available at: http://www.heatpumpcentre.org/en/projects/specialtasks/casestudies/Documents/Case%20Studies%20report.pdf | Rejected -- CHP in industry raises specific barriers not generally common to other energy efficiency options; this section is not on technology options and other heat pump comments are considered replies associated with 10.4; literature given focuses mainly on CHP in buildings not industry |
| 17985 | 10 | 46 | 25 | 46 | 26 | Please use the term "barriers" but not "issues". The meaning of these terms differ in the AR4 Glossary and this difference might be kept in the AR5 Glossary. | Accepted -- barriers replace issues |
| 3029 | 10 | 47 | 1 | | | I am not very comfortable with the idea of considering the Clean Air Act (or other command and control policies for local pollutants) as a barrier to industrial CHP. Local pollutants regulation is a requirement of societies and should not be removed as a barrier to mitigate GHG emissions. | Accepted -- reference to the CAA removed |
| 10022 | 10 | 47 | 19 | 47 | 21 | This part should be deleted totally. Carbon pricing and international emission trading do not always result in reducing CO2 emission. In addition, CO2 leakage caused by the implementation of the ETS happened actually through transfer of industry from one country to others. Market mechanisms at least under Kyoto-like international scheme, where the condition of all countries' meaningful participation is not met, does not work well, as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No50 line of this table.<br>Even if there are not carbon pricing and international emission trading, CCS has problems such as high cost, difficulties in site selection, and difficulties in public acceptance, as shown in (Finkenrath, 2011, page39) and (Zobacka, 2012, Abstract). These literatures are listed in the No47 line of this table. | Accepted -- chapter 7 referred to on barriers to power decarbonisation |
| 9542 | 10 | 47 | 21 | | | Please, provide information of reference, IEA 2009c. | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now |
| 12355 | 10 | 47 | 25 | 47 | 25 | Regulatory and permitting uncertainties should not be regarded as a barrier. IEA 2007 is an old reference. EU Directive 2009/31/EC has now been implemented in most EU countries and can be applied world wide. | Accepted -- deleted and Ch7 referred to |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9538 | 10 | 47 | 3 | 47 | 8 | Please, reconisder here as CHP is one of mature technologies without a cost gap. (ETP 2010, IEA, p50) | Rejected -- CHP is not economic in all cases due to market barriers |
| 12036 | 10 | 47 | 32 | | | 3R is important means in general to save resources and reduce CO2 emissions. However, specific cases need to be assessed with LCA standpoints to prove if they are indeed contributing to CO2 emission reductions as compared to alternatives. Duarable materials may be recycled less frequent than short life products but may have more environmetal advantage as they require less energy and resources from LCA aspects. It must be noted that downgrade of quality frequently happens in recycling. Even for aluminum cans, roughly 30 percents cannot be returned for use to cans but to be sent to dicast or other applications. | Accepted -- aluminum recycling example removed |
| 6754 | 10 | 47 | 36 | 47 | 37 | "reduce, re-use, recycle" concept should be included early in the chapter. This is important concepts. | Accepted -- topic covered in 10.4. |
| 17546 | 10 | 47 | 42 | 47 | 45 | But Allwood and Cullen debunk this oft-stated optimistic claim. See p. 21, Allwood, J. M., J. M. Cullen, and M. A. Carruth. 2012. Sustainable materials with both eyes open. England: UIT Cambridge Ltd. | Accepted -- sentence deleted |
| 12014 | 10 | 47 | 42 | 47 | 45 | This kind of statement often misleads readers to believe recycling can be done endlessly. Actually, in almost all cases, downgrade of quality is inevibable even in aluminium products. It is true that some 95% of aluminium products are recycled, however, due to the quality downgrade only 65% of aluminium cans can be recycled to cans. It is important to recognize that longer use, or reuse is usually more energy and resource efficient than recyling.<br>http://www.alumi-can.or.jp/data_0101.html | Accepted -- sentence deleted |
| 8295 | 10 | 47 | 22 | 47 | 31 | paragraph on CCS seems to be a repeatition of what has been already said about CCS in sections 10.8.2 and 10.8.3 | Accepted -- redundancy reduced |
| 17986 | 10 | 47 | 22 | 47 | 23 | Please provide a cross-reference to and liaise with Chapter 7 to bring the different discussions of CCS impacts across chapters (5, 6, 7, and 11) together. | Accepted -- redundancy reduced and Ch7 referred to |
| 16171 | 10 | 48 | 16 | 48 | 19 | This sentence gives no clear direction, it is "either" "or", maybe to be removed. | Accepted -- sentence simplified |
| 7107 | 10 | 48 | 34 | | | Sentence does not make sense - "first", delete? See also how sentence follows up | Accepted -- section deleted |
| 7108 | 10 | 48 | 38 | | | I cannot see that Gössling et al. (2009) makes the claim that tourists are attracted by the behaviour of a minority of hypermobile tourists. The text outlines, though, that an increasing number of people move towards highly mobile lifestyles. | Accepted -- section deleted |
| 17547 | 10 | 48 | 38 | 48 | 39 | Not clear what "are ATTRACTED by the behaviour of a minority of hypermobile tourists" means. | Accepted -- section deleted |
| 7109 | 10 | 48 | 43 | 48 | 45 | "Should large-scale mitigation emerge…" how does this sentence refer to the previous one, and what is meant by large-scale mitigation? "Serious" (in political or scientific terms) mitigation, with concomitent consequences for transport? Or technology-based mitigation - which is not what I can read out of Becken (2005), or see substantiated by this reference? | Accepted -- section deleted |
| 5222 | 10 | 48 | 45 | 48 | 45 | There is a contradiction here with statements in chapter 8, page 8, line 16-20, and also logically; developing countries have to develop their infrastructure anyway and 'only' have to dedicate their investment to more sustainable mopdes like rail. So the funds are there and i do not see the limitation due to funds (invest less in road and more in rail). opportunities are therefore much better for developing countries that do not suffer from very high sunck cost in current infrastructure. To some extend countries like India still depend mainly on more sustainable transport, but need to invest in improving this and less in new unsustainable transport infrastructures like arorports. | Accepted -- section deleted |
| 16170 | 10 | 48 | | | | Key section to be retained, even in case of limited space. | Accepted -- section retained |
| 17987 | 10 | 48 | 4 | 48 | 19 | Although this subscribes to some substantial critique of current business models and the way of life of many people, it is presented in a rather factual language and does not provide many references to substantiate the claims made. Please reword and/or provide more references. | Accepted -- value judgements removed |
| 7721 | 10 | 48 | 20 | 48 | 30 | The description in this section is too old and not worth reading in 2014. The update could be done by asking TEAP experts based uopn the 2010 TEAP Assessment Report as well as the 2011 and 2012 TEAP Progress Report to the Montreal Protocol. | Accepted -- TEAP 2010 reference added (as UNEP, 2010) for HCFC replacement |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11137 | 10 | 48 | 21 | 48 | 30 | Consumption control of HFC use should be added (see USA/Canada/Mexico proposals/papers published under Montreal Protocol | Noted -- comment suggest a policy recommendation |
| 11138 | 10 | 49 | | | | Control of HFCs should be added to non-CO2 GHGs; Physical box | Accepted: control of HFCs is added |
| 9539 | 10 | 49 | | | | Please, check categories on the table as Cogeneration and CCS seem to be strange relative to other elements. Check also whether emissions efficiency is similar to emissions reduction. | Accepted -- cogen included in efficiency column and CCS included in emission |
| 17548 | 10 | 49 | | | | In the column "Non-CO2 GHGs", lower cost technology for PFC emission reduction is listed as a barrier. Shouldn't this be the lack of lower cost technology? Also this point is repeated in the last row. | Accepted -- suggested text added |
| 10023 | 10 | 49 | | | | According to the structure of the main text, "Cogeneration" should be mentioned in "Energy Efficiency". And "CO2 capture, utilization and storage" should be mentioned in "Emission Efficiency". "Heat Pump" should be considered in the same categorization as cogeneration with information of its huge potential, as described in (IEA, 2011, page16) and (IEA/OECD, 2010, page65-83). These literatures are listed in the No51 line of this table. | Accepted -- cogen included in efficiency column and CCS included in emission eff column |
| 15898 | 10 | 49 | 1 | | | simplify table 10.9 | Accepted -- table columns reduced to |
| 18525 | 10 | 5 | | | | It is surprising that there is so little on costs and potentials in the Executive Summary. One would expect the results of that section to be one of the major outputs of the chapter. | Accepted - the text on costs and potentials in the ES have been extended |
| 6719 | 10 | 5 | 2 | 7 | 7 | In order to make it fast and easy for the reader place cross-references for the statements. | Rejected - in ES usually no cross- |
| 2259 | 10 | 5 | 2 | 5 | 4 | There is no evidence that emissions of greenhouse gases hav any harmful effect on the climate. .This information is thus not a cause for concern so the whole Chapter is unnecessary. It is also surprising that while the supposed, unproven theory relies on changes in the atmospheric concentioin of greenhouse gases. you seem here to be exclusively concerned with emissions. which are not necessarily related to concentrations | Not specifically relevant for the industry chapter, general concern for the report |
| 15875 | 10 | 5 | 23 | 5 | 27 | Rather than saying that best practices are within 25-30% of technical limit (efficient Pareto frontier), you should look at gap between actual energy use and best practice. This is more usefulness to industry and policy makers in order to make real near-term gains. Also regional variations (OECD vs. developing nations, where developing nations = over 75% of industrial production, p.11) need to be considered. | Accepted - this is now explicitly mentioned in point 3 of the Executive Summary and acrosss the sections (e.g. 10.4, 10.7). Moreover the differences |
| 4539 | 10 | 5 | 23 | 5 | 27 | The claim of 25-30% and the appraching of technical limits is based on a few sectors. It cannot be generalized to all industry, not even energy-intensive industries. This is an example of a blanket statement, that in the body of the chapter is only backed up with a few selective references. | Accepted, cf. Comment 15875 |
| 12341 | 10 | 5 | 28 | 5 | 34 | In the last sentence, options beyond energy efficiency is mentioned. CCS should be added to the last sentence (line 33 and 34) to reflect the huge potential of CCS in line with the other options mentioned. | Rejected - CCS still included under point 9 "Long-term step-change options". CCS is nevertheless considered within the group of "emissions efficiency" |
| 12006 | 10 | 5 | 28 | 5 | 34 | Contribution of industry sector as providers of goods to be used in other sectors to save or generate energy should be mentioned. Many of the materials for the purpose tend to be energy intensive, e.g. carbon fibers, and silicon. | Accepted: this important aspect is now reflected in point 8 of the ES |
| 10796 | 10 | 5 | 3 | 5 | 9 | Are these numbers right? 0.83 in year 1990 grew to 11.00 in 2009? | Accepted - typo |
| 15876 | 10 | 5 | 35 | 5 | 41 | Material efficiency / demand – the chapter discussed the final end state for emerging nations (will China = Japan or US?) and the willingness and practicality of nations to choose end states based on emissions footprint (eating meat, car size, etc). There are several references in text to car sharing, lower meat consumptions, etc. Rather than sending a message of top down regulation of behaviour, perhaps the chapter should discuss Environmental valuation, namely including the cost of externalities (e.g., cost of emissions, waste, water use, climate change adaptation, etc) in product prices. Then, choices would be governed by simple supply-demand curves (e.g., see Worley-Parsons EcoNomics model, by Paul Hardisty, as a practical example of this) | Noted - the chapter tries to outline the full range of options (please see revised 10.1 text, equation and figure ); regulation of consumption patterns as an policy instrument is not mentioned in the chapter. We acknowledge importance of internalisation of environmental costs but this is covered in framing and policy chapters of the report |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7525 | 10 | 5 | 35 | 5 | 34 | "Material Efficiency" is a current continuing advance rather than "an additional promising and largely unexplored option". The use of high-tensile steel for car is a good example.<br><br>In the context, business as usual scenarios (BAUs) of material demand include a certain "Material Efficiency" progress. Future material service and "Material Efficiency" are uncertain; however, additional "Material Efficiency" is less controllable.<br><br>As a result, “Low agreement” is appropriate. | a) Accepted - wording changed. b) Noted. see revised Executive Summary for the considerations on BAU and model projections regarding material efficiency: "The models running future long-term scenarios also envisage rising production rate of materials (...). But material flows and opportunities for material efficiency to mitigate emissions |
| 2278 | 10 | 5 | 35 | 5 | 41 | Wording could be interpreted differently. Although the idea of using materials longer, sharing products, etc. "using less new material" could also mean using lighter weight new materials such as increased use of advanced high strength steels to replace standard steels resulting in lighter weight products - primarily automotive industry to increase gas mileage. This is also important because making new materials from stronger materials makes them smaller - using less materials (less GHGs). Assuming new materials have similar embodied GHG | Accepted - the various dimensions of material efficiency are explained in the introduction to section 10.4 (space constraints do not allow detailed explanation in executive summary) |
| 10199 | 10 | 5 | 35 | 5 | 41 | Especially l. 37-39: what about reduced consumption? This would results in reduced energy and material use, reduced energy emissions, reduced waste disposal and increased health | Accepted - SOD very clearly mentions this in ES (point 7), introduction and |
| 17173 | 10 | 5 | 41 | 5 | 42 | The text says, ‘While spatial planning can influence energy use and emissions, there are limited quantitative assessments of the emissions savings through spatial planning strategies’. Due to the very different urban contexts (city size, geographical setting, affluence level, dominant culture, social cohesion/segregation etc.), it should not at all be an aim to develop general figures for savings potentials. Rather, examples form different cities could be mentioned, leaving it up to the users of the information to assess whether the context of the example is sufficiently similar to the planning context at hand. (See Næss, 2004 and Næss & Strand, 2012 for more elaborate discussion.) | This comment has been addressed to Ch.10 by error and is meant as a comment to Ch.12. Please see Comment ID 19006 for the answer by the Ch.12 author team |
| 6751 | 10 | 5 | 42 | 5 | 42 | This is the first time CCS is declared but not out written. The abbreviation is written out in page 44 row 45 | Accepted - copyedit to be completed |
| 16135 | 10 | 5 | 42 | 5 | 44 | There are several radical process options in the pipeline, such as the innovative cement processes at the pilot stage. These options do have difficulties in implementation to replace the existing stock of plants. But in this major case, there is no CCS involved. The point 8 should be broadened in this respect. | Accepted - text revised (see point 9 of ES) |
| 12342 | 10 | 5 | 42 | 5 | 44 | All of the (individual) components of integrated CCS Systems exist and are in use today in different sectors. The risk is probably not a technological risk, but an economic risk. The current knowledge of CCS and the challenges related to it, is thoroughly described in the Energy Chapter (chapter 7, page 31, line 5 to 7) and should be the basis also for the description in the Industry chapter (as it provides a more updated view). | Accepted - CCS-related text in chapter 10 has been shortened and revised, with stronger focus on industry-specific aspects and more cross-references to |
| 12007 | 10 | 5 | 45 | 6 | 2 | Emissions from Chemical sectors are expected to increase to supply goods for energy saving and renewables energy generations, which much more than offsets the increased emissions in the chemical sectors. ICCA report, July 2009 | Accepted - important aspect which is included in the ES (point 8) and in section 10.5 |
| 8439 | 10 | 5 | 8 | 5 | 8 | the 1990 data is clearly wrong (see Figure 5.2.3) | Accepted - typo |
| 14409 | 10 | 5 | 8 | | | Is “0.83” a typo? Looks far too small. | Accepted - typo |
| 15874 | 10 | 5 | 8 | | | 0.83GtCO2 should probably read 8.3Gt? or 7.9Gt (table 10.2). Make sure data in ES are consistent with rest of text! | Accepted - typo |
| 10132 | 10 | 5 | 8 | | | 0.83 GtCO2 energy-related emissions in 1990 for manufacturing must be a typo. On page 14, line 21 the primary enery use in the manufacturing industry is described as 129 EJ in 1990, which does not fit with the aforementioned CO2 emissions for 1990. A second figure showing the development in process emissions from chemical reactions should be shown as well. | Accepted - typo |
| 12005 | 10 | 5 | 8 | 5 | 8 | Is 0.83Gt CO2 in 1990 correct? | Accepted - typo |
| 11128 | 10 | 5 | 7 | 5 | 7 | Electricity is also produced on site through CHP | Rejected - this is considered as part of |
| 12947 | 10 | 5 | 29 | 5 | 30 | Expected increase in emissions not given a date (should be 2050 I think) | Accepted - dates for all projections now |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12948 | 10 | 5 | 43 | 5 | 44 | Other reason for slowness of CCS development: lack of sufficiently high CO2 price/lack of economic model to support it commercially. | Noted - but CCS-related text in chapter 10 has been shortened and revised, with stronger focus on industry-specific |
| 17549 | 10 | 50 | | | | Remove original caption. Very hard to read in black & white. | Noted - but figure no longer appears in |
| 4284 | 10 | 50 | | | | Chapter 10.10.1 One general comment. I am fully missing energy audit as a policy. Normally, energy audits are the first step in succesful adoption of energy management practices and are the most common means of promoting energy efficiency in industrial SMEs and non-energy efficient companies but ar ealso mandatory components in e.g. LTAs or VAs. Please note that the succes of the Learning networks you refer to is 1) energy audits and two 2) the actual network where industry respondents meet and discuss their improvements and ideas for future such. | Accepted |
| 4285 | 10 | 50 | | | | Chapter 10.10.1 I am also missing the fact that energy management may not only be regarded to include technical measures. This comment holds for the whole chapter. Please see Thollander and Palm (2012) (Improving Energy Efficiency in Industrial Energy Systems - An Interdisciplinary Perspective on Barriers, Energy Audits, Energy Management, Policies, and Programs, Chapter 8 (and chapter 6), ISBN 978-1-4471-4161-7) where it is shown in Figure 4, chapter 8, that energy management could contribute to significantly higher energy efficiency potentials. Please also see Backlund, S., Thollander P, Palm, J., Ottosson, M., 2012. Extending the energy efficiency gap. Accepted for publication in Energy Policy holding the same line of arguments. | Accepted - we didn't get the book till just after submission but will consider it for final draft |
| 15891 | 10 | 50 | 13 | | | can't read this fig. | Noted - but figure no longer appears in |
| 17550 | 10 | 50 | 14 | 50 | 15 | Add "in IEA +5" to caption | Noted - but figure no longer appears in |
| 15926 | 10 | 50 | 19 | 50 | 28 | Might state which policies work best and describe how they work (what kind of incentives?) | Rejected - the factors that work best are described, for space reasons the specific instruments cannot be described in detail. The coment is not specific about |
| 4282 | 10 | 50 | 19 | | | Please note that Voluntary agreements (VA) may also be referred to as LTA (Long-term agreements). I suggest a footnote here clarifying this. Your ref to Rezessy and Bertoldi 2011 refers to LTAs. Please also include ref to the Swedish Scheme (Stenqvist and Nilsson, 2011 from the Journal Energy Efficiency). | a) Rejected - term is widely understandable. B) accepted |
| 18557 | 10 | 50 | | | | Please make sure that any policy category that is introduced matches the framework presented in Chapter 3. | Accepted - the framework agreed in cross-cut discussions was used |
| 18558 | 10 | 50 | | | | A reader sorely misses a synthesis of the subsections on policy, clearly answering the question: "which policies are the most important for each mitigation option in industry?". The answer to this question would eventually be brought into the Technical Summary and SPM. | Taken into account - statement with caveats and syntesis now included at the end of the section. |
| 15889 | 10 | 50 | 1 | | | Sectorial policies section could be shortened and could highlight/focus on examples of which policies are more successful | Taken into account when revising the section |
| 7116 | 10 | 51 | 24 | | | ".. Institutions like OECD and UNEP consequently are calling" - why is there no reference to OECD and UNEP here, rather than to Dubois? Wrong references? Check even subsequent section, where the same references appear to have been used. | Accepted - there was a problem with the references in the last paragraphs of section 10.10. References now correct |
| 10024 | 10 | 51 | 3 | 51 | 4 | This part should be deleted completely. Cap & trade schemes have not been effective to reduce GHG emissions and enhance energy efficiency in energy-intensive industry. CO2 leakage caused by the implementation of the ETS happened actually through transfer of industry from one country to others. Market mechanisms at least under Kyoto-like international scheme, where the condition of all countries' meaningful participation is not met, does not work well, as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No50 line of this table. | Accepted - EU ETS discussed in Chapter 15 |
| 17551 | 10 | 51 | 33 | 51 | | Paragraph is in past tense. Are the programs over? | Rejected - past tense only used to say that a review has been made |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4564 | 10 | 51 | 33 | 51 | 39 | I do not think energy management standards are mandatory in many of the countries quoted; certainly not in The Netherlands. | Accepted - text revised |
| 4283 | 10 | 51 | 35 | | | Same here, the Swedish program is missing, e.g Nilsson and Stenqvist, 2011 (in Energy Efficiency) | Taken into account |
| 10283 | 10 | 51 | 9 | 51 | 17 | The main reason that the carbon leakage did not observed in EU ETS is low carbon prices in the market due to economic crisis etc. It cannot be insisted that ETS scheme or ETS with free allowances have small impacts on carbon leakages. The draft descriptions will mislead readers, and should be revised. | Accepted - text revised |
| 11139 | 10 | 51 | 9 | 51 | 17 | This is clearly an over-simplication of the carbon leakage scenario in EU. Studies by both Climate Strategies and The Carbon Trust demonstrate that there are sector specific impacts. | Accepted - text revised |
| 4563 | 10 | 51 | 9 | 51 | 17 | The discussion on ETS is extremely selective and provides really wrong insights A wide body of literature is available around the EU-ETS, which is not used. Generally, the conclusion is that ETS had had little to no effect until now due to over-allocation in Period I and the crisis in Period II. The current section seems to suggest the opposite.... | Accepted - text revised |
| 9306 | 10 | 51 | 5 | 51 | 8 | Basically, EU-EST is only "regional" policy. Therefore, this paragraph should be moved to right place in 13.6.1.1 on page 32. Furthermore, since there is no reference of (Jochem and Gruber 2007) in Reference between page 70 and 106, I would suggest to delete it. | Rejected: the sectorial policy section has to rely on specific examples for sector specifc policies, but should also build the bridge to the more overarching policy instumenst discussed in chapter 13-15. The EU ETS is a very good bridge building example which high relevance particularly for the industry sector in the EU. Moreover: due to an editorial |
| 9307 | 10 | 51 | 9 | 51 | 17 | This is wrong analysis. Small effect of ETS on carbon leakage results mainly from shrinkage of European market due to Lehman shock or European finance crisis. It cannot be said that the scheme of ETS itself has no impact on carbon leakages even if free allowances are implemented.<br>Furthermore, it is seen that most of such studies based on ER20-30/tCO2 suggest small impact on carbon leakage under free allocation. Therefore, it should be stated that the current carbon price in the EU-ETS is lower than its prerequisite of ER20-30/tCO2.<br>In addition, since there are no references of (Reinaud 2008) and (Clo 2010) in Reference between page 70 and 106, I would suggest to delete both references. | Accepted. Moreover: due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now been resolved |
| 12632 | 10 | 52 | 21 | 52 | 23 | CCS legal and regulatory frameworks have been put in place in Australia and many parts of Europe and USA. I therefore do not feel signling out regulatory uncerntainy as an issue solely for CCS is appropraite. Please see the IEA CCS Model Regulatory Framework and IEA CCS Legal and Regulatory Review for references. CCS is also now included in the CDM as of COP 17 in Durban. | Accepted (moreover CCS-related text in the industry chapter has been shortened to avoid overlaps with chapter 7) |
| 12675 | 10 | 52 | 21 | 52 | 23 | CCS legal and regulatory frameworks have been put in place in Australia and many parts of Europe and USA. I therefore do not feel signling out regulatory uncerntainy as an issue solely for CCS is appropraite. Please see the IEA CCS Model Regulatory Framework and IEA CCS Legal and Regulatory Review for references. CCS is also now included in the CDM as of COP 17 in Durban. | comment is in duplicate, see reply in 12632 |
| 10025 | 10 | 52 | 4 | 52 | 8 | This part should be deleted completely because it is not necessary to adopt cap & trade scheme for non-CO2 GHG, considering successful example of capturing SF6 in Japanese power industry. Such Japanese examples is shown in (Nishimura, 2008, abstract).<br><br><Reference><br>[1] Nishimura et al ( 2008 ) . Mitigation of Non-CO2 Greenhouse Gases ( Y07012 ) . Available at: http://criepi.denken.or.jp/jp/kenkikaku/report/detail/Y07012.html | Taken into account as an example, but case reviewer gives is for power industry which is not within our scope. Text does not say that inclusion in the cap & trade system is a must, but more an option. |
| 7100 | 10 | 53 | 17 | 53 | 21 | References (Anderson and Newell 2004, etc.) - these appear to be misplaced, as the text refers to OECD and UNEP (2011), which is the review of tourism-related climate change policies. The sentence "Policies may vary…" does not make sense? | Editorial - copyedit to be completed prior to publication |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8296 | 10 | 53 | 20 | | | … according TO the forms .. | Editorial - copyedit to be completed prior |
| 8297 | 10 | 53 | 38 | 53 | 42 | Sentence too long and unclear | Editorial - copyedit to be completed prior |
| 8298 | 10 | 53 | 43 | | | results in the table ARE derived | Editorial - copyedit to be completed prior |
| 17552 | 10 | 54 | 15 | 54 | 15 | The word "both" doesn't make sense. | Editorial - copyedit to be completed prior |
| 8300 | 10 | 54 | 15 | | | changing prices haVE on ?both? Energy service demand | Editorial - copyedit to be completed prior |
| 5223 | 10 | 54 | 18 | 54 | 21 | It is true that global scenarios are currently not available for tourism in the context of climate change mitigation (there are some for adaptation, e.g. Ciscar, J.-C., Iglesias, A., Feyen, L., Szabo, L. s., Van Regemorter, D., Amelung, B., Nicholls, R., Watkiss, P., Christensen, O. B., Dankers, R., Garrote, L., Goodess, C. M., Hunt, A., Moreno, A., Richards, J., & Soria, A. (2011). Physical and economic consequences of climate change in Europe. Proceedings of the National Academy of Sciences, 108, 2678-2683).<br>However, for a PhD thesis I am now almost finished with a global tourism emission model that allows for doing scenarios up to 2100. Included are policy imputs for cost, infrastructure investments, transport system quality and technological development. having fully reviewed paper out on scenario runs is envisaged next year. Happy to help to this respect. Still, the UNWTO presented BAU scenario sets the scen for measures as does the Peeters et al., 2010 reference used earlier in this chapter. | Noted - section has changed significantly in SOD, tourism now framed differently in the chapter (see comment 2279. Will check if results of Phd thesis can be used if the results of the phd have been published before FD submission |
| 8299 | 10 | 54 | 4 | 54 | 7 | Consider revising the wording, unclear. | Editorial - copyedit to be completed prior |
| 17553 | 10 | 55 | | | | Table is too faint to read and review. | Accepted - section has changed significantly in SOD and new figures are |
| 12015 | 10 | 55 | | | | Not readable and I can not understand what these graphs mean. | Accepted - section has changed significantly in SOD and new figures are |
| 8301 | 10 | 56 | 27 | | | the 2DS scenario IS exploring | Editorial - copyedit to be completed prior |
| 6927 | 10 | 56 | 44 | 56 | 46 | The statement "describing a pathway which tries to limit the rise in global average temperature to 4°C by 2050." is completely wrong; according to IEA ETP (http://www.iea.org/etp/explore/) it should rather be something along the lines of: limit the LONG-TERM RISE in global average temperature to 4°C which requires significant ADDITIONAL CUTS IN EMISSIONS in the period after 2050additional cuts in emissions in the period after 2050. The 4DS scenario is described as follows on the IEA ETP website: "The 4°C Scenario (4DS) takes into account recent pledges made by countries to limit emissions and step up efforts to improve energy efficiency. It serves as the primary benchmark in ETP 2012 when comparisons are made between scenarios. Projecting a long-term temperature rise of 4°C, the 4DS is already an ambitious scenario that requires significant changes in policy and technologies. Moreover, capping the temperature increase at 4°C requires significant additional cuts in emissions in the period after 2050." Please make sure to cross-check the accuracy of other scenario descriptions in your Chapter with the original source(s). | Accepted - text has been revised |
| 16172 | 10 | 57 | | | | Tables 10.11, 10.12, 10.13 give a misleading idea that "all scenarios are alike". This choice remove part of the point of the last sections in the chapter, i.e. there is room for manoeuver in more systemic or radical changes. For example, invididual energies remain nearly the same. Historically, though, entire branches have switched fuels or adopted technologies in rather short periods, phasing in or out fuels, for example the sugar industries. If the benefits of recycling is rewarded, even paper or glass may change fast. In all, the scenarios illustrate that the "absence" of radical technology implementation will limit the change in energy consumption patterns of industries. It is not helpful. | Noted - section has changed significantly in SOD and new figures are used |
| 8302 | 10 | 57 | | | | Additional Investment needs are zero for the 4DS scenario? | Rejected - comment unclear, no discussion about investment at this |
| 15892 | 10 | 57 | 1 | | | add production values for each industry sector (e.g., tonnes/yr), and their intensity (e.g., J/tonne) forecasts | Noted - section has changed significantly in SOD and new figures are |
| 15893 | 10 | 57 | 6 | | | add production values for each industry sector (e.g., tonnes/yr), and their intensity (e.g., J/tonne) forecasts | Noted - section has changed significantly in SOD and new figures are |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15894 | 10 | 57 | 8 | | | add production values for each industry sector (e.g., tonnes/yr), and their intensity (e.g., J/tonne) forecasts | Noted - section has changed significantly in SOD and new figures are |
| 6756 | 10 | 58 | 31 | 58 | 31 | Could not carbon taxes for aircrafts together with investments in railways be added here. | Taken into consideration - policy section addresses the instrument of carbon taxes |
| 7113 | 10 | 58 | 33 | 58 | 36 | Please clarify sentence. | Editorial - copyedit to be completed prior |
| 8303 | 10 | 58 | 35 | | | "what" instead of "how" | Editorial - copyedit to be completed prior |
| 7114 | 10 | 58 | 39 | | | how can emissions from air transport and accommodation triple at 130% projected growth, please clarify. | Accepted - text has been revised |
| 6755 | 10 | 58 | 7 | 58 | 27 | State the risks with the different solution, especially has the CCS technology been criticised earlier in the report, e.g. page 45, however here it is put forward as high potential solution. No doubt about that, however it feels strange for the reader. | Taken into account - overlaps with chapter 7 (Energy) on the topic of CCS have been removed from the text where |
| 7517 | 10 | 58 | 13 | 58 | 14 | 80% with CCS is overstated. For example, IEA(ETO2012) predict one third of CO2 emission even in 2deg.C senario, even in 2050. | Accepted - text has been revised |
| 16173 | 10 | 59 | | | | This figure is excellent because it includes both projections and potentials. | Noted, thanks. |
| 17554 | 10 | 59 | | | | X-axis labels have misspellings. | Editorial - copyedit to be completed prior |
| 7101 | 10 | 59 | 2 | | | Reference is UNWTO, UNWTO and WMO (2008), see also line 8, same page, as well as throughout text | Accepted |
| 17555 | 10 | 59 | 25 | 59 | 25 | 38% seems very high, but the references can't be checked because they aren't in the reference list. Also 38% in what year? | Taken into account. Due to an editorial problem chapter 10 had the reference list of a different chapter. This problem |
| 8304 | 10 | 59 | 4 | 59 | 6 | move "CO2 emissions" to after "reduction", i.e. reduction in CO2 emissions | Editorial - copyedit to be completed prior |
| 18559 | 10 | 59 | | | | A lot of the information presented here may be better placed in 10.8. A more thorough, focused discussion of the differences between the IAM community results and BU studies on industry will need to be developed and expanded in this section. | Accepted - section has been revised |
| 7518 | 10 | 59 | 24 | 60 | 2 | It is not clear what is the difinition of "Green job" of sttel industry. New technology is able to be developed to reduce CO2 emission to produce steel by exinting "large global stel producers". Since breakthrough technology development requires huge financial resorces and long research and development activity at which no return can be expected for rather long period. Only challenging large company can bear such development work. | Accepted: text has been revised, thisstatement no longer appears in the revised discussion of employment impacts (end of section 10.10.2) |
| 7115 | 10 | 6 | 12 | | | Please add: "…significant mitigation measures for the tourism sector can only be achieved through changes in demand and lifestyle". | Noted - see point 7 of new ES. Nature of discussion on tourism has changed, cf. |
| 15760 | 10 | 6 | 13 | | 16 | Seems like this would require incredible coordination across many different industries and individual companies. Might be possible were govts have a strong hand in industrial development; much more difficult in places like the U.S. | Accepted - complexities of industrial cooperation should be better acknowledged in barriers section 10.9, |
| 4791 | 10 | 6 | 17 | 6 | 19 | It could be different for other sectors. For instance regarding energy, hydropower plant with reservoirs, in addition to generate power, will also provide other benefits suhc as water storage and for instance flood control, navigation, irrigation, etc. | The example does not concern industry, comment is mostly relevant for chapter 7 |
| 8818 | 10 | 6 | 24 | 6 | 26 | It would be more specific to say that the short term payback promoted by speculative capital make mitigation with substantial but longer term paybacks make financing mitigation investment difficult to obtain in the absence of legislative requirements. | Accepted - text revised (see point 17 of ES) |
| 15878 | 10 | 6 | 24 | 6 | 30 | Additional Barriers to add:<br>o Volatile energy prices (high prices favour efficiency, low ones do not)<br>o Infrastructure Lockin (long life of facilities (30-50 years) limits new builds, tradeoffs between brownfield retrofits vs. green-field new builds)<br>o Economics (NPV, hurdle rates, use of high discount rate vs . lower “social” discount rates, how to value long term opex savings)<br>o capital allocation – tradeoffs between more production (making money), efficiency (saving money), and reliability and safety issues | Taken into account - some of these barriers could be mentioned in section 10.9, although in most cases they are dealt with in the general framing and policy chapters of the report (including the Finance chapter). The paragraph in the ES is only a list of selected examples. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11045 | 10 | 6 | 25 | 6 | 26 | Not only new and additional approach and review the existing finance mechanism is needed as well. Please see Aaron Atteridge, Clarisse Kehler Siebert, Richard J. T. Klein (2009)Bilateral Finance Institutions and Climate Change - Stockholm Environment Institute, Working Paper - 2009 Environment Institute, Working Paper - 2009 ... | Taken into account - however due to space restriction a more in-depth discussion can be found in the finance chapter of the AR5 |
| 12343 | 10 | 6 | 27 | 6 | 28 | (Lack of) public acceptance regarding CCS can be managed by information and should not be regarded as a real obstacle. Consider to delete. | Accepted - removed from point 17 of revised ES |
| 15877 | 10 | 6 | 3 | 6 | 5 | Should include oil & gas upstream and refining, coal mining in this category since these industries have adopted many best practices and improved energy efficiency substantially. Chap. 7 only addresses these industries very superficially. | Rejected - those industries are dealt with in the energy chapter (chapter 7) |
| 12008 | 10 | 6 | 35 | 6 | 35 | What "complemenary policies" mean here to address what issues? The term should be clearly defined. | Accepted - sentence removed |
| 16136 | 10 | 6 | 37 | 6 | 42 | This finding that most scenarios involve an increase of energy demand from industry should be precised "in emerging countries" because it is misleading for developed country decision makers. In industrialised countries, demand is stable or decreasing. | Taken into account - longterm pathway discussion in the ES and main text (section 10.10) have been significantly |
| 15880 | 10 | 6 | 37 | 6 | 42 | Energy intensity (J/GDP) is not truly representative of sector energy performance or efficiency. You should use J/unit output instead (e.g., J/tonne product, J/barrel, etc). The cement section addresses this well, but others sections do not. Also need to mention/discuss structural (e.g., light vs heavy industry) vs. technical (really efficiency gains) components of J/GDP metric.<br>Note that electrification might result in less CO2 for an industry but might also be less efficient if you include the losses and emissions in the power plant | Taken into account - longterm pathway discussion in the ES and main text (section 10.10) have been significantly revised in light of results from modelling exercise. |
| 17484 | 10 | 6 | 43 | 6 | 43 | Awkward wording: "Technology oriented scenarios show possible future pathways describing that CO2 emissions" | Editorial - copyedit to be completed prior to publication |
| 6604 | 10 | 6 | 44 | 6 | 46 | Delete the sentence. It might be misunderstood that IPCC encourages a specific scenario i.e. 2DS. | Taken into account - longterm pathway discussion in the ES and main text (section 10.10) have been significantly |
| 15761 | 10 | 6 | 45 | | 46 | What is the likelihood/feasibility of achieving a 20% reduction? | Taken into account - longterm pathway discussion in the ES and main text (section 10.10) have been significantly |
| 16898 | 10 | 6 | 7 | | 12 | Suggest deleting this -- people find great utility from tourism as indicated by their willingness to pay a fairly high amount to engage in it. Air travel is a fairly small wedge of total emissions. The value of a market based system is not only that it tends to reduce the lowest costs reductions first, it also delays or gives time to find out other ways to reduce emissions for activities we value the most. Perhaps another way to think of it is that emissions from some activities are highly valued -- travel being one of those. Not all sectors should reduce at the same rate or hit the same targets -- the menu laid out in this paper seems to suggest they should. This goes against the meaning of market based policies discussed in other parts of the report. | Noted - but scope of discussion on tourism has changed in SOD, cf. Response to comment 2279. |
| 11129 | 10 | 6 | 24 | 6 | 30 | Commercially availability of alternatives is still a barrier to HFC replacement | Accepted - this barrier is explicitly discussed in section 10.9.5. However the paragraph in the ES is only a list of |
| 12949 | 10 | 6 | 2 | 6 | 2 | Not relevant and not necessarily true. Are Solar PV likely to be significant as a share of global industry emissions? Are solar PV production going to lead to an net increase in global emissions? Probably not. Not even necessarily in industry if they contribute to electrification of manufacturing. | Taken into account - Text has been revised to avoid a misunderstanding. However PV production is a source for non-CO2 emissions, maybe not the most important one, but as we try to address typical mitigation options and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12950 | 10 | 6 | 4 | 6 | 5 | Second sentence of paragraph not relevant or not clear enough | Taken into acount - the sentence "Particularly many emerging economies typically produce more than they consume" (referring to extractive |
| 9540 | 10 | 60 | 13 | 60 | 16 | Please, reflect the different view to job creation; the U.S. should expect a loss of at least 2.2 jobs on average, or about 9 jobs lost for every 4 created, to which we have to add those jobs that non-subsidized investments with the same resources would have created. (Study of the effect on employment of public aid to renewable energy sources, 2009) | Accepted - text revised in end of section 10.10.2. The text has been revised to to echo the different views held on the |
| 12016 | 10 | 60 | 13 | 60 | 14 | Explanation needs to be added to what kind of job creation policies with job support creat what kind of jobs by how many. In addition, it should be shown that what kind of jobs will disappear how many. Socially, the sensitivity is higher in areas where jobs will be lost and it is important to show what kind of policy measues can address the problem to what extent. | Accepted - text revised in end of section 10.10.2. |
| 10026 | 10 | 60 | 13 | 60 | 16 | This part should be deleted totally or revised to explain that mitigation policies can rather lead deindustrialization. As a result, economic recession will be caused by inflation of energy cost, as described in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No50 line of this table. | Accepted - text revised in end of section 10.10.2. |
| 9377 | 10 | 60 | 13 | 60 | 16 | It should also be written that climate change mitigation policies can cause a rise of energy prices and a hollowing out of manufacturing industry which leads to economic downturn.<br>Employment creation is realized as a result of the policy tradeoff(Berndes and Hansson,2007).Thus mitigation policies are not always link to job creation. | Accepted - text revised in end of section 10.10.2. The text has been revised to capture the fact that only through job support mechanisms and policy trade- |
| 17556 | 10 | 60 | 37 | 60 | 42 | This sentence is convoluted and much too long! | Accepted |
| 15872 | 10 | 61 | 23 | 61 | 26 | missing a verb in this sentence | Editorial - copyedit to be completed prior |
| 17558 | 10 | 61 | 25 | 61 | 26 | Verb missing | Editorial - copyedit to be completed prior |
| 15873 | 10 | 61 | 39 | | | there are many other technologies other than heat pumps that could benefit from more R&D | Accepted - text revised |
| 10027 | 10 | 61 | 39 | 61 | 39 | This part should be kept in SOD and, if possible, should mention how much potential heat pump has at higher temperatures. | Accepted: however a speific discussion of the potential of single technologies is |
| 15871 | 10 | 61 | 4 | | | In gaps section (10.12), there is lots of discussion on lack of data. Authors could leverage lifecycle analyses and databases (e.g., Simapro, GaBi) for more data. Also section could be streamlined and could discuss R&D needs in a bit more detail. | Rejected: space constraints do not allow comprehensive discussion |
| 17557 | 10 | 61 | 5 | 61 | 7 | What about the complexity of the interrelationshps? Isn't that a key factor? | Accepted |
| 7519 | 10 | 61 | 23 | 61 | 27 | Very important issue with an appropriate explanation | Accepted |
| 15269 | 10 | 61 | 17 | 61 | 22 | I agree with the importance of the mitigation/emission assessment to attribute the environmental impacts of the each step of supply chain (furthermore, it may be able to include the emission/mitigation during its use.). Therefore, I think it is better to summarize the current state of “assessment method” including LCA, and input-output method somewhere in this chapter, to give some hints to the readers. Eventhough, it might not be a perfect soluion, I believe that a sufficient evaluation method will enhance inter-sectional or cross border mitigation. | Rejected: space constraints do not allow comprehensive discussion |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17559 | 10 | 62 | 10 | 62 | 15 | A discussion/explanation of carbon leakage doesn't belong in a list of gaps in knowledge | Accepted - text revised |
| 8305 | 10 | 62 | 18 | | | "potential energy efficiency improvement potential" - remove extra "potential" | Editorial - copyedit to be completed prior |
| 5224 | 10 | 62 | 31 | 62 | 31 | Suggest to add the radiative forcing share here as well (between 5 and 12%, though numbers vary a bit depending on the source you choose). | Rejected: comment not clear (context to discussion at this place is missing) |
| 12017 | 10 | 62 | 42 | 62 | 44 | It should be mentioned that the goods which contribute GHG emissions reductions at end use tend to use energy intensive materials such as carbon fires and silicon. Better quality products for longer use may need more energy to produce as compared with regular quality products. These imply that emissions at production may increase. Such an implication should be stated. | Taken into account in revision of chapter |
| 8502 | 10 | 62 | 32 | 62 | 36 | Option for mitigation of GHG emission from industry can consider action of raw materials subsitution e,g from PVC plastic packaging to biomass plastic packaging which emit less CO2 in process and during end of cycle. | Taken into account in revision of chapter |
| 17560 | 10 | 63 | | | | This figure should show disposal for (pre-consumer) industrial wastes along with post-consumer wastes. | Taken into account - but EDGAR database only contains data for post- |
| 17561 | 10 | 63 | 18 | 63 | 18 | "Waste to wealth" (using a variety of labels) is hardly a new concept!! Henry Ford was prominent proponent. Authors in Victorian England were passionate about it. See Desrochers, P. 2000. Market processes and the closing of "industrial loops": A historical reappraisal. Journal of Industrial Ecology 4(1): 29-43. | Taken into account - text revised. |
| 18560 | 10 | 63 | | | | This section is recognizably at an early stage. It may nonetheless be worthwhile to consider restructuring it according to the AR4 model (with indirect and direct mitigation strategies). The sections on Waste from chapters 5 (5.7.5) and 12 (12.4.3.11) could be integrated directly into this text. | Taken into acount. It is not possible to restructure the chapter to be similar to AR4 as space given to this section is limited compared to AR4. However, coordination has been done with other |
| 18561 | 10 | 63 | | | | To save space Figures 10.13 and 10.14 could either be deleted or merged. | Accepted - figures have been merged |
| 8354 | 10 | 63 | 3 | 69 | 26 | Chapter 10 is about industry sector. Therefore it would be better than waste sector is moved to separate chaper like AR4 WG III or chapter 11 (AFOLU) in AR 5. | Rejected - It was decided to include the waste sector as a subsection to the industry at a late stage after the approval |
| 9076 | 10 | 63 | 3 | 69 | 26 | 10.14 Waste- suggest to be treated as a separate chapter | Rejected - It was decided to include the waste sector as a subsection to the industry at a late stage after the approval |
| 17563 | 10 | 64 | | | | Some discussion of the impact of waste prevention on GHG emissions should be included. U.S. Environmental Protection Agency and Office of Solid Waste and Emergency Response. 2009. Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices: U.S. Environmental Protection Agency.<br>The statement about informal recovery is confusing. What about the involvement of the informal sector?<br>Incineration: Co-combustion of what? | Taken into account - included under waste minimization |
| 17562 | 10 | 64 | 5 | 64 | 6 | This sort of statement should be supported with a reference. | Taken into account - text revised |
| 8503 | 10 | 64 | 11 | 65 | | For waste handling activity, it good to mention types of storage container and GHG emission amount whenever it being disposed or incinerated. Especially during incineration, plastic container emit many types of GHG emission as well as other gases. As compare if the storage container made from the paper. This issue normally happen in incineration of Medical waste from hospital | Rejected - reference to emissions from waste handling in the table covers only the handling and transportation and not incineration. This table no longer |
| 8504 | 10 | 64 | 11 | 65 | | GHG emission form incineration process can be mitigated through segregating of waste material at source which in some part of the world the municipal waste is wet and it requires more fuel for complete combustion. | Taken into account - included under alternative waste treatment techniques. |
| 17564 | 10 | 65 | | | | What region is represented in this figure? | Accepted - clarified that these are world |
| 10797 | 10 | 66 | 17 | | | Composting: please refer to the book "Guia para Elaboracao de Projetos MDL a partir de compostagem". Nogueira da Silva et al. Fundacao Banco do Brasil, 2010. Portuguese. Downloadable from www.fbb.org.br. The book is a guide on how villages and poor communities can reuse/recycle organic wastes from residences and hotels. | Taken into account. Discussion of composting added in the revised text. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16259 | 10 | 66 | 24 | 66 | 26 | I cannot follow the reasoning that for metals, there are by definition no subsititutes for the required chemical elements… The requirements are only in specific cases defined by the chemical elements themselves (e.g., alloy composition), but in principal by the required properties, and there are many examples of substitutions between individual metals or between metals and other materials (such as plastics). | Taken into account. Text deleted from waste section in SOD. See revised section 10.4 of SOD for considerations on material substitution |
| 17565 | 10 | 66 | 7 | 66 | 12 | The text in this section discusses what is usually referred to as waste valorization, i.e., treatment and reuse of bulk industrial wastes. It should be labeled as such and discussion added on other forms of recycling (municipal, industrial scrap, etc.) Also there should be some mention of chemical recycling of plastics. | Taken into account - This paragraph has changed in the SOD. |
| 9309 | 10 | 66 | 17 | 66 | 19 | The cement industry applies many kinds of co-processing technologies. (Susumu Sano, Makihiko Ichikawa, Takamiki Tamashige, Toshihiko Matsuto and Nobutoshi Tanaka, Journal of the Japan Society of Material Cycles and Waste Management, Vo1.13, No.3, p.140, 2002 "Environmental Load Assessment of Disposal and Utilization of MSW Incineration Ash and Waste Plastics") and (Hidetoshi YAMAMOTO, Yoshiaki TSUJI, and Takao HARA, Journal of the Japan Institute of Energy, 83, 272-280 (2004) "Mechanisms of Dechlorination and Fuel Characteristics of Char Formed in the Pyrolysis Process of Municipal Solid Waste (MSW)") | Rejected - References available only in Japanese and therefore could not be used. |
| 9308 | 10 | 66 | 7 | 66 | 12 | Please add following example and reference.<br>Local municipal waste treatment in cement production (Susumu Sano, Akira Kato, Tomoyuki Iino, Nobuo Kasiwazaki, Toshihiko Matsuto and Nobutoshi Tanaka, Journal of the Japan Society of Material Cycles and Waste Management, Vol.16, No.5, pp.341, 2005 “Effects of CO2 Emissions from the Utilization of Municipal Solid Waste as Alternative Fuel and Raw Materials in Cement Production”) and industrial wastes (Yugo Nomura, Kazuo Fujiwara, Makoto Takada, Satoshi Nakai and Masaaki Hosomi, Journal of the Japan Society of Material Cycles and Waste Management, Vol.17, No.5, p.360, 2006 “Detoxification of Fly Ash by Mechanochemical Treatment with Blast Furnace Slag and the Usability of the Residues as Cement Materials”) | Rejected - References available only in Japanese and therefore could not be used. |
| 2301 | 10 | 67 | 1 | 67 | 15 | Redundant with earlier sections - almost word for word - eliminate | Accepted - redundancy removed |
| 17566 | 10 | 67 | 12 | 67 | 12 | "Liquid metal" is term used by Allwood and colleagues but is not otherwise in widespread use in this context. | Taken into account. Text deleted from waste section in SOD. See revised |
| 17568 | 10 | 67 | 12 | 67 | 12 | The statement about post-consumer recycling of aluminum (20%) should have a reference and indicate date and region. | Taken into account. Text deleted from waste section in SOD. See revised section 10.4 of SOD for considerations |
| 16260 | 10 | 67 | 12 | 67 | 15 | A recent publication that discusses the downgrading of aluminium and assesses its potential consequences for the loss in energy saving: Modaresi and Müller 2012: The role of automobiles for the future of aluminium recycling. Environmental Science and Technology 46(16):8587-94. The authors demonstrate that without rapid development and penetration of post-consumer scrap sorting technologies, a large fraction of the aluminium scrap may not find markets in the near future, resulting in a scrap surplus and a corresponding loss in energy saving potential of 43-240 TWh/yr by 2050 . | Taken into account. Text deleted from waste section in SOD. See revised section 10.4 of SOD for considerations on aluminium |

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| 10159 | 10 | 67 | 16 | | 23 | Delete paragraph and write instead: "All plastics are recycable. Depending on the quality of the plastics waste one can differentiate three options for recycling, which are all beneficial according to the balance of costs and energy saving & GHG emission mitigation.<br><br>1. Mechanical recycling<br>Aplicable to postconsumer waste or industrial waste which is homogeneous and clean. Examples are PVC (72% of all collected PVC waste from windows and 67% of used PVC pipes are recycled), industrial packaging films made from polyolefins, PET bottles (they are collected separately and either after grinding and washing recycled together with virgin material to bottles again or textiles are produced).<br><br>2. Feedstock recycling<br>Production of new raw materials by changing chemical structure of plastics waste through cracking, gasification or de-polymerisation. An example is the use of plastics for the blast-furnace process producing iron as additional reducing agent.<br><br>(References<br>J. AGUADO, D.P. SERRANO, G. SAN MIGUEL, "EUROPEAN TRENDS IN THE FEEDSTOCK RECYCLING OF PLASTIC<br>WASTES" Global NEST Journal, Vol 9, No 1, pp 12-19, 2007)<br><br>3. Energy recovery<br>Since the energy content of 1 kg plastic equals 1 kg of oil incineration with heat recovery is used for the recycling of mixed or dirty plastics<br><br>Globally there is large potential for increasing the recycling rate by diverting the 'calorie rich' plastics waste from landfill into the most sustainable recycling option."<br><br>(References:<br>Plastics Waste - Feedstock Recycling, Chemical Recycling and Incineration, A. Tukker Vol. 13, No 4, 2002 Rapra Review Reports Expert overviews, ISBN-13: 978-1859573310<br><br>Consultic study 2012, "In 2012 Plastics waste in Germany was recovered as material for 42%, as feedstock 1% and for energy recovery for 56%"<br>(http://www.consultic.de/files/pdf/consulticstudie_kunststoffverwertung_20120911.pdf)) | Taken into account. Text deleted from waste section in SOD. See revised section 10.4 of SOD for considerations on plastics recycling |
| 17567 | 10 | 67 | 24 | 67 | 24 | Waste paper recycling is NOT recent. The most recent surge in interest dates to the mid-1990s. And of course waste paper recycling more generally is quite old. | Taken into account. Text deleted from waste section in SOD. See revised section 10.4 of SOD for considerations |
| 10158 | 10 | 67 | 3 | | 4 | Delete "plastics recycling is greatly inhibited by the wide variety of incompatible compositions" and exchange with: "for plastics recycling different possibilities are in practice depending on the cleanliness and conformity of the plastics waste". | Taken into account. Text deleted from waste section in SOD. See revised section 10.4 of SOD for considerations |
| 17569 | 10 | 67 | 31 | 67 | 31 | High substitution of what by what?? | Accepted |
| 5022 | 10 | 67 | 8 | 67 | 15 | The global rate of recycling of steel is 83% and some specific steel use sector shows much higher recycle rate. Reality and future of the recycling of steel is described in deteil in the following site of worldsteel association: http://www.worldsteel.org/publications/fact-sheets.html | Taken into account. Text deleted from waste section in SOD. See revised section 10.4 of SOD for considerations |
| 8306 | 10 | 68 | 14 | 68 | 17 | Consider revising the wording | Editorial - copyedit to be completed prior |

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| 17571 | 10 | 68 | 18 | 68 | 23 | The sentences on the Action Plan need a punchline, that is, indicate why the information is relevant in this section. | Accepted. A sentence to clarify the relevance to waste minimization has |
| 8307 | 10 | 68 | 18 | 68 | 26 | this paragraph is not really about waste, maybe could be moved to section 10.4 | Taken into account - we have clarified that these are policy intitiatives that can |
| 17570 | 10 | 68 | 6 | 68 | 7 | Verb missing | Editorial - copyedit to be completed prior |
| 17572 | 10 | 69 | 12 | 69 | 13 | Why is composting complementary to landfill gas recovery?? Most proponents of landfil gas development see composting as diverting sources of organic material that degrade to produce methane, i.e., a competitor. | Taken into account. These key messages have been revised as part of |
| 17573 | 10 | 69 | 25 | 69 | 25 | PAYT and landfill taxes are measures that are much more commonly used in developed rather than developing countries. Some distinction might be warranted here. | Taken into account. These key messages have been revised as part of |
| 15882 | 10 | 7 | 1 | 7 | 4 | 50% GHG reduction from BAU with doubled demand implies a 75% reduction in energy intensity. This sounds ambitious. How feasible is that? Instead, the chapter should present a realistic range of expectations, not an optimistic, theoretical technical limit | Taken into account - longterm pathway discussion in the ES and main text (section 10.10) have been significantly |
| 9300 | 10 | 7 | 1 | 7 | 4 | There is no reference herewith. Basically, I have never seen any literature telling that a GHG emissions can be reduced by 50% compared to BAU although global demand of selected set of steel, cement, plastic, paper and aluminum is expected to double. Therefore, I would suggest to delete the paragraph. | Rejected: ES does not normally include references. Taken into account - longterm pathway discussion in the ES and main text (section 10.10) have been |
| 8266 | 10 | 7 | 15 | | | repeating "Co-benefits" | Editorial - copyedit to be completed prior |
| 15281 | 10 | 7 | 15 | 7 | 15 | remove one "co-benefits" | Editorial - copyedit to be completed prior |
| 4540 | 10 | 7 | 31 | 7 | 37 | It is strange to see the focus on rare earth metals and copper as a major issue in discussing mitigation efforts in mining. These are very small volumes, even in ore terms when compared to major other commodities. This focus is not warranted from the scope of this study. The analysis on mining included in this chapter lacks any depth. | Accepted - discussion of GHG emissions related with the provision of energy commodities is covered in the energy chapter. Some improvement in the representation of mining sector has been made in the SOD but given the fact that mining has very little energy share (cf. section 10.2) compared to the |
| 15762 | 10 | 7 | 5 | | 6 | This is occurring because there is an economic driver. What is the practical limitation of what can be accomplished by re-using waste materials? | Accepted - text has been improved in light of new waste section |
| 15883 | 10 | 7 | 5 | 7 | 7 | Need to consider the energy intensity of waste reprocessing, and also cost curves for waste as a feedstock since even waste will follows laws of supply and demand | Accepted - text has been improved in light of new waste section |
| 9301 | 10 | 7 | 5 | 7 | 7 | I agree with this paragraph and would provide two of literatures and a website for your reference: (MORIMOTO, NGUYEN, CHIHARA, HONDA and YAMAMOTO; Journal of Life Cycle Assessment, Japan, Vol.2 No.4 October 2006 "Proposals for Classification and an Environmental Impact Evaluation Method for Eco-Services: Case study of Municipal Waste Treatment in Cement Production") and (Susumu Sano, Akira Kato, Tomoyuki Iino, Nobuo Kasiwazaki, Toshihiko Matsuto and Nobutoshi Tanaka, Journal of the Japan Society of Material Cycles and Waste Management, Vol.16, No.5, p.341, 2005 “Effects of CO2 Emissions from the Utilization of Municipal Solid Waste as Alternative Fuel and Raw Materials in Cement Production”) , and (http://www.taiheiyo-cement.co.jp/english/env/env.html) | Noted |
| 6605 | 10 | 7 | 15 | 7 | 15 | Make a editorial modification -delete one of the "co-benefit." | Editorial - copyedit to be completed prior |
| 7717 | 10 | 7 | 25 | 7 | 26 | Emissions of F-gases in industry mainly from refrigeration, car and home air conditioning and insulation gases for buildings are very important because these F-gases has high GWP values and there seem to have a great progress on the development of environmentally-friendly F-gases with much lower GWP, Hoever I could not see any detailed description of these f-gases even in other chapter like Chapter 8 and 9. | Accepted. The comment in fact refers to other chapters. X-cut issue. Cross chapter coordination needed. This issue has been clarified during 3rd Lead Author Meeting. Theses sources will be |
| 15704 | 10 | 7 | 26 | 7 | 26 | Chapter 8 covers transport and not Chapter 9. | Editorial - copyedit to be completed prior |

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| 15705 | 10 | 7 | 38 | 7 | 42 | Although this AR5 apporach is more holistic, which is good, this framework inherently has double counting from other sectors such as transport. This was state in the TSU notes but this is a critical issues that will likely not be resolve with just a note or table. | Accepted - issue of double counting has been discussed among report authors as it is important for the whole report. The |
| 10157 | 10 | 70 | | | | Many of the references provided in the text could not be found in the reference section. | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now |
| 9408 | 10 | 70 | 106 | | | Some journal informations were missing in reference even if these papers were reviewed in the text. Thus, reviewers cannot check whether contents were appropriately quated. For example, related to my paper, the following information was missing in reference.<br>Akashi, O., Hanaoka, T., Matsuoka, Y., Kainuma, M. (2011) A projection for global CO2 emissions from the industrial sector through 2030 based on activity level and technology changes. Energy, 36(4):1855-1867, DOI: 10.1016/j.energy.2010.08.016 | Accepted - due to an editorial problem chapter 10 had the reference list of a different chapter. This problem has now been resolved |
| 12952 | 10 | 8 | | | | Step 6 (using waste to substitute for resources from extractive industries) missing from model design | Accepted - figure 10.1 has been modified |
| 18515 | 10 | 8 | | | | The sixth point (by using waste to substitute resources) doesn't appear in the figure marked as a green number as the other options do. It is also not incorporated into the structure of Section 10.4. If it should be considered as a major option, may be useful to amend the figure and the structure of 10.4 accordingly. | Accepted - figure 10.1 has been modified, waste aspect is discussed in detail in a specific section 10.14 |
| 17486 | 10 | 8 | 18 | 8 | 19 | Awkward wording: "Box 1 shows a Sankey diagram clearly delineating different sources of<br>19 anthropogenic emissions aims to resolve this confusion." Perhaps some words are missing. | Editorial - copyedit to be completed prior to publication |
| 8267 | 10 | 8 | 18 | | | Sentence: "Box 1 shows a Sankey diagram …." unclear | Editorial - copyedit to be completed prior |
| 10203 | 10 | 8 | 21 | 10 | 11 | Box 1.1 and Fig. 10.2 could preferentially be moved to a more general chapter since it is relevant for all sectors | Accepted - issue of double counting has been discussed among report authors as it is important for the whole report. The |
| 8268 | 10 | 8 | 24 | | | Sentence "Using a Sankey diagram provides …" unclear | Editorial - copyedit to be completed prior |
| 15901 | 10 | 8 | 9 | | | Clarify fig. 10.1 (not clear what bottom flow box is for, also wrong chap. #'s in upper right corner) | Bottom box highlights trade-related issues. Presentation has been improved |
| 15706 | 10 | 8 | 22 | 8 | 25 | Figure 10.2 is helpful presentation of the issues associated with attribution of emissions to sectors but it is not clear that groupings in figure 10.2 parallel the chapter of the AR5 WGII report. This figure would be much more useful at addressing double counting if the categories of the figure paralleled the chapters of the report. As an example, trasnport of food and people for leisure seems to be part of transport but these are not included in transport in Figure 10.2. | Accepted - issue of double counting has been discussed among report authors as it is important for the whole report. The topic has been transferred to chapter 5 |
| 18516 | 10 | 8 | | | | I would like to echo the sentiment from Washington that this text (including figure) would be useful in an early chapter, e.g. Chapter 5. On the Sankey Diagram, it would be very useful to try and include some kind of deliniation of what is covered in which chapters -> this would also help to guide the reader through the AR5. | Accepted - issue of double counting has been discussed among report authors as it is important for the whole report. The |
| 11153 | 10 | 887 | 26 | | 27 | The statement that communication and information channels play a major role for an evaluation of the technology by the public is unlikely to come from Pietzner et al, 2011. I suggest the author checks this reference. | Accepted |
| 11154 | 10 | 887 | 27 | | 28 | The statement that there's no particular evidence on what the acceptance would be for the case of industrial applications of CCS is false. See comment 3 including a reference to an ancillary document including references on public acceptance of CCS related to real cases. | Accepted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in |
| 11155 | 10 | 887 | 30 | | 33 | The reference to de Best-Waldhober et al 2009 is incorrect in relation to the survey results from six European countries. The research in de Best-Waldhober et al. 2009 concerned a comparison of six technologies, not countries. Possibly there's confusion with another report that did compare six countries: Desbarats, J.,Upham, P., Riesch, H., Reiner, D., Brunsting, S., de Best-Waldhober, M., Duetschke, E., Oltra, C., Sala, R., McLachlan, C. (2010). Review of the public participation practices for CCS and non-CCS projects in Europe. NearCO2 report. | Accepted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in chapter 7 (Energy) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11156 | 10 | 887 | 33 | | 35 | An example of initiatives aiming to engage the public in a dialogue about the potential use of the technology within the context of other alternatives is the Large Group Process method used by CSIRO: Ashworth, P., Carr-Cornish, S., Boughen, N., Thambimuthu, K. (2009). Engaging the public on Carbon Dioxide Capture and Storage: Does a large group process work? Energy Procedia, 1, pp. 4765-4773. | Accepted - CCS discussion has been significantly reduced throughout the chapter and is now concentrated in chapter 7 (Energy) |
| 11130 | 10 | 9 | | | | This figure may simplify for a superhuman, for me, it is impossible to understand | Noted - this valuable feedback will be used in completing the work of publishing this diagram. However, the position within the WG3 report will most |
| 8440 | 10 | 9 | | | | I suggest to invert this figure, putting consumer need on the left and then emission vector, transofmration device, land-use, source and GHGs at the right | Rejected: figure follows the logical flow from the provision of primary energy carriers to the coverage of service demand. In any case this feedback has been forwarded to the authors of the |
| 10133 | 10 | 9 | | | | This Sankey diagram misses the segmentation by industry, which is the governing segmentation in this chapter. The Sankey diagramm from the World ressources institute would be more helpfull. (http://www.wri.org/publication/world-greenhouse-gas-emissions-in-2005: World Greenhouse Gas Emissions in 2005 is a comprehensive view of global, anthropogenic greenhouse gas (GHG) emissions. The chart in this working paper is an updated version of the original chart, which appeared in Navigating the Numbers: Greenhouse Gas Data and International Climate Policy (WRI, 2005).) | Rejected: figure is displayed incorrect in the pdf, transport, building and industry are explicitely outlined in one of the columns and discussed in line 16-17. In any case, figure will be shifted to chapter 5 and modified |
| 12953 | 10 | 9 | | | | Unless its a problem with my printer, certain important words do not seem to appear in the diagram e.g. Transport, Buildings, Manufacturing | Noted - this valuable feedback will be used in completing the work of publishing this diagram. However, the position within the WG3 report will most |
| 15904 | 10 | 9 | 1 | | | Sankey chart (fig. 10.2) is a good idea but is slightly confusing. It does a good job in showing where how the GHG emissions are allocated but does not show what the sources of these emissions are. It might be more useful to add a “standard” Sankey chart showing energy sources to the left, conversion steps in the middle (e.g., boilers, generators, compressors), and a breakdown of useful energy and wasted energy flows on the right to show where opportunity lies for improved efficiency (by minimizing waste energy, wasted product,…). The end users should also be more aligned with the traditional industry sectors (iron, steel, cement, food processing, …) o The power of a Sankey is that is shows users which industries are the “heavy hitters” or contributors. So, food, construction, and heating are more important GHG emitters than lighting, communication, or tourism (another reason why I think it is not necessary to focus on this tourism) | Rejected: figure is displayed incorrect in the pdf, transport, building and industry are explicitely outlined in one of the columns and discussed in line 16-17. In any case, figure will be shifted to chapter 5 and modified |
| 7092 | 10 | 9 | 1 | 9 | 3 | The large net sink due to forest growth and expansion should be noted., e.g. see Pan, Y., Birdsey, R., Fang, J., Houghton, R., Kauppi, P., Kurz, W., et al. (2011). A Large and Persistent Carbon Sink in the World's Forests. Science Vol. 333 , 988-993. | Rejected: figure focuses on emission and not mitigation options, discussion about the mitigation potential of forest growth is covered in chapter 11. In any case this feedback has been forwarded |
| 4542 | 10 | 9 | 12 | | | Billion? Please replace this with SI units (not sure if this 10^9 or 10^12) | Accepted - potentially confusing terms such as billion used only in a few instances now. Will be checked further |
| 9515 | 10 | 9 | 6 | 9 | 10 | delete either sentence - These sentences are duplicated | Editorial - copyedit to be completed prior |
| 14260 | 10 | 9 | 6 | 9 | 11 | The same sentense is duplicated. | Editorial - copyedit to be completed prior |
| 11782 | 10 | 9 | 9 | 9 | 11 | Delete. Same as the befere sentence. | Editorial - copyedit to be completed prior |

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| 18517 | 10 | 9 | 9 | 9 | 11 | This text is duplicated word-for-word with the preceeding paragraph. | Editorial - copyedit to be completed prior |
| 10413 | 10 | 9 | | | | as the figure has not been published yet, the rource of numerical values in this figure should be particularly | Noted - this valuable feedback will be used in completing the work of publishing this diagram. However, the position within the WG3 report will most |
| 7718 | 10 | 9 | 1 | 9 | 4 | This diagram intends to show all the anthropogenic GHGs but contribution of F-gases cannot be seen. Does it mean that f-gases are negligible small conparing other main 5 GHGs? | Noted - this valuable feedback will be used in completing the work of publishing this diagram. However, the position within the WG3 report will most |
| 10412 | 10 | 9 | 9 | 9 | 11 | this paragraph repeats the content of the paragraph before it | Editorial - copyedit to be completed prior |
| 8857 | 10 | p24 | | p25 | | section 10.4.2.1 iron and steel, 24-25, 2nd paragraph suggest to add the reference that analyzed cost effective energy efficiency measures and potentials in energy savings and carbon reduction: Xu, T., J. Sathaye, C. Galitsky. 2010. Development of Bottom-up Representation of Industrial Energy Efficiency Technologies in Integrated Assessment Models for the Iron and Steel Sector, Lawrence Berkeley National Laboratory Report to U.S. Environmental Protection Agency, Climate Economics Branch, Climate Change Division. LBNL-4314E. | Accepted - reference added (Worrel, E et al., 2010) (APP,2010),(Xu et al., 2010) Reference: Xu, T., J. Sathaye, C. Galitsky. 2010. Development of Bottom-up Representation of Industrial Energy Efficiency Technologies in Integrated Assessment Models for the Iron and Steel Sector, Lawrence Berkeley National Laboratory Report to U.S. |
| 8858 | 10 | p26 | | p26 | | section 10.4.2.2 cement, 26-26, 3rd paragraph suggest to add newer reference that analyzed cost effective energy efficiency measures and potentials in energy savings and carbon reduction: Sathaye, J., T. Xu, C. Galitsky. 2010. Bottom-up Representation of Industrial Energy Efficiency Technologies in Integrated Assessment Models for the Cement Sector, Lawrence Berkeley National Laboratory Report to U.S. Environmental Protection Agency, Climate Economics Branch, Climate Change Division. LBNL-4395E. | Reference added. Contacted one of the authors to ask if the research has been published in a journal article. |
| 8859 | 10 | p29 | | p30 | | section 10.4.2.4 pulp and paper, pages 29-30, 1st paragraph suggest to add newer reference that analyzed cost effective energy efficiency measures and potentials in energy savings and carbon reduction: "Xu, T., J. Sathaye, K. Kramer. 2012. Development of Bottom-up Representation of Industrial Energy Efficiency Technologies in Integrated Assessment Models for the Pulp and Paper Sector, Lawrence Berkeley National Laboratory Report to U.S. Environmental Protection Agency, Climate Economics Branch, Climate Change Division. Lawrence Berkeley National Laboratory Report." On black liquor gastification, according to LBNL study (Kramer et al. 2009, page 107), potential disadvantages of gasification combined cycle systems include the energy investments required for achieving sufficient black liquor solids concentration and higher lime kiln and causticizer loads (and associated fuel inputs) compared to Tomlinson systems. Whether or not it's economical option depend on location and applications. | Noted - Cannot find the suggested reference from a quick search online. It could be evaluated and considered if it becomes accesible in the future. Taken into account - potential disadvantages of gasification have been added to the text. |

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| 8860 | 10 | p31 | | p32 | | Section 10.4.2.6 Page 31-32. The existing content seems too US-centric and shall be revised to cover more regions (ideally from global perspective). For example, dairy processing is among the most energy and carbon-emission intensive within global food processing industry. Xu and Flapper (2009, 2010) performed extensive analysis on global and regional dairy processing sector, and estimated that GHG emissions associated with energy use in the global dairy processing sector is responsible for over 128 million metric tonnes of CO2 emissions annually. Xu et al. (2009, 2012) identified cheese sector among the most carbon and energy intensive dairy processing, and developed a tool and recommendations for promoting mitigating strategies in the energy dairy processing sector. Supporting references are:<br>Xu, T. and J. Flapper. 2010. Reduce Energy Use and Greenhouse Gas Emissions from Global Dairy Facilities. Energy Policy. Volume 39, Issue 1, January 2011, Pages 234-247. doi:10.1016/j.enpol.2010.09.037;<br>Xu, T. and J. Flapper. 2009. Energy Use and Implications for Efficiency Strategies in Global Fluid-Milk Processing Industry. Energy Policy, Volume 37, Issue 12, December 2009, Pages 5334-5341.<br>Xu, T., J. Flapper, and K. J. Kramer. 2009. Characterization of Energy Use and Performance of Global Cheese Processing. Energy - The International Journal, Volume 34, Issue 11, November 2009, Pages 1993-2000.<br>Xu, T., J. Flapper, J. Ke, K. Kramer, J. Sathaye. 2012. Development of a Computer-based Benchmarking and Analytical Tool: Benchmarking and Energy & Water Savings Tool in Dairy Plants (BEST-Dairy). California Energy Commission, CEC 500-06-058, Lawrence Berkeley National Laboratory Report, LBNL-5679E. | Accepted - sentence added "Dairy processing is among the most energy- and carbon-intensive activities within the global food production industry, with estimated annual emissions of over 128 MtCO2 (Xu and Flapper 2009; Xu and Flapper 2010). Within dairy processing, cheese production is the most energy intensive sector (Xu et al., 2009)" |
| 4983 | 11 | | | | | Lay out of chapter did not follow outline sugessted | Rejected, Lead author meeting |
| 13513 | 11 | | | | | Lay out of chapter did not follow outline sugessted | Rejected, Lead author meeting |
| 4996 | 11 | | | | | Consider to delete table ,since it is not adding much to subsection, and not providing complete summary to what is presented in subsection | Accepted, Text has been shortened, table has been deleted |
| 13526 | 11 | | | | | Consider to delete table ,since it is not adding much to subsection, and not providing complete summary to what is presented in subsection | Accepted, Text has been shortened, table has been deleted |
| 8838 | 11 | | | | | Further, after such explanation it would be interesting to have a discussion on how the resulting GHG impacts of these changes can be accounted for products (e.g. for bioenergy) | Rejected, Accounting rules are not in scope of AR5 |
| 8779 | 11 | | | | | For this first draft I have no comments. I will waiting for the next version. | Accepted, Thank you |
| 9100 | 11 | | | | | One individual part (section or sub section) of "Forestry" should be composed. It makes clear that what is the contribution of forestry and forest products to governments and any sectors. Also role of forestry is clearer. And what governments and/or any sectors should do on Forestry.<br>That way relation between “forestry” and “another chapters” would be more clearly and practically.<br>[e.g.] “7.4.3 Renewable energy, 7.5.4 Renewable Energy in chapter 7”, “10.4.1.3 Material substitution, material reuse and waste (material efficiency), which covers recycling materials in chapter 10 ”. “Urban forestry”, which is mainly explained in chapter 12 and told some other chapters, is obviously one of “forestry”. But it is not enough to be covered in “agriculture and forestry” combined word in sections (or sub sections). | Accepted, Addressed in SOD |
| 10237 | 11 | | | | | Need to be improved in terms of format | Accepted, Revised for SOD |
| 10236 | 11 | | | | | Need to improve nearly all figure in terms of format: x-axis legend below the figure (e.g. Fig 11.2, 11.3), need to homogenize (Fig 11.1 left anf right), digital separator is "." … | Accepted, Figures have been revised for SOD. Will be further improved with |
| 16617 | 11 | | | | | The 20% figure may have been correct for the 1990s but no longer is, given the increases in total emissions since then. If this is the basis for the high figure (34%) in the final sentence it cannot be justified -- at least if you use the verb "is" rather than "was"! Make sure that all figures described in the present tense refer at least to the 2000s, and if possible to the 2005-2010 period. | Accepted, Update for 2000s |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16618 | 11 | | | | | Are the demand-side reduction potentials in agriculture included in the agriculture figure? If not, they should be given separately. Also, do not give the high figure for agriculture ("up to 4.30 Gt") without also giving the low one, as for the forest sector. and deleted the unquantified and citation-lacking assertion that "a large proportion" of the potential is from soil carbon sequestration. | Accepted, Add for SOD |
| 16619 | 11 | | | | | Here, the "large portion" of the AFOLU mitigation potential is said to be in soils AND vegetation, but again without quantification and without a citation. Drop this sentence. | Rejected, Quantify and add references instead |
| 16620 | 11 | | | | | The question should be phrased "What are the co-benefits…" rather than "Are there any co-benefits.." | Accepted, Changed fo SOD |
| 16537 | 11 | | | | | Since as mentioned in the text the "Asia" figures are due to combining opposite trends in tropical (S and SE Asia) vs temperate (E Asia), it is important to separate out the tropical parts of Asia. Otherwise one gets the impression that deforestation is low in SE Asia, whereas just the opposite is true. | Accepted, Revise |
| 16538 | 11 | | | | | Clarify in the table heading that these represent net change (gain minus loss). | Accepted, Revise |
| 16601 | 11 | | | | | This appears to be the same data as in Figure 11.12, just rearranged in a different way (OECD vs non-OECD; where do the "Economies in Transition" fit in?). Thus it has the same problems as Figure 11.12 and Table 11.9; I suggest it be deleted. | Accepted, Revised for SOD |
| 16615 | 11 | | | | | This table completely leaves out the Norwegian program, which is has the largest commitment of funds of any country and has already achieved the most reduction in emissions (mostly in Brazil). It's important to add it. | Accepted, Added for SOD |
| 16558 | 11 | | | | | I doubt whether such a large table, simply summarizing options but without quantification of their potential contributions, really adds much (or will be read). Suggest you delete it. | Rejected, It describes the practice and provides the reader with the key papers to read on each measure. Potentials are |
| 16563 | 11 | | | | | This table is quite confusing and should be deleted. Among its problems are: a) no indication of what the separate rows within cells represent -- different estimates? Different time periods? Something else? b) no indication of the units for the numbers in the table; c)Cells that correspond to partly overlapping areas (e.g. Canada and USA", "Canada", "USA", "Europe & Russia", "Europe", "Former Soviet Union (Russia),", etc.). Most fundamentally, it's not clear what's the point it's supposed to demonstrate. | Accepted, This table went very wrong in formatting - it will be replaced in SOD |
| 16570 | 11 | | | | | The "reduction of FSC losses" line has high uncertainty and isn't comparable in assumptions to the others; it also is based to some extent on unpublished data ("Extrapolation from…."; "(in prep.)" I suggest deleting that part, and making the rest (Stehfest et al. 2009 results) into a Figure, which would be easier to interpret. | Accepted, Text was strongly revised and new references inserted |
| 16586 | 11 | | | | | Delete -- same point as # 68. | Rejected, Improved but retained - saves |
| 16588 | 11 | | | | | This table could be shortened considerably by eliminating the "could" and "can" assertions, leaving only those for which there is empirical evidence. | Accepted, Shortened and Revised for SOD |
| 16596 | 11 | | | | | Since there has been a peer-reviewed publication (Kindermann et al.) comparing the potential of forest mitigation according to these three models, I don't understand why this table presents what are apparently new, unpublished figures from those authors, and doesn't cite that paper. This leaves the chapter open to some of the same criticisms as AR4. Also, some of the numbers in the table appear to be lacking their final digits (e.g. Total for $100 for reduced deforestation and for forest management). The term "forest management" needs clarification. Finally, a Figure would show this information more clearly than such a large table. But in that case, it would have to show something beyond what Fig. 11.10 shows. | Accepted, Revised for SOD |
| 16598 | 11 | | | | | Given the new countries joining the OECD (Mexico, Chile, etc.) it's no longer a useful shorthand for "rich countries". Furthermore, this table mostly emphasizes how uncertain the estimates are (20-fold range for the global total). I suggest it be deleted. | Accepted, Is it not good to show uncertainties? Was replaced for SOD anyway |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16528 | 11 | | | | | This figure has several problems: i) using units of GtC/yr is inconsistent with other chapters of AR5 and with other figures and text within this chapter, and looks particularly strange for emissions of CH4 and N20; ii) in both 11.1a and 11.1b, the fourth column is for a time period that overlaps with earlier columns, but is not visually distinguished or separated from those columns, making it appear incorrectly that the fourth column is for a subsequent period; iii) the quite considerable amounts of emissions from "fires" are stacked on top of those from deforestation, giving the incorrect impression that these are non-overlapping categories, which they are not; iv) the relation between the two sides of the figure (11.1a vs. 11.1b) is quite unclear -- is it that a is gross while b is net? Or that b represents additional emissions not included in a? | Accepted, Revise for SOD |
| 16597 | 11 | | | | | The point labelled "Sohngen (Copenhagen Consensus)" seems to be from a study that is not listed in the Literature Cited. Is it a peer-reviewed publication? | Accepted, Zotero updated for SOD |
| 16599 | 11 | | | | | This figure is very hard to interpret, since several of the X-axis categories would seem to be overlapping. For example: is it true that cropland management does not include actions that might help restore cultivated organic soils, nor rice management, nor restoring degraded lands, nor agroforestry? Does the "livestock" total exclude all grazing land management, and does it include the demand-side activities discussed earlier, which seem to have large potential from the data presented there? Do "Setaside", "LUC" and agroforestry overlap at all with forestry activities? | Accepted, Yes- these are all mutually exclusive. Clarified in the legend or replaced with better figure for SOD |
| 16609 | 11 | | | | | This is the Wise et al. figure and suffers from the unrealistic aspects already mentioned. There is no reason to include its projections as opposed to any of the others. | Accepted, Place holder only - scenarios not projections |
| 16533 | 11 | | | | | This figure is very confusing. Visually, all the reader can distinguish is that each panel has several lines, often crossing and with quite different trends, and which turn out to represent quite different kinds of variables (land areas, livestock numbers, fertilizer). There is no way one can see which region is most important for which variable, nor how they might or might not be correlated with each other. Rather than having the separate panels be regions, I suggest reversing the panels-vs-lines relation, so that each panel represents a separate variable (e.g. a for arable land, b for pastures, c for forest land, d for cattle, etc.) This will allow you to stack, and separately color, the values for each region, so that the reader can see which are the largest ones and how the scales (e.g. for arable vs pasture vs forest land) compare. I would also suggest using a more neutral term that "reforming economies" for the EIT countries. | Accepted, Figure revised for SOD, including actual numbers. A regional breakdown has been agreed as cross-cutting issue for all chapters. |
| 16546 | 11 | | | | | As with Figure 11.1, the third set of columns appears visually to be simply a later period than the first two, whereas in fact it combines them. There needs to be a visual break of some kind between 2 and 3. Also, it needs to be explained how "land use change" relates to the other bars (is it the combination of all of them?) and whether the "deforestation" and "secondary vegetation" bars are tropical only (since boreal and temperate forests are shown separately). Finally, where in this figure would forest degradation show up? | Accepted, Revise figure for SOD |
| 16575 | 11 | | | | | This figure can also be deleted. It has no quantitative data, and it's not at all clear what the differences among its components (e.g. two kinds of arrows, 5 kinds of shapes, 5 colors) are supposed to represent. | Accepted, Figure has been revised for SOD |
| 16577 | 11 | | | | | The text (p. 34. lines 16-17) says that this figure demonstrates different synergies and trade-offs for demand vs supply side measures. However it's not indicated in the figure where the boundary between demand and supply sides is. Should indicate that on the figure, or delete it. | Accepted, Figure was completely redrawn |
| 16587 | 11 | | | | | Delete -- same point as # 68. | Accepted, Considering all comments on this graph, we have improved the design |
| 16591 | 11 | | | | | This figure doesn't make the point for which it is cited (number 73), and failing that, it's not clear what it contributes other than indicating the great uncertainty of model predictions. Unless you wish to assert that in the text, it can be deleted. | Accepted, Revise figure for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 5518 | 11 | | | | | General comments- It would be very helpful for the reader if the authors could somehow divide the discussion into forestry, wild lands, and agricultural lands. These different land uses are currently interspersed and it is difficult to follow. There seems like the discussion on forest lands often eclipses the discussion on agricultural lands, and particularly the challenges to food production. If these topics could be divided- following a similar outline for each, it would be a much more effective way to present information. Finally- I realize that there are sections to be written to integrate a greater discussion of sustainability- but these are critical and I would encourage the authors to follow through on this linkage. Finally, the chapter makes no mention of how AFOLU interacts with urban spaces. This seems like a small but significant factor that merits discussion. There is an increasing trend to integrate ecosystem processes into urban areas- including bioretention systems to capture rainwater, green roofs and urban agriculture. The potential impacts for this type of development should be mentioned | Partially Accepted, We wish to integrate across land uses more rather than less, but the issue of under-represented land uses is well made and will be addressed in the SOD |
| 5515 | 11 | | | | | Adding a column with target area for each program would be helpful | Accepted, Good idea - revised for the |
| 3762 | 11 | | | | | An entry on the co-benefit of mitigation from RED for biodiversity conservation is warranted | Accepted, Interactions between REDD+ and biodiversity were included |
| 3764 | 11 | | | | | This table ought to include UNREDD and the REDD+ Partnership | Accepted, UNREDD was included in the |
| 4275 | 11 | | | | | Overall Excellent. In several places discussing forest disturbances, leaves impression (without actually saying so) that insect and disease disturbances are insignificant compared to fire. Mantions invasive alien species only in passing on page 43 line 19, even though they are a possibly significant feedback. | Accepted, Thank you |
| 11975 | 11 | | | | | In general, this is an excellent chapter and a real "tour de force" of all the critical issues on AFOLU. Mostly, the specific comments are simply recogninisng taht there are biodiversity considerations, alongside emision considerations, of AFOLU mitigation options | Accepted, Thank you |
| 11977 | 11 | | | | | The explanatory notes need to state what is included here, especially whether it includes plantations. | Accepted, Add for SOD |
| 11986 | 11 | | | | | Explain "technical potential" in teh footnote | Rejected, It will be in the glossary |
| 18231 | 11 | | | 10 | | • Table 11.1 (Trends in extend of forest 1990-2010); page 10, indicates that South America and Africa are the regions with more loss of forests. This trend diminishes in both regions during 2005-2010. The arguments of the report refer particularly to the diminution of deforestation in Brazil. The source of the data is report FRA 2010, published by FAO. Probably, many countries have not been able to update data of deforestation and forest degradation, because limitations in taking a baseline in the field, which forces them to maintain the same deforestation rates. | Noted, This is a statement - not clear what action is required |
| 18232 | 11 | | | 16 | | • In table 11.2 (Summary of production-side mitigation options in the AFOLU sector); page 16, regarding mitigation options in the productive forest sector, are included: reducing emissions from deforestation and forest degradation (REDD), afforestation/reforestation, improvement of forest management, plantations, sustainable management of the native forest, agroforestry and bioenergy generation by forests and plantations. In brief, these are different mitigation measures that each country adopt or will adopt in accordance of their forest-environmental policies. In the context of the Convention on Climate Change, Venezuela does not adopt REDD mechanisms, however the country have been developing management actions for sustainability of forests which result in voluntary mitigations. | Noted, This is a statement - not clear what action is required |
| 18230 | 11 | | | 7 | | • In graph 11.1 (Global trends in CO2 eq emissions from AFOLU (a) and net C emissions from land use, 1 land use change and forestry activities (b), Gt C/yr.); page 7, it shows that the largest emission of CO2 to the air comes from deforestation and burning, which raised significantly after the 90`s. It is hard to extrapolate or infer the situation of Venezuela within these numbers, since they are adding trends. Similarly, it is observed regarding the raise of the C global, that there are slight fluctuations in more than a decade. | Noted, We do not say anything about Venezuela, nor is the figure intended for any one country to infer trends from it |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2367 | 11 | | | | | The cost elements are not clear and not overly recent. Recommendation to contact some key countries in which ambitious REDD+ efforts are underway (Brazil, Guyana, Indonesia, PNG, DRC). It is highly unlikely that those programs are already featured in peer reviewed academic literature, but they are just now being implmented at scale for the first time. Thus, IPCC should attempt to get best available information to make this chapter as relevant as possible to the next politicians who want to implment REDD+ measures. (Consider text boxes with case examples) | Accepted, Policy section rewritten and REDD+ text improved |
| 15172 | 11 | | | | | not readable/comprehensible as is | Accepted, This table went very wrong in formatting - it will be replaced in SOD |
| 16223 | 11 | | | | | REDD+ Partnership is not in the table; it came out of Copenhagen--now has many countries and $billions in pledges | Accepted, REDD+ partnership was included in the table |
| 16220 | 11 | | | | | Note the BAU scenario against which these reductions should be compared (in GTCO2e/yr) | Accepted, Add for SOD |
| 16209 | 11 | | | | | Is this based on the remote sensing assessment from FAO FRA? Or just the self-reported country data? The former is at least using a uniform methodology; the latter suffers from multiple different approaches and accuracies. Also surprising not to use non-FAO derived estimates, at least to bound these estimates (e.g. Hansen et al PNAS 2009?) | Accepted, State source |
| 2570 | 11 | | | | | Refer to GEA Chapter (Knowledge Module) 20 on land use and water for bioenergy | Accepted, Table has been deleted. Its content has been used in section 11.7 using the corresponding references. Reference by the reviewer is not complete. The issues correlating land |
| 13339 | 11 | | | | | Not clear what the units are. | Accepted, Added for SOD (in MtCO2/yr) |
| 13311 | 11 | | | | | Text is deformed, reformat. | Accepted, Revise figure for SOD |
| 7082 | 11 | | | | | In the row "Natural assets", in the first column, need to change first sentence to include "planted and other forests." Also, in the discussion of plantations later in this same part of TAble 11.7, it should be noted that the potential for the types of adverse impacts suggested for plantations are highly site specific and can often be mitigated by a variety of means. | Accepted, Table has been deleted. Its content has been used in section 11.7 |
| 7083 | 11 | | | | | In the row "Economic factors", in the first column, add the fact that "Demand for forest products give economic incentives for keeping land in forest rather than converting to non-forest uses." | Accepted, Table has been deleted. Its content has been used in section 11.7 |
| 7062 | 11 | | | | | Somewhere in this section, it would be useful to observe that although increasing amounts of fertilizer are being used in forest management, the amounts are small compared to those used in agriculture . e.g. see USEPA (2012), INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990 – 2010 - which observes that "Direct N2O emissions from fertilizer application to forest soils have increased by 455 percent since 1990, but still account for a relatively small portion of overall emissions." | Accepted, Section 11.2.3 has been largely revised for SOD, reduced in page number and information. |
| 4273 | 11 | | | | | At first of this chapter there is used C and CO2 for emission and sink, I think that should be good if only one (C or CO2) is used instead of both | Accepted, Revised for SOD - all should be converted to CO2-eq. |
| 2149 | 11 | | | | | better understanding of the rural livelihood effects of curent carbon finance institutions in case those become more and more frequent in agricultural contexts - in particular, how do MRV requirements from carbon finance interfere with optimal agricultural production planning and implementation, etc. | Rejected, Not sure where this is suggested to go |
| 2146 | 11 | | | | | as it is first discussed in the text, put "co-benefits" in the first column | Accepted, Revised for SOD |
| 2138 | 11 | | | | | section Bioenergy/Natural assets: add: "May lead to competition for biomass used for bioenergy production or used as organic fertilizer in crop production" | Accepted, Table has been deleted. Its content has been used in section 11.7 |
| 2139 | 11 | | | | | also point out that biomass residues can become scarce in a region if too many biomass projects are implemented, thus driving up prices for this biomass waste, that was basically without a price before. This can compromise economic viability of residues based bioenergy - as e.g. happening in the context of the CDM in India. | Accepted, Table has been deleted. Its content has been used in section 11.7 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2128 | 11 | | | | | drop the CO2e on the vertical axis to the left of figure 11.1.a - it's Gt C only, I guess. - Calrify the figures in general - are they consistent? - 111.1.b does not cover deforestation? - Why not combining the two figures into one only? | Accepted, But change to CO2 in the figure instead |
| 7496 | 11 | | | | | ALFOU. My comments have already been submitted. (uploaded document 254). | Noted, No action required |
| 10183 | 11 | | | | | 1. Points in this table are important and interesting and could be discussed in more depth in some cases, e.g. competition between global benefits and local negative effects. 2. On the horizontal level of the table, are points under the different categories (i.e. risks, uncertainties, co-benefits and spill-over, respectively) related or unrelated? 3. This table might become clearer if points are related to specific mitigation measures. | Accepted, Revised for SOD |
| 10185 | 11 | | | | | How can increasing desertification be an opportunity? | Accepted, Incorrect - revised for SOD |
| 10189 | 11 | | | | | For Amazon: the same text used for context as well as objectives and strategies | Accepted, Incorrect - revised for SOD |
| 10174 | 11 | | | | | not all symbols in the graph are represented in the legend | Accepted, Revise figure for SOD |
| 10176 | 11 | | | | | Values for total economic mitigation potential are not the same although deriving from the same publication, e.g. cropland management is higher than grazing in the figure but lower in the table for <100 USD/tCO2 eq. | Accepted, Table removed |
| 10187 | 11 | | | | | Text: 1. lines 11-17 repeats lines 6-11, 2. FFICT and UCT scenarios/pathways are not discussed or described in the main text | Accepted, Revise figure for SOD |
| 10171 | 11 | | | | | Figure legend explaining the colour scheme is lacking | Accepted, Revise figure for SOD |
| 11811 | 11 | | | | | An interesting reference for the bioenergy part of the table maybe: Schulze et al. GCB Bioenergy doi: 10.1111/j.1757-1707.2012.01169.x | Accepted, This is new since FOD - has been revised to include newer references |
| 7163 | 11 | | | | | Overall comments: | Noted, |
| 7164 | 11 | | | | | It is useful to have a discussion on the 'definition of forest' in the beginning of the chapter, unless this topic has been touched upon in other chapters. Internationally accepted definitions should be used to avoid misunderstanding, and mis-interpretation of this chapter and to encourage mitigation measures that in fact encourage the opposite: destruction of natural ecosystems and loss off biodiversity by developing (high-carbon) monoculture ecosystems. E.g. the Indonesian definition of forest is: an area ≥ 0.25 ha, crown cover ≥ 30%, tree height ≥ 5 m. This may include any type of tree. If for example in tropical regions a natural existing peat swamp forest is being converted into an acacia plantation (which following the Indonesian definition is considered as reforestation), from a national-definition-point-of-view nothing happens: forest remains forest. | Rejected, Refer to standard IPCC / UNFCCC definitions (national) |
| 7165 | 11 | | | | | Since anthropogenic GHG sources in the AFOLU sector include fluxes from management of land (crops, forests, grasslands, wetlands) and land use change, all main sources and/or sinks should be broadly discussed while looking at mitigation measures to reduce fluxes from these activities. Unfortunately, this is not the case. Illustration: the word peatland or wetland has been used < 20 times in this chapter, the word 'forest' has been used > 500 times. No Figs. on 'fire' as a source or 'drained peat' as a source (fire is partly shown in fig. 11.1, but the other figs. are on forest only), which both are major AFOLU emission sources. Throughout the document I have tried to give suggestions to also include wetlands/peatlands/fire part in the various sections | Rejected, The chapter is about mitigation, not emission sources (which are the focus of WGI) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7166 | 11 | | | | | No mitigation measures are given for reducing emissions from managed peat (in. table 11.2, only soil C restoration on peatlands and improved land management are mentioned), while it has been demonstrated that peat oxidation is a major and increasing GHG source: 'CO2 emissions from drained peatlands in the world have increased from 1.1 Gton CO2 yr-1 in 1990 to 1.3 Gton CO2 yr-1 in 2008 (Joosten et al., 2012, page 14). Because of more and more scarcity of mineral soil in e.g. SE Asia, pressure on peatlands for agricultural (booming oil palm business) development is increasing. Suggestion: include wetlands/peatlands and fires throughout the whole document (e.g. in tekst, tables and figures) and in the discussion since these are major (potential) GHG emission sources within AFOLU, which should be considered in mitigation policies (e.g conservation of peat and rewetting of peat (PRC projects), measures to avoid fires etc), but also optimizing management in drained peat for agriculture (optimizing drainage systems, high water table etc) and encouraging paludicultures as an alternative for crops that need deep drainage. REDD+ does not only include forest conservation, sustainable forest management and enhancement of carbon stocks in forest, it also takes into account conservation and rehabilitation of soil carbon stocks which more clearly should be addressed in this chapter | Accepted, Included |
| 7167 | 11 | | | | | · Discussion is missing on implementation of mitigation measures e.g. by global initiatives such as Roundtables. 1) how and where to implement 2) how to increase the platform or basis of the (right!) stakeholders that support measures 3) how to implement as effective as possible taking into account future development trends, future demand trends etc. E.g. for production of bioenergy there could be a discussion on | Accepted, Added to policy implementation section |
| 7168 | 11 | | | | | o Continued globalization of bioenergy production over the next 20 years, including concentration of bioenergy production into regions and farmers cooperatives, debates about 'free trade' and 'protectionism'. | Accepted, Added to policy implementation section |
| 7169 | 11 | | | | | o The globalization-related changes in power relations (un-balanced power) and the related risks of exclusion of participant(s) (groups) such as small farmers, local communities, and poor countries from the debates. Debates and discussions within the participant groups could then become decentralized; how te deal with that?. | Accepted, Added to policy implementation section |
| 7170 | 11 | | | | | o Different participant groups have different forms of engagement (pragmatic and functional, justifiable, familiar). Understanding between participants and interactions between them needs to be promoted. | Accepted, Added to policy implementation section |
| 7171 | 11 | | | | | o Because the focus is on GHG emission savings which is one of the main drivers behind the production of bioenergy, the risk of exclusion of social vulnerabilities should be considered in mitigation measures. | Accepted, Added to policy implementation section |
| 7172 | 11 | | | | | o The debate on the indirect impacts of large scale bioenrgy production related to food supplies, food prices, and food scarcity. | Accepted, Has already been done, but has also been improved for SOD in |
| 7173 | 11 | | | | | Good implementation procedures are the key to successful GHG emission reductions | Accepted, |
| 7174 | 11 | | | | | In this chapter it shall be more clearly highlighted that a very important mitigation measure to reduce GHG emissions and to produce sustainable products in the AFPLU sector is to define 'no-go-areas' for agricultural expansion and land use planning. Kaper et al., 2008 concluded that the most sustainable case for 'choice of agricultural land' considers not to use 1) forest land, 2) steep terrain, or 3) vulnerable peat soils if the crop needs drainage. Wicke et al (2008) and Germer and Sauerborn (2007) studied the sustainability of production of palm oil (as a bioenergy crop). They concluded in their studies that in order for products to be sustainably produced from palm oil and its derivates, only (non-peat) low-carbon degraded land should be used for palm oil production and plantation management should be improved. With growing demand for both food and fuel export, as well as for domestic biodiesel production, it is likely that significant further land use conversions to oil palm will occur (Koh and Wilcove 2007; Levanget al., 2008) and will put further pressure on peat swamp forests (Rijenders and Huijbregts, 2008; Fargioneet al., 2008). Land use planning and good governance is mentioned as a tool to sustainably produce biofuels, however, this is at the end of the document (page 70) under sectoral policies and should be mentioned earlier. | Rejected, Policy prescriptive - entirely inappropriate for IPCC |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 7175 | 11 | | | | | Throughout the document there is some repetition of topics. I think the chapter could be easily shortened by avoiding this repetition | Accepted, Addressed in SOD |
| 7193 | 11 | | | | | Full and effective participation, broad platform (means meaningful influence of all relevant rights holder and stakeholder groups who want to be involved throughout the process, and includes consultation and free, prior and informed consent). | Accepted, Added to policy implementation section |
| 7194 | 11 | | | | | Good governance (includes accessibility, people's participation, transparency, accountability etc). | Accepted, Added to policy |
| 7195 | 11 | | | | | Implementation is understood to include on-going planning/decision-making as well as the implementation of the activities. | Accepted, Added to policy implementation section |
| 7196 | 11 | | | | | In the section 'successful implementation' it would also be interesting to have a discussion on the current status of mitigation measures. Mitigation projects (e.g. REDD (+) projects etc) are running, but most of them are not very successful until now. What is the problem? What should be improved? Another brief discussion related to this could be on 'validation of carbon credits' which is extremely complicated (in terms of monitoring, reporting, verification of baselines, project scenario's leakage etc) at the moment for project proponents, again, it would be good to relocate some of the text of 11.10 to this section, e.g. lines 29 onward, page 69 . | Accepted, Added to policy implementation section |
| 7203 | 11 | | | | | Page 45. Section 11.5.3. Perhaps this is a good paragraph to clearly show the separation between 1) climate impacts 2) human induced impacts and 3) natural disturbances. Impacts that have to be addressed can by summarized in 1) Offsite impacts resulting in a change in GHG emissions 2) On-site changes in GHG emissions 3) ILUC impacts. | Accepted, Addressed in SOD |
| 7186 | 11 | | | | | Does re-vegetation belong in this category? So, revegetation with vegetation that does not fulfil the requirements of the 'forest-definition' | Accepted, Clarified for SOD |
| 7187 | 11 | | | | | Land-based agriculture. Missing mitigation measures: Peat soil conservation (not only restoration), peat soil rewetting (or is that meant with restoration of organic soils?), crops on peat that do not need drainage (paludicultures) | Accepted, Added to table |
| 7188 | 11 | | | | | o Bioenergy. No bioenergy products from high carbon land (such as palm oil on peat). | Rejected, Not clear what action is |
| 7189 | 11 | | | | | Mitigation measures to reduce fires missing? E.g. Zero-burning practices for land clearing, fire detection and control, and rewetting to avoid peat fires. Fires is one of the major sources, mitigation measures should be included. | Partially Accepted, Can Discuss further but can increase fuel load and lead to greater C loss-so not correct as a |
| 7199 | 11 | | | | | This table needs revisions. Below an example of how the second column of the table could be optimized (avoid the word potential in the table, this is already in the title, the following question has to be answered in the table 'what are the potential impacts of AFOLU mitigation measures". | Accepted, Table has been deleted. Its content has been used in section 11.7 |
| 7210 | 11 | | | | | Suggestion: insert Global land area of Wetlands and/or peatlands under 'crops' since this is a category in AFOLU | Accepted, Revised for SOD |
| 11159 | 11 | | | | | Unfortunately, initiatives from many smaller developing countries tend to be very small scale. The nature of the scale, coupled with the wide differences in socio-economic and cultural differences over thousands of tribes etc especially in Africa means that these case examples are not identifiable. Specific success stories - eg. policy changes and continuing streamlining of land policies among countries in Afica that enhance the role of AFOLU in CC mitigation; | Accepted, Revised for SOD |
| 10596 | 11 | | | | | There is a GAP in the whole chapter (and report) on FISHERIES and AQUACULTURE. For example Table 11.2 could have a Fish section covering mitigation options. Useful examples are included in: FAO, 2011. Energy-smart food for people and climate, UN Food and Agricultural Organisation, Rome. 65 pp. http://www.fao.org/docrep/014/i2454e/i2454e00.pdf<br>Also if need a CA on fish, are some good people at FAO who might assist - eg Frank Chopin or Cassandra DeYoung | Accepted, Fisheries and aquaculture added for SOD - new CA on this topic has joined the team |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3961 | 11 | | | | | Indian Research papers published in literature may be cited for crop residues production as well as feed and fodder deficit data given in report of 12th Plan submitted to Govt. of India (2012-2017). This information may be included "Over the last two decades (1985-86 to 2005-06) availability of various types of feed has increased. Even though availability of feed resources vary from area to area, but during this period, the India as a whole recorded 52% (240.7 to 365.8 Mt), 76.0% (19.6 to 34.5 Mt) and 1.8% (124.3 to 126.6 Mt) increase in crop residues, concentrates and green forages respectively. In spite of this, there is a gap in the availability vs. requirement. As per estimates, the deficit of dry<br>fodder, concentrates and green fodder currently is 10, 33 and 35 percent<br>respectively, which by 2020 is likely to be 11%, 35% and 45%." | Rejected, Too country specific - we cannot cite every paper and report for every country - this is a synthesis |
| 15348 | 11 | | | | | Smithers, R.J.; Cowan C.; Harley, M.; Hopkins, J.J.; Pontier, H. and Watts, O. (2008) England Biodiversity Strategy: Climate Change Adaptation Principles. Conserving biodiversity in a changing climate. Defra, London. 16pp. | Rejected, Not sure what is suggested here. This is an adaptation report - not a mitigation paper |
| 16051 | 11 | | | | | In general , the chapter is OK structured and written, but has, in my opinion, some major drawbacks related to forestry which should be improved in the next version. These drawbacks are: 1. The estimates of forest mitigation potential should be much more geographical explicit and linked to types of forest ecosystem and baselines/additionality. For example, very few studies from Scandinavian boreal forests are referred to and used. Many of these studies are considerably more specific than the US/North America and global studies referred to in Ch. 11, both regarding forest manangement options included, simultanously including bioenergy and "normal" end-uses of forest fibre (e.g. competition to the existing forest industries and substitution impacts), and regarding analysing additionality. 2. Carbon leakage impacts should be more thoroughly discussed (for example that decreased harvest in country A will in most cases lead to increased harvest in other countries, thus reducing the direct carbon sequestration impacts in country A).Because of time limitation I have managed to comment just so generally . If references are needed to Scandinavian/European articles , just contact. | Accepted, Revised for SOD |
| 15228 | 11 | | | | | In general, I think the chapter is well-balanced among different approaches. It is an improvement from AR4 to combine forest and agriculture in mitigation efforts related to land use, they are indivisible in practice and it is good to see an integrated holistic approach to those. | Noted, Thank you |
| 14418 | 11 | | | | | Overall the chapter is a good summary of the complexity of managing agricultural and forest landscapes for C storage and GHG reduction in terms of ecological capacity, as well as social and economic constraints. | Noted, Thank you |
| 14419 | 11 | | | | | 11 Throughout chapter parentheses for citations are not consistently formatted. | Accepted, Zotero updated for SOD |
| 17999 | 11 | | | | | The definition of spill-overs used in this section seem to deviate substantially from the topics discussed elsewhere in the report (e.g. carbon leakage, technological spill-overs, etc.). See my comment on section 11.7.3. | Parially Accepted, Section has been reviewed. The reviewer should consider that spillovers from AFOLU differ from other sectors anyway. . However the text |
| 6780 | 11 | | | | | Suggest add "interaction of desertification and crabon ",controlling desertification of lands is important sustainable development,and it can increase the carbon sequestation in lands.Inorganic carbon is important in arid region,so add some content about land use change on inorganic carbon. | Accepted, Included as a potential co-benefit (section 11.7) |
| 18922 | 11 | | | | | Try to convert into figure (absolute and % values; time range normalization needed for that); consider adding historic values (see Section 11.2.2) to that. | Accepted, Converted to figure for SOD |
| 18931 | 11 | | | | | Some issues brought up in this table have been critically discussing with regard to sustainability (negative effects and emissions from production of fertilizers; improving crops and breeds might include GMOs that are by some critically discussed; water availability in cropland leading to increase of competition for water; long term effects of dietary additives such as antibiotics; ). Please consider discussing these issues here or in the sustainability section with reference to the table. | Parially Accepted, Added refs but these issues are mainly dealt with in trade-offs section |
| 18932 | 11 | | | | | Giving ranges once the data is available sounds very good. Please consider turning it into a figure - possible several figures, one for each of the 5 world regions + 1 global. | Accepted, This table went very wrong in formatting - it will be replaced in SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18914 | 11 | | | | | Four comments: (1) In a) I suggest to change the order within the bars, having deforestation at the top, as this is most volatile - this will help comparing changes in the other aspects much better. Also try to separate the last stack from the others (e.g. by a vertical dashed line) as this one does not follow the time sequence of the others. (2) This figure should in my view be ammended by historic data from Ch.5 (or that historic data should go into separate figures). (3) In the caption line 4 it says "1990-2007" with respect to a) but this range is only found in b). (4) In line 10 there is a citation software error. | Accepted, Revised for SOD |
| 18919 | 11 | | | | | As the increase is very different for poultry please consider adding that data, too, if available. In order to be able to better compare world regions, consider having the same y scales for all figures here. | Accepted, Text revised to include non-ruminants |
| 18926 | 11 | | | | | I like the figure but have a few comments: (1) Could you clarify whether the last range is the sum of the other two or whether this is based on other data? (2) There should be a legend explaining the single points (i.e. which shape which study). As the other legend uses squares try to have a different symbol than a square for the single points. (3) I suggest to align the single points with the bars of the same colour, as otherwise the viewer asks him/herself whether it has any meaning that they are set aside. (4) I think it would be very good to also give the total over the different aspects, if nothing speaks agains adding the Pan data and if this is available for the other studies. (5) As the numbers labeled can already be read from the y-axis, consider replacing those values by % values, which would be interesting to have as additional information in the figure. | Accepted, Changed for SOD |
| 9446 | 11 | | 32 | | 32 | A trend is a real, observed phenomenon. It is not driven by a projection unless that projection causes people to act differently than they otherwise would have. | Rejected, No page number - cannot act |
| 7055 | 11 | | | | | It appears that throughout this chapter the "net co2 fluxes from management of land (croplands, forests, grasslands, wetlands)" is collectively referred to as "land use" but this is not clear. For instance, in the next sentence, the categories suddenly switch to land use, land use change, and forestry. And then in the next sentence, the terminology seems to change again - this time to "land management and land use change". This shifting of terminology makes it almost impossible for the reader to know exactly what is included in the various parts of the discussion. At the beginning of this section (perhaps in 11.1) the text should clarify what is meant by the various terms and the terms should be used consistently throughout. | Accepted, This should be dealt with in the glossary - but we should also use consistent terminology in SOD |
| 3531 | 11 | | | | | It is appreciated that Agriculture and Forestry are treated in a single sector AFOLU. I suggest to avoid to personalize the text. | Rejected, Cannot see what personalize means here |
| 15205 | 11 | | | | | glad to see review of REDD | Noted, Thank you |
| 2147 | 11 | | | | | may further emphasize the role of co-benefits in policies - e.g. the EU nitrate directive may has been the most effectice mitigation instrument for agriculture in the EU - and a similar soil-directive, still under discussion, could similarly benefit mitigation via soil carbon sequestration - while both these directives have not been aimed at supporting CC mitigation. | Accepted, Comment on the impacts of Nitrate Directive on mitigation of N2O was included |
| 2148 | 11 | | | | | add: better understanding of the combined C- and N-cycles - e.g. the influence of SOC levels on N2O emissions and also the dependence of N2O emissions on fertilizer types (incl. Legumes). | Accepted, Was reflected in SOD |
| 7216 | 11 | | | | | Gaps in knowledge and data. Add a bullet: Better data on the extent and depth of peatlands on a global scale. | Accepted, Added for SOD |
| 4991 | 11 | | | | | Title suggested in ouline fits more with content of section rather than this title . Delete the words ( New developmen in ) | Accepted, Changed for SOD |
| 4992 | 11 | | | | | In subsection 11.2.1 something on consumption of woodfuels in developing counteries can be added to subsection | Accepted, Done |
| 13521 | 11 | | | | | Title suggested in ouline fits more with content of section rather than this title . Delete the words ( New developmen in ) | Accepted, Change for SOD (duplicate comment) |
| 13522 | 11 | | | | | In subsection 11.2.1 something on consumption of woodfuels in developing counteries can be added to subsection | Accepted, Done |
| 14428 | 11 | | | | | It would be easier for a reader to compare the relative significance of a particular land cover if all numbers were reported in Gt. | Accepted, Done |
| 18923 | 11 | | | | | Try to convert numbers in this and the following sections into figures. | Accepted, Change to consistent units for |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16540 | 11 | | | | | This section is densely packed with numbers, which are not easily understood when they simply follow each other in text. It would be helpful to reduce the text and express some of the changes and comparisons among estimates in Figure or Table form. | Accepted, Section rewritten for SOD |
| 7184 | 11 | | | | | Trend of C fluxes in land use and land use change. An overview is missing on C fluxes (per climate zone) in the AFOLU sector. It would be good to have a table with the main sources and sinks, ordered on source or sink sizes. This illustrates the relative importance of certain measures in terms of carbon 'gains' and GHG emissions reductions | Accepted, Section rewritten for SOD |
| 18927 | 11 | | | | | This section has a lot of numbers in the text. These are very hard to digest and make it difficult to keep with the flow of the text. So, please consider moving numbers into a table or better a figure and focus the text on contextualizing and interpreting the data. | Accepted, Section rewritten for SOD |
| 16556 | 11 | | | | | Another section with many numbers presented in text -- reduce the text and give the information as a Table or Figure. | Accepted, Section rewritten for SOD |
| 3959 | 11 | | | | | Contribution of ruminants towards methane emissions is missing so it should be added in this chapter | Rejected, Incorrect - ruminant methane is discussed throughout |
| 15159 | 11 | | | | | possible to replace some wordy, data laden text with figures? | Accepted, A new table is added that will reduce the amount of text |
| 15160 | 11 | | | | | a very interesting section, and perhaps the heart of the chapter. But, it repeats on itself across all subsections, especially on the topics of bioenergy/biofuels, diets, and land tradeoffs. The message seems to come through that there is a need to be create multi-criteria land uses (without a myopic focus on mitigation). That's a good message, but could be much better organized and tightened throughout the entire section. | Accepted, Agreed - have made more central to the storyline on the chapter for SOD |
| 3960 | 11 | | | | | Mitigation technology options and practices being adopted in feeding strategies of ruminants are to be given in this sub-section | Accepted, New table has been constructed and updated with more |
| 8839 | 11 | | | | | Would biomass based materials (biomass-baded plastics, natural fibre for material reinforcement, fine chemicals from forest residues, …) deserve a place in this section as well? | Accepted, Added reference here |
| 15161 | 11 | | | | | section cn be reduced/ tightened | Accepted, Revised for SOD |
| 17353 | 11 | | | | | Changes is global diet. This study needs to be better explained. Does it mean that is possible to conceive a diet that would be "healthy" for all persons in the world and still be healthy? There is more than one assumption here involved, as culture etc are all mingled with food. This is a difficult proposition and deserves further elaboration. | Accepted, Revised, references added |
| 5750 | 11 | | | | | The reasons for food loss/waste could be added as per pag. 26 of the FAO Energy-smart food report (http://www.fao.org/docrep/014/i2454e/i2454e00.pdf) | Accepted, Revised, references added |
| 11814 | 11 | | | | | This whole section is very conceptional is data and/or examples could make it more tangible for the reader and its arguments more convincing | Accepted, Section edited. Published papers to support examples not readily |
| 12074 | 11 | | | | | Please add a discussion on the point that timing of mitigation benefits from actions (e.g. bioenergy, forest management, forest products use/storage) can vary and that timing of benefits needs to be considered in judging the effectiveness. Cherubini et al (2012) gives examples for how timing of benefits varies for forest management to produce wood for energy or wood for products that have different use lives. [Cherubini, F., Guest, G. and Stromman, A. (2012). Application of Probability Distributions to the Modeling of Biogenic CO2 Fluxes in Life cycle Assessment. Global Change Biology Bioenergy, 1 - 15.] | Accepted, Commentary on timing of mitigation benefits added to end of section. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12079 | 11 | | | | | Given the importance of assessing the risk of alternate mitigation strategies I suggest there is a great opportunity for the authors to prepare a table for this section that has as its columns the risks to mitigation noted in this section (ie nonpermanence/ reverablity; saturation; human and natural impacts (threats?); displacement/leakage) and as its rows the alternate strategies identified in previous sections of this report. I think the magnitude of risk - OF NOT ATTAINING MITIGATION BENEFITS would differ greatly, for example, between afforestation, avoided deforestation and biomass use for enegy from roundwood in forests. I think riskiness issues and uncertainties in risk could be identified. This would provide a dimension of understanding risk that is not shown in many model estimates of mitigation benefit where there is assumed certainty (mostly) in carying out the mitigation activities at least for a given scenario. I'll forward a table where we attempted to do this for the U.S, for forest sector mitigation actions for the Forest Sector report of the forthcoming U.S. National Climate Change Assessment. | Accepted, This is an excellent suggestion, however a published study that provides a quantitative basis for this analysis is not available. The US National Climate Change Assessment update, noted in this comment, has not been published (12/2012) and is "scheduled to be completed in 2013" http://www.globalchange.gov/what-we-do/assessment. This chapter is also for AFOLU rather than forestry alone and similar assessment as suggested for |
| 4993 | 11 | | | | | Suggest to remove subjection 11.4.4 since most of information are tackled in 11.10 and in other section of chapter 11 | Rejected, Retain here as per IPCC outline |
| 13523 | 11 | | | | | Suggest to remove subjection 11.4.4 since most of information are tackled in 11.10 and in other section of chapter 11 | Rejected, Retain here as per IPCC outline (duplicate comment) |
| 16574 | 11 | | | | | This section is a good candidate for deletion so as to reduce the length of the chapter to the allotted amount. It is rather general, lacks quantitative data, and mostly just makes the point that the system is complex. That is well known! | Partially Accepted, Section was strongly revised and shortened |
| 7198 | 11 | | | | | o A lot of text. Text is very suitable for illustrating it in a figure. E.g. show in a figure what the effects are from mitigation measures (ARR, REDD, PRC) on food prices, production, competition for land etc. maybe a separate figure for production of bioenergy. | Rejected, Only 3 paragraphs - correct section? |
| 16585 | 11 | | | | | This is another section that can be deleted to save space. It is general and conceptual, lacking quantitative data and mostly just listing the many factors that are involved, without suggesting which ones are most important nor what should be done about them. | Accepted, Retained here as per IPCC outline but shortened |
| 17354 | 11 | | | | | Interesting table. Please consider adding gender issues in particular with relation to land ownership issues and ressource managment affecting transitions. | Rejected, Wrong table / section |
| 4994 | 11 | | | | | Suggest to remove whole section since most of information may be covered in adaptation report | Noted, Need to make links to adaptation |
| 13524 | 11 | | | | | Suggest to remove whole section since most of information may be covered in adaptation report | Noted, Need to make links to adaptation |
| 7201 | 11 | | | | | Another example of a land use – climate feedback: the drainage of peat for agriculture makes the soils susceptible to fire. The global warming (increase in number of dry (El Nino) years) causes the fire frequency to increase. The particle load in the atmosphere increases, which causes not only health problems (steep increase in respiratory illnesses in e.g. the tropics), but also a reduced penetration of sunlight and therefore a reduced photosynthesis of trees | Noted, Noted, but reference not available for SOD |
| 7202 | 11 | | | | | o compounding pressures. Also mention compounding pressures of grasslands, wetlands and croplands. | Noted, Section restructured and shortened due to page limitation |
| 2142 | 11 | | | | | some more details on these measures would be nice - or more explicit reference that the reader should consult these othe rdocuments for these practices. - may provide a table or so. | Accepted, Text modified |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2144 | 11 | | | | | may refer Smith, P. and Olesen, J.E. (2010) 'Synergies between mitigation of, and adaptation to, climate change in agriculture', Journal of Agricultural Science, 148, pp. 543–552; may also take up the more critical assessment of synergies in Rosenzweig, C. and Tubiello, F. (2007) 'Adaptation and mitigation strategies in agriculture: an analysis of potential synergies', Mitigation and Adaptation Strategies to Global Change, 12, pp. 855–873; may also add a sentence at the end of this section such as: "Systemic approaches to sustainable agriculture, such as organi cagriculture, have a good potential to realise these synergies, as many of the aforementioned practices are core-practices in these production systems, which are applid in optimal combinations (El-Hage Scialabba, N., Müller-Lindenlauf, M., 2010. Organic agriculture and climate change. Renewable Agriculture and Food Systems 25, 11; Muller, A., Osman-Elasha, B. and Andreasen, L., 2012, The potential of organic agriculture for contributing to climate change adaptation, in: Halberg, N. and Muller (Eds), Organic Agriculture for Sustainable Livelihoods, Earthscan Publishers)." | Accepted, Reference and text included |
| 4995 | 11 | | | | | Insubsection 11.7.1.2 consider to adress environmental & health cobenefits associated in using wasted polluted water from industry or water produced in oil exploration field for establishing of forest plantation | Accepted, Section redrafted considering the comment |
| 13525 | 11 | | | | | Insubsection 11.7.1.2 consider to adress environmental & health cobenefits associated in using wasted polluted water from industry or water produced in oil exploration field for establishing of forest plantation | Accepted, That is the same comment as in line145:,section redrafted considering |
| 17988 | 11 | | | | | Introductory sentences like the ones in Chapter 10 might be a good idea to prepare the reader for the following discussions: "Besides economic cost aspects, several other aspects have implications on the final deployment of mitigation technologies. Co-benefits, co-costs, risks and uncertainties associated with alternative mitigation technologies as well as public perception thereof can affect investment decisions of companies and priority setting of governments."<br>Additionally, the structure of the section is not consistent with the agreements made in Wellington (p. 36) whereby both co-benefits and co-costs should be discussed under the sub-section headings 'socio-economic effects' and 'environmental and health effects' instead of framing the co-cost discussion under the risk headline. This would imply that sections 11.7.2.1, 11.7.2.2 and the paragraph on ecosystem markets in 11.7.3 should be integrated with the corresponding sections in 11.7.1. There is no obvious reason why Chapter 11 would want to deviate from the agreements made in Wellington on the structure of the sections on co-benefits, risks on the one hand and barriers and opportunities on the other. | Accepted, The whole section has been restructured considering this and other comments |
| 10258 | 11 | | | | | Sections 11.7 and 11.8 either might be merged thus their covers similar aspect and there are several times duplication of the ideas presented (See Table 11.11 and 11.12) | Rejected, Stick to IPCC chapter headings |
| 2145 | 11 | | | | | I suggest to add some paragraph specifically on soil carbon sequestration and it's double role for mitigation and adaptation in agriculture, the latter via imporved water absorption and retention capacity, thus increasing resilience agains water scarcity and heavy rains (water logging, erosion), improved soil fertility, etc. | Accepted, Included in the table and some mention in the text |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3761 | 11 | | | | | A great deal has been published on the potential co-benefits and risks of REDD+ on biodiversity, and in general this topic could be given more coverage in the report. For example: Forests provide habitat for over two-thirds of known terrestrial species (Raven, 1988). Thus a REDD+ mechanism that pays for climate mitigation is also expected to benefit forest-dependent biodiversity by conserving forest habitat that would otherwise have been cleared (Busch et al., 2011). However, a REDD+ mechanism whose incentives are focused solely on carbon storage risks undesirable consequences for biodiversity. Such a REDD+ mechanism could favor the conservation of higher-carbon forests over higher-biodiversity forests (Putz and Redford, 2009; Paoli et al, 2010; Siikamaki and Newbold, 2012) or could displace agricultural activity into low-carbon but biologically important landscapes (Miles and Kapos, 2008).<br>There is substantial interest in policies to increase the biodiversity benefits or ameliorate the biodiversity risks associated with REDD+. This includes more closely linking the objectives of the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biodiversity (CBD) (Secretariat of the CBD 2009), but extends more broadly as well. Harvey et al. (2009) distinguish pro-biodiversity policies between those that contribute to greater climate mitigation and those that present a tradeoff with weakened or delayed climate mitigation. Policies that promote both greater biodiversity conservation and greater carbon storage include increasing finance for REDD+ (Busch et al., 2011, Strassburg et al., 2012), strengthening institutions to handle large financial flows under REDD+ (Ring et al., 2010), minimizing leakage of deforestation to regions with high forest cover and low deforestation rates (da Fonseca et al., 2007; Busch et al., 2011), and ensuring that definitions of forest proclude incentives for the conversion of natural forest to low-carbon, low-biodiversity plantation crops (e.g. oil palm) (Sasaki and Putz, 2008). Policies that present tradeoffs between biodiversity conservation and carbon storage include geographically prioritizing the conservation of forests that are richest in biodiversity (Kapos et al., 2008; Venter et al., 2009; Strassburg et al., 2010; Larsen et al., 2011; Gardner et al., 2012), monitoring the impacts of REDD+ on biodiversity (Gardner et al., 2012), and enacting safeguards to prevent the afforestation of biologically significant grasslands (Stickler et al., 2009).<br>A commonly suggested policy to increase the biodiversity benefits of REDD+ is supplementing carbon payments with biodiversity payments (Venter et al., 2009; Strassburg et al., 2010; Dinerstein et al., 2010; Busch et al., 2011; Collins et al., 2011). Busch, J., Godoy, F., Turner, W., Harvey, C. (2011). “Biodiversity co-benefits of reducing emissions from deforestation under alternative reference levels and levels of finance.” Conservation Letters, 4:101-115.<br>Collins, M.B., Milner-Gulland, E.J., Macdonald, E.A., Macdonald, D.W. (2011). Pleiotropy and charisma determine winners and losers in the REDD+ game: all biodiversity is not equal. Tropical Conservation Science, 4(3):261-266.<br>da Fonseca, G.A.B., Rodriguez, C.M., Midgley, G., Busch, J., Hannah, L. and Mittermeier, R.A. (2007). “No forest left behind.” PLoS Biology, 5(8):1645-1646.<br>Gardner, T.A., Burgess, N.D., Aguilar-Amuchastegui, N., Barlow, J., Berenguer, E., Clements, T., Danielsen, F., Ferreira, J., Foden, W., Kapos, V., Khan, S.M., Lees, A.C., Parry, L., Roman-Cuesta, R.M., Schmitt, C.B., Strange, N., Theilade, I., Vieira, I.C.G. (in press). A framework for integrating biodiversity concerns into national REDD+ programmes. Biological Conservation, doi:10.1016/j.biocon.2011.11.018<br>Harvey, C.A., Dickson, B., Kormos, C. (2010). Opportunities for achieving biodiversity conservation through | Accepted, The argument has been included as a potential environmental effect. Some of the mentioned references were included. |
| 15201 | 11 | | | | | highly repetitive of 11.3 | Accepted, The whole section has been restructured considering this and other |
| 7205 | 11 | | | | | o Suggestion: change title in ‘positive environmental and health effects’ | Accepted, The whole section has been restructured considering this and other comments. In the new version, positive and negative potential impacts are |
| 7207 | 11 | | | | | Add: 1) Reduction of fire: decrease respiratory illnesses, increase plant growth. 2) Rewetting of peat: decreasing soil subsidence -> decreasing flooding risk -> decreasing salt water intrusion in coastal areas, decreasing DOC loads because of peat-erosion in rivers and streams -> decreasing negative impacts on fisheries | Accepted, Reduction of fire included in the table. Impacts on floods, fisheries and salt water intrusion should be discussed in 11.5 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17994 | 11 | | | | | This paragraph has only one reference which is clearly not enough to substantiate the many claims made here - which are partly redundant. The sentence on carbon credits should mention that this only applies if a hypothetical carbon market is introduced and also covers the agricultural sector. | Accepted, The whole section has been restructured considering this and other comments |
| 7206 | 11 | | | | | o Suggestion: change title in 'negative environmental and health effects'. | Accepted, The whole section has been restructured considering this and other comments. In the new version, positive and negative potential impacts are |
| 7208 | 11 | | | | | Another example of a negative effect: Rewetting of peat might cause high methane fluxes in the first years after rewetting | Accepted, Considered, but not included because it is discussed in section 11.2 |
| 15202 | 11 | | | | | this si the land/water section! | Noted, We thank you for the statement |
| 17996 | 11 | | | | | The paragraph is the only discussion of risks which is consistent with the agreements made in Wellington. Please consider a broader discussion of risks and uncertainties along the classification of risks and uncertainties provided in Section 6.7. Please liaise with the other sector chapter LAs to discuss the process by which a more consistent approach can be reached. | Accepted, The whole section has been restructured considering this and other comments. The term "uncertainties" was avoid to reduced potential confusion. However, issues that are not yet clear |
| 17997 | 11 | | | | | This paragraph on public perception should have its own third-level heading according to agreements made in Wellington rather than be framed under 'risks'. | Accepted, The whole section has been restructured considering this and other |
| 11177 | 11 | | | | | Concept of this section is not clear.This section can be deleted. | Accepted, The whole section has been restructured considering this and other |
| 17998 | 11 | | | | | The definition of spill-overs used in this section seem to deviate substantially from the topics discussed elsewhere in the report (e.g. carbon leakage, technological spill-overs, etc.). I would suggest to integrate the paragraph on ecosystem markets into 11.7.1.2 or into the policy section and to integrate the paragraphs on the scale of impacts into the introduction to the section 11.7. Additionally, please avoid the usage of the term trade-off which is inconsistent with agreements made in Wellington (p.35). | Parially Accepted, Text has been reviewed. The discussion on terms like risks or trade-offs for this section is still open. The nature of spill-overs in the AFOLU sector is different than in the |
| 17993 | 11 | | | | | This short paragraph on innovation could well be moved to the section on socio-economic effect | Accepted, The whole section has been restructured considering this and other |
| 13354 | 11 | | | | | This section requires revision for grammar, clarity of sentence structure and use of language before it can be judged for content. | Accepted, Section has been reviewed |
| 18000 | 11 | | | | | An introductory sentence along the example of Chapter 9 referring to the agreement reached in Wellington (p. 36) might be helpful for readers: "Barriers and opportunities are referred to as conditions that hinder or facilitate the implementation of the analyzed measures." | Accepted, Introductory sentences were added |
| 7209 | 11 | | | | | Technological barriers and opportunities. Rewetting as a mitigation option requires knowledge on building dams. Building dams in rural areas can be a challenge and there are many examples of the dis-functioning of such dams. Future developments should focus on opportunities, e.g designing simple but robust constructions that can be build by using local products (to avoid that transport emissions are relatively large compared to the emissions that can be avoided through rewetting). | Accepted, Caveat added |
| 18002 | 11 | | | | | The use of opportunities in this paragraph is inconsistent with the agreements made in Wellington (p. 36) by which they should be interpreted as favourable conditions to mitigation options. It would thus be interesting which opportunities exist that would foster or prevent the mentioned "future developments". | Parially Accepted, Consistency improved |
| 18003 | 11 | | | | | This sub-section on public perception should be integrated with the sub-section on public perception in 11.7. | Accepted, Moved to 11.7 |
| 18766 | 11 | | | | | Mitigation potential (global and regional) should be discussed in this section and not as stated there in the "Cost and Potentials" section. We should discuss this at SIE-3 and other relevant X-Cut sessions at LAM3. | Accepted, Potentials given here as well as in the costs and potentials section |
| 18767 | 11 | | | | | Please communicate to Ch.6 what data would be desirable for this section. | Rejected, Already done at LAM2 |
| 18768 | 11 | | | | | Please communicate to Ch.6 what data would be desirable for this section. | Rejected, Already done at LAM2 |
| 8831 | 11 | 0 | | | | Generally this is a very comprehensive chapter bringing together state-of-the-are information on all relevant aspects. | Noted, Thank you |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16518 | 11 | 0 | | | | Congratulations to the AR5 team for the welcome decision to integrate the land use chapters into a single AFOLU chapter. This has made it possible to consider in detail the interactions among agriculture, forests, bioenergy and other land uses, which is a major advance over AR4. To the degree that I have critical comments relating to this decision, it is that in some of the sections of this chapter the integration has not be done as much as necessary, so that analyses remain "siloed" and thus incomplete or even misleading. | Accepted, Has been further integrated for SOD |
| 16519 | 11 | 0 | | | | Given the damaging criticisms of AR4 for a few citations of non-peer-reviewed literature, it is particularly important to avoid this error in AR5 chapters. There are a few cases in this chapter where this problem appear to be present; although this would be a minor point in reviewing most publications, here it is of key importance. Thus I would urge special attention to these cases, pointed out individually below. | Rejected, This comment seems to have been spliced so cannot act on it in isolation |
| 16520 | 11 | 0 | | | | The different sections vary in the units they use for emissions and sequestration, and in a few places do not make it clear what the units are at all. This variation causes needless confusion, and the units should be standardized both within this chapter and between it and the rest of AR5. The main options are tCO2eq and tC; in a few places PgC, which is the same as GtC, is used. Since the standard unit for emissions in other sectors (and thus in other chapters) is tCO2eq, I urge the authors to convert all emissions and sequestration figures to this unit. This will also avoid the strange feature of having non-CO2 gas emissions expressed in "tCeq", apparently calculated by multiplying quantities of CH4, N2O, etc. by their GWPs and then dividing by 3.67 to convert them into C units. | Accepted, Made all units consistent for SOD |
| 16521 | 11 | 0 | | | | It is anachronistic, and substantially reduces the policy value of this chapter, to continue the AR4 practice of expressing mitigation potentials in the format "X GtCO2e at a carbon price of $ Y". This had a justification at the time of AR4, when it was expected that international negotiations would lead to a global carbon market in which competition would equalize supply and demand at a single carbon price. But this expectation no longer corresponds to reality. We do not have a single carbon market or a single carbon price, and the result of the negotiations in Durban (with its decisions on what will be negotiated over the rest of the decade) make it clear that we will not have them in the foreseeable future. Rather, policies are being made in a bilateral and multilateral, pledge-and-review framework, in which the major payments being made for AFOLU emissions reductions and sequestration are being done through non-market mechanisms (e.g. the Brazil-Norway Amazon Fund arrangement) and with different carbon prices, or even no explicit carbon price, depending on the particular donor and recipient nations involved. In these circumstances, to continue presenting results in a framework that assumes a global carbon price is to put a great deal of effort into analyses which the policymakers will find outdated and mostly irrelevant. | Noted, We can only review what has published - so if the literature uses these metrics, we have to reflect them |
| 16522 | 11 | 0 | | | | As a followup to my previous comment (#4) I would point out that it is also anachronistic to present analyses only for carbon prices up to $ 100/tCO2eq. Policymakers are now considering options which effectively imply higher prices than that, though often expressed in different ways. | Noted, We can only review what has published - so if the literature uses these metrics, we have to reflect them |
| 15973 | 11 | 0 | | | | There is a lot of interesting information in the document, however it is sometimes not represented in a very clear and structured way, especially at the beginning of the chapter. Sometimes too much detail is given which makes the main message unclear, figures, bullet points, etc. could be used in many places to represent the main issues. Numbers throughout the text from different authors, makes text sometimes heavy, comparable figures/tables may increase readability. | Accepted, Revised for SOD |
| 15975 | 11 | 0 | | | | The overall structure of the document could be improved, sometimes, it seems there is no connection between various chapters & sub-chapters | Accepted, Revised for SOD |
| 12356 | 11 | 0 | | | | Chapter 11 shows the effect development of bioenergy can have on the carbon stock in soil and vegetation and that transformation of these carbon stocks can lead to emissions of CO2 to the atmosphere, higher than the amount of CO2 saved by the substitution of fossil fuel. The chapter also emphasize the effect on land use and competition with production of food and fiber and visualize the consequences for land use of different bioenergy scenarios, for instance in fig 11.14. These consequences can be dramatic. | Noted, Statement - not clear what action is required |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12357 | 11 | 0 | | | | The chapter elaborates on the effect of different diet scenarios on the emissions of GHGs from the food chain. The difference between scenarios with high consumption of animal products and low animal product scenarios in 2050/2055 could be up to 10 Gt CO2-eq. This figure is significant higher than the effect of technical mitigation measures. Land-use related GHG-emissions and the effect on land use play an important role. The effect of different diets on land use is mentioned clearly in WGII chapter 19 with reference to the same publication as in WGIII chapter 11. One of the studies conclude that, to limit the GHG concentration to 450 ppm CO2-eq, a global adoption of the "healthy diet" would reduce global GHG abatement costs by about 50% compared to the reference case. | Noted, Statement - not clear what action is required |
| 12358 | 11 | 0 | | | | It would be very useful if the effects of different bioenergy scenarios on emissions and land use could be compared and collocated with the effects of different diet scenarios with comparable units, for example Gt CO2-eq and million km2 land or percentage of the global land area. Eventually could the effect of technical mitigation and reduction of food-supply chain losses and wastes also be included. | Accepted, Revised, included new Table in section 11.4.4 |
| 18239 | 11 | 0 | | | | Final comments: The document presents a series of numerical data that allow visualize trends, especially CO2 emissions to carbon sinks. However, the evaluation of IPCC shows that in section 11.11 (Gaps in knowledge and data); pages 71-72, the need of increase knowledge on other environmental variables, space information, dynamic of world ecosystems, forestry practices, among others, so can be obtained a current description of forest, based on a reliable and timely data. In this sense, it is recognized an information deficit, which should be solved to improve decision making process in management of forests and climate change. | Accepted, Have expanded on uncertainties |
| 14263 | 11 | 0 | | | | The chapter is coherent, well written covering almost all aspects pertaining to mitigation in Agriculture, Forestry and Land use Section | Noted, Thank you |
| 14264 | 11 | 0 | | | | Repitition of same things, at some places, has made the chapter lengthy. I think synthesis of these can make the chapter concise | Accepted, Edited for SOD |
| 14265 | 11 | 0 | | | | The main purpose of the revision of Assessments Reports, after every four years, under auspices of IPCC is to have a synthesis of the work done in that period. So fresh refercnes are required to be quoted. Whereas the present manuscript have many citations of the period prior to 2007. This requires serious attention of the CLAs, LAs and ERs. | Accepted, Updated all references for SOD |
| 15135 | 11 | 0 | | | | very interesting overall. Strong messages don't jump out at reader though. In places, there are surprisingly detailed descriptions of specific studies. This becomes a somewhat random aggregaton of detail rather than providing a synthesis. It would be helpful to take draft as is and pull out the the synthetic messages (thus chopping away unnecessary detail as well as helping to decrease the chapter's page length. Make sure it's not just a lit review (mentioning that someone worked on a particular topic), but that it presents a coherent story and contributes value-added (i.e. more than the sum of its parts). | Accepted, Used multi-functional land use as the central narrative for the SOD |
| 15136 | 11 | 0 | | | | delete "either/or" statements, i.e. any vague sentences that say trends or stocks go up or down or could increase or decrease, depending on site or how things are modeled. Doesn't contribute to the synthesis (just the page length). (and no need to say that "anything can be everything" | Accepted, Removed for SOD |
| 15137 | 11 | 0 | | | | Similarly, cut any calls for the need for more data or study; doesn't *inform* here. | Accepted, Removed for SOD |
| 15138 | 11 | 0 | | | | Chapter is heavily, but somewhat narrowly, referenced. There seems to be a high degree of self-citation and nepotism (i.e., referencing colleagues from research groups and partnerships). Be cautious with this: a global assessment must draw widely, and fairly, on the literature. Given past controversies and media flare-ups, it's wise to tread carefully and judiciously here. | Accepted, Checked for over self-citation in SOD |
| 15139 | 11 | 0 | | | | a formatting issue to be sure, but the citations are a mess- it would be easier to read and cut the length if all citations were consistent (i.e. use only surnames in in-text citations!). Is it not possible to issue all authors with the same referencing software and citation style guidance? | Accepted, Zotero updated for SOD |
| 15140 | 11 | 0 | | | | writing to ban from chapter: "being" is not a strong verb; "impacted" or "impacted upon" is weak (doesn't tell much) and some argue it's not a verb; "etc." tells nothing, so there's no point including… | Accepted, Removed for SOD |

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| 15001 | 11 | 0 | | | | This chapter should include some discussion of the role of indigenous peoples in protecting forest land. This has been particularly salient in Brazil, where indigenous reserves are in some cases among the best-protected land in the Amazon. In many countries, active engagement of indigenous populations can amd must play a critical role in any strategy to reduce emissions from forest destruction and degradation. This issue may merit a separate section within chapter 11. | Accepted, Included in chapter, but not as separate section |
| 15003 | 11 | 0 | | | | In chapter 11, or perhaps more appropriately in chapter 13, it would be very useful to have a text box that would describe the evolution of REDD+ as an international effort. It would include discussion of national actions, such as Brazil's reduction in deforestation and establishment of the Amazon Fund; of the role that donor countries such as Norway are playing in stimulating interest and investment; the role of the Forest Carbon Partnership Facility at the World Bank; evolution of REDD+ as an area of agreement in the UNFCCC negotiations; interest among subnational governments as manifested through the GCF, involving governors from the U.S., Brazil, Indonesia, Mexico and other countries; and perhaps also the role that NGOs have played through supporting REDD+ projects (e.g., Noel Kempff Mercado in Bolivia), and the interest in REDD+ that was manifested in U.S. climate legislation with extensive REDD+ financing provisions in 2009. | Accepted, A figure with the evolution of REDD+ was included, as well as some information on national programs and bilateral cooperation for the REDD+ |
| 7666 | 11 | 0 | | | | Chapter 11 does not reflect that since AR4 the literature has fundamentally changed how we consider bioenergy as a mitigation option. Especially the papers by Searchinger et al. (2008) and Fargione et al. (2008), both in Science 319, have been followed by a vast literature. This literature is in contrast to the very optimistic view on bioenergy as an important mitigation option provided by earlier IPCC reports, not least the SRES report. I had expected that this chapter provides a critical review of the previously far too optimistic IPCC assessments as far as bioenergy concerns. | Rejected, The text reflects this later literature very well, and is not overly optimistic for bioenergy. See new concensus bioenergy annex. |
| 14775 | 11 | 0 | | | | The chapter focuses on global discussion on emission budgets and mitigation potential. However in AFOLU sectors mitigation actions need to take place at the local scale, predominantly by small-holders. I'd recommend the author team writes more about the issues at the local scale. There are a number of specific challenges at the small scale: measurement of carbon storage and mitigation potential, uncertainties associated with bottom-up estimates, access to mitigation finance schemes by farmers, lack of capacities, identification of efffective mitigation options, etc. | Accepted, Issues regarding local character of AFOLU measures are included |
| 8216 | 11 | 0 | | | | QUOTATION OF REFERENCES AND AUTHORS IN THE TEXT ARE VERY INCONSITENT SOME AUTHORS HAVE THEIR INITIALS INCLUDED IN THE TEXT OTHERS DO NOT HAVE INITIALS. SOME AUTHORS ARE QUOTED BY THEIR FIRST NAMES IN THE TEXT WHILE IN THE LIST OF REFERENCES | Accepted, Zotero updated for SOD |
| 2321 | 11 | 0 | | | | The National Comunications on Climate Change from Parties to UNFCCC could be useful for this kind of report as they provided informations and data related to mitigation of GHG emissions in each country. But on the whole, no reference is made to such documents | Rejected, Peer-reviewed analysis preferred |
| 12037 | 11 | 0 | | | | Chapter seems to be conclusive, good incorporation of current land-use patterns, good discussion of competition between food and feed production and bioenergy | Noted, Thank you |

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| 13303 | 11 | 0 | | | | The chapter was effective in summarizing the current knowledge of emission potential mitigation for the AFOLU sector based on large scale modelling studies published in the scientific literature. The chapter requires a more general introduction to AFOLU presenting in a brief and precise manner the interactions between sources of GHGs from AFOLU; how mitigation of one source or gas may compliment or contradict other mitigation of other sources or gases. My main, more specific criticism, lies in a generally poor treatment of the role of the nitrogen cycle in the text and analysis. Reactive nitrogen in the biosphere has increased proportionately to CO2 in the atmosphere over the past 100 years, with the increase in agricultural intensification (Galloway, J.N., Aber, J.D., Erisman, J.W., Seitzinger, S.P., Howarth, R.W., Cowling, E.B., Cosby, B.J., 2003. The nitrogen cascade. BioScience 53, 341-356). I find that N2O emissions are treated in a very peripheral manner throughout the text. Within the agricultural sector, there are important tradeoffs between CH4 and N2O and mitigation strategies for one may result in increases in the other gas. Likewise the interactions between soil carbon and nitrogen cannot be ignored and some acknowledgement of interactions must be clear within the discussion. Specific examples and suggestions are given in my comments throughout the text. The chapter drowns in technical jargon from a variety of different fields and is often quite difficult to follow. Particularly the last few sections. Finally, as the authors are no doubt aware, there are problems throughout the text with citation and brackets around citations All citations require verification. | Accepted, add new reference and expand N2O sections where appropriate |
| 7528 | 11 | 0 | | | | This executive summary indicates that messages from this chapter are not matured, not balanced and not comprehensive. Important messages form AR4 are forgotten. Huge revision is required respecting AR4. | Noted, Comment not specific enough to allow action - what huge revisions since |
| 7529 | 11 | 0 | | | | This chapter deals with AFOLU, but large parts of discussion look at agriculture sector and bioenergy. The most important issue in AFOLU is land use change / deforestation, so these related issues should be most highlighted in this chapter. Because the main draiver of deforestation is agriculture. However, discussion in forestry sector including deforestation is shrunk and does not have progress comparing with AR4. CLAs and LAs should consider priority of mitigation options in AFOLU. | Rejected, We consider the mitigation in the different parts of the AFOLU sector to be balanced |
| 7551 | 11 | 0 | | | | Where is discussion on Research and Development and Technology transfer? This discussion is important for R&D and mitigation options in developing countries especially for REDD+. | Rejected, Already dealt with in section 11.11 |
| 9077 | 11 | 0 | | | | I roughly understood the reasons of the integrated assessment of AFOLU in the AR5. But topic in Forestry sector were scale-down from AR4, and were biased toward "bioenergy" issue. | Accepted, Bioenergy text was shortened and revised |
| 13956 | 11 | 0 | | | | the chapter as a whole is lacking context of responsibility for emissions, therefore responsibility for mitigation. This is necessary for equity reasons, and should be connected to the discussion in chapter 5. it is also necessary because it is not appropriate to weigh costs and benefits, and the distribution of those costs and benefits, without also an assessment of who is undertaking action and who might be benefiting from that action. if the benefits of carbon sequestration are principally as an offset for developed country emissions, but the sequestration is undertaken in developing countries, this is absolute essential to include in the calculus of cost-benefit analysis. | Rejected, Whilst equity issues are discussed, responsibility for emissions is a policy issue and policy prescriptive text must be avoided. That discussion does not belong in Ch11 |
| 13989 | 11 | 0 | | | | several other references to include with regard to mitigation potential (or lack thereof) of conservation tillage. J.M. Baker, et al. 2007. Tillage and carbon sequestration -- what do we really know? Agriculture, ecosystems and environment 118: 1-5; A. Meyer-Aurich et al. 2006. Cost efficient rotation and tillage options to sequester carbon and mitigate GHG emissions from agriculture in Eastern Canada. Agriculture, ecosystems and environment 117: 119-127 | Rejected, Focus on post-2007 literature |
| 13990 | 11 | 0 | | | | other miscellaneous references. D.S. Powlson, et al. 2011. Soil carbon sequestration to mitigate climate change: a critical rexamination to identify the true and the false. European journal of soil science 62:42-55; J.D. Unruh. 2008. Carbon sequestration in Africa: the land tenure problem. Global environmental change 18: 700-707. | Partially Accepted, Added these references for SOD if appropriate |

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| 12924 | 11 | 0 | | | | Only for the structure of the chapter… When there are sub-section in each section, breaf introduction should be included before the sub-sections. For example, Line34-38 in section 11.3 and Line13-27 in section 11.3.2. | Accepted, Added few sentences at the beginning |
| 5455 | 11 | 0 | | | | Only forest with sustainable harvesting can remove CO2 from the atmosphere continuously. Natural forests without harvesting can not act as such CO2 pump. To increase wood products stock in human society and to substitute wood for energy intensive materials and fossil fuels can reduce CO2 in the atmosphere. The importance of sustainable foresty and wood utilization is described little in this chapter. | Accepted, Wood utilization has been discussed more in SOD |
| 11182 | 11 | 0 | | | | It is not appropriate to devide all the mitigation options into production side and demand side. This approach can only focus on the industrial aspect of AFOLU sector such as agriculture and timber production. However, mitigation options related to land-use sector especially forest-related options are not limited in these industrial activities. | Rejected, The division of options into demand and production side measures does not only focus on industrial aspects of the AFOLU sector |
| 11057 | 11 | 0 | | | | Overall, my major comment is that the issue of technological barriars to mitigation practices in the agricultural sector is not emphasized nearly enough. It is so often assumed by those not so familiar with the primary literature that practices such as reduced tillage for increasing soil carbon storage or improved nitrogen fertilizer management for reducing N2O emissions are highly proven and reliable strategies across systems and locations. Unfortuntately, at this point in time, this is not the case, and much more work is needed to better define what the most effective practices are for particular locations, and to quantify their effectiveness. In this regard, I have provided a few examples, and some references in along with my comments below (including some in press articles that were sent via email to comments@ipcc-wg3.de). | Accepted, Barriers have been emphasized more |
| 2607 | 11 | 0 | | | | This chapter has a lot of good information but is poorly organized and has poor transition between paragraphs and even between sentences. It does not have a balance in the materials that are presented and the summary has not balanced by much of the material that was introduced before the policy sector. Combining forests and agriculture also contributes to this imbalance since each is discussed in a section but frequently the information is really mostly applicable to agriculture. By combining them, it ends up suggesting that forests should mitigate impacts that are really from agriculture. In the front part of the chapter, there are many sentences that are too long so the take home messages are lost. | Accepted, Thorough edit has been done for SOD |
| 18983 | 11 | 0 | | | | General Comment: The chapter is substantiated and does a good synthesis. There are nonetheless a few points of critique by the TSU that we would like to share. We are submitting these comments so that they may guide the author team in their work on the chapter. The core comments are labelled "Main Comment". | Noted, |
| 18984 | 11 | 0 | | | | Main comments: Storyline. When reading the chapter no storyline emerges and key messages do not stick out. The FAQs, particularly FAQ 11.1, 11.2 and 11.3, though, address the core questions the chapter should answer. The structure and content of the chapter should be improved in such a manner that it becomes clear which sections contribute to which key messages. | Accepted, Coherent narrative developed for SOD - new introduction and executive summary outlines this narrative |
| 18985 | 11 | 0 | | | | Main comments: Data and accessibility. The chapter covers a lot of data, which is good but which also constraints the flow of the text significantly. Please move more numbers into tables and figures and restrict the text to providing the context and interpretation. | Accepted, Streamlined the text |
| 18986 | 11 | 0 | | | | Main comments: Potentials. The chapter is very detailed on the bio-physical potential. It would be good to extend on the economic potential if possible as this is the one that the policy makers are particularly interested in. We are aware that there is a great range between existing studies, that the ranges are great for different soils and Tiers assumed – please try nonetheless to provide more insights into the economic potential taking into account existing uncertainties. | Partially Accepted, We can only review the literature that exists - and almost all of this is of the kind that provides potential as Gt Co2-eq. at a given C price |
| 18987 | 11 | 0 | | | | Main comments: Redundancies. There are redundancies in Sections 11.3 (options), 11.4 (system perspective) and 11.6 (cost & potentials) concerning mitigation options and their associated potentials. Consider to have a central table that can be referenced throughout. | Accepted, Redundancies removed and whole chapter shorter by 20% |

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| 18988 | 11 | 0 | | | | Main comments: Co-benefits, risks and SD. For all sectoral chapters there must be more clarity about how and where risks, co-benefits and sustainable development is covered in the section “Costs and potentials” (11.6) and what in Section “Sectoral implications of transformation pathways and sustainable development” (11.9). The upcoming meetings (SIE-3, LAM3) should work on this. | Accepted, Has been better developed for SOD |
| 18989 | 11 | 0 | | | | Main comments: Scenario linkage. With the lack of data from the scenario database this section needs attention. Please start collecting, reviewing and where possible synthesizing bottom-up data as soon as possible to have an appropriate counterpart for the scenario data. | Accepted, No data was delivered from Ch6, so we could not include in the FOD. |
| 18990 | 11 | 0 | | | | Main comments: Policies. In the policy section it would be good to focus on policy experience rather than listing plans whose implementation is unclear. | Accepted, Restructured around assessment of existing that has been implemented rather than policies not yet |
| 18991 | 11 | 0 | | | | In contrast to AR4 there have been discussions and a consensus not to provide global mitigation potentials from the sectoral chapters, as these numbers do not take interdependencies into account. In the upcoming process there needs to be discussion among the sectoral chapters how to deal with AR4 numbers. At this stage it seems reasonable not to cite the AR4 mitigation potentials as we will not provide any updates to these numbers in AR5. | Partially Accepted, Accepted - have only provided updates - but we feel that global mitigation potentials should still be given |
| 18992 | 11 | 0 | | | | Please improve the coverage of regulatory uncertainty concerning aforestation. | Rejected, Why? No rationale given |
| 5081 | 11 | 0 | 0 | 0 | 0 | in your list of mitigation strategies I would use yield enhancing and input reducing technical change | Partially Accepted, Have included, but some technologies do both |
| 7394 | 11 | 0 | 0 | 0 | 0 | This chapter should include a section (and a statement in the executive summary) that considers and discusses the role of GHG metrics (GWPs etc) for AFOLU. As a sector whose main emissions are non-CO2 gases, but much of its perceived mitigation potential is CO2, the choice of metric is of major importance. I would expect a section that (a) recognises this, (b) exemplifies it by showing how the significance of agriculture compared to other sectors changes under different metrics, (c) identifies the areas within AFOLU where abatement options and LCA results might be affected by different metrics (in particular where e.g. reductions of CH4 come at the price of increasing N2O), and (d) considers the role of metrics in AFOLU abatement trajectories, including their impact on regional mitigation potential in the context of international trade (see Reisinger et al, 2012, accepted for Climatic Change), and also recognises the interaction between metrics and RD&D cycles. This could link with Section 3.10.3 but build on it by demonstrating the particular importance of GHG metrics for the AFOLU sector. More literature coming out over next few months on metrics for agriculture and policy options for implementing new metrics. | Accepted, Linked to section 3.10.3 |

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| 10131 | 11 | 0 | 0 | 100 | 100 | A general commnet: I am quite a bit concerned about the framing of mitigation in agriculture in this chapter, this can have serious unintended political consecuenses. It is important not to mix issues.I think you are mixing reduction of net emissions and how this could be funded and this leads to the unrational discussions that developing countries should not mitigate and agriculture should not be part of the convention. My frame would go like this; 1.Separate mitigation as a biophysical phenomenon of the politica decisions on financing. 2. Agriculture on existing land areas, separate mineral soils and organic soils.3. Existing agriculture on mineral soils, mitigation is a co-benefit for adoption climate smart practices increasing productivity, organic matter in oils, biomass including trees, reducing waste by more effeicient use of nutriensts and water, improving animal healt and nutrition, improving resilience etc. the real extra cost is MRV cots as and when the emission reducitons are reported.This should be funded by increased and climate smart normal agricultural investments by farmers, governments, private sector, ODA etc. 4. Agriculture on drained peatlands is unsustainable, the peatlands should be rewetted, here climate money is needed for rehabilitation, finding alternative livelhoods, PES etc. 5. AGriculture as a driver of landuse change, this is the difficult part and intimately related to REDD+, which will not succeed if a holistic landscape land use planning approach is not taken including development of agriculutre on existing areas on forest fringes and protection agreements to forests. This is the small holder piece. Then we have large scale commercial farming (soya in Brazil, oilpalms in Indonesia and elsewhere etc.), this is partly a policy driven (biofuel policies), ppartly demand driven (increasing demand of meat the main driver, ) and here the demand side has to be managed. | Partially Accepted, Items 1, 2, 3 and 4 already done. Discussion of leakage in REDD+ programs and land planning policies were included in section 11.10 |
| 14734 | 11 | 0 | 1 | | | use the chronological order to cite the authors: (Wise et al., 2009; Plevin et al., 2010; Searchinger, 2010; Havlik et al., 2011; Popp et al., 2012). This happens in several places of the text. | Accepted, Zotero updated for SOD |
| 10235 | 11 | 1 | | 103 | | General comments on chapter 11: Overall Chapter 11 covers well most of the AFOLU sector, but the writing can be greatly improved (many repetitions between sections, sections to review and / or complete).<br>The references are incomplete, and are often the same references that recur in the text, it should also include more existing reviews on the various points discussed in this chapter. Many sections still need to be updated.<br>See specific comments below for more details | Accepted, Thoroughly edited and updated for SOD |
| 14549 | 11 | 1 | | | | General comment: this chapter pulls a great deal of very useful information in one place. I think it is a move forward to have all AFOLU together and the authros have done a great job in complining much information. It still neds more synthesis in pulling the different information together but this is a great start | Noted, Thank you |
| 14550 | 11 | 1 | | | | General comment: I would like to see a discussion of land availability before numbers are given for potenial mitigation. Also where numbers are given for potential mitigation I would like to see wherever possible the amount of land impled to be used for this mitigation, particualrly for afforestation, reforestation bioenergy. This would help to judge trade off of different otpions and conflicts with other land use (e.g. food). Having land availablility first would help tp put the numbers we see in context. It would also aid in seeing where the land could be sued for either forest mitigation (aff/ref) or bioenergy, but not both, to avoid double counting | Partially Accepted, The land availability is completely linked to the mitigation potential and the land use, so these issues have to be treated holistically |
| 5533 | 11 | 1 | 1 | 73 | 29 | The general comments are now at the end. | Noted, Not a specific comment |
| 5662 | 11 | 1 | 1 | 73 | 29 | General comments on Chapter 11 AFOLU | Noted, Not a specific comment |
| 5663 | 11 | 1 | 1 | 73 | 29 | I have read and re-read this paper, some statements and figures are questionable and in my opinion it misses a fundamental option when considering mitigation alternatives to help reduce increases in GHGs over time. | Noted, Not enough information in this comment to take action |
| 5664 | 11 | 1 | 1 | 73 | 29 | The paper assumes that the use of wood products is a major cause deforestation. It never considers the annual growth of trees compared to annual demand for wood or its sustainability. It assumes that cutting trees is deforestation, yet cutting cereals is not de-farming! In most cases both are harvesting. | Rejected, We are dealing with economic, not total biophysical potentials. Biophysical potentials of not |

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| 5665 | 11 | 1 | 1 | 73 | 29 | I estimate that the growing stock of trees on all land formations is of the order of 544 Gt wood containing 272 Gt C. The annual growth from accessible trees is of the order of 18.4 Gt wood (9.2 Gt carbon) and the annual demand for wood products is an estimated 3.5 Gt wood (1.8 Gt C) or 19% of sustainable supply, (Openshaw, K. Supply of woody biomass, especially in the tropics: is demand outstripping sustainable supply? International Forestry Review. Vol. 13(4) 2011. ISSN 1465 5489.) I attach a copy for your information. Note the (low heat) energy value of dry wood = 18.7 GJ/tonne. | Rejected, We are dealing with economic, not total biophysical potentials. Biophysical potentials of not the focus of modern assessments |
| 5666 | 11 | 1 | 1 | 73 | 29 | Much more wood could be used, especially substituting it for fossil fuels and sawnwood/panel products for steel and concrete, without making inroads into the woody growing stock. The paper is silent on this. It assumes that energy crops will have to be grown to meet increased demands for renewable fuels and planting trees in all formations will sequester more atmospheric carbon and could supply more wood products. | Rejected, We are dealing with economic, not total biophysical potentials. Biophysical potentials of not the focus of modern assessments |
| 5667 | 11 | 1 | 1 | 73 | 29 | Each year, plants capture about 100 billion t of atmospheric carbon (NPP) of which about half is by land plants and each year the same quantity is returned to the atmosphere through respiration in plants and animals, rotting, wildfires etc. Only a small fraction of this carbon is used by humans for food and fuel etc. With improved management much more could be used. By way of contrast, the current use of fossil fuels produces about 8 billion t of carbon (IEA). If you don't use the annual growth of biomass (an estimated NPP of 53 Gt C for land plants – see my article), you lose most if not all of it. | Rejected, We are dealing with economic, not total biophysical potentials. Biophysical potentials of not the focus of modern assessments |
| 5668 | 11 | 1 | 1 | 73 | 29 | The paper talks about using switchgrass (Panicum sp.) and silvergrass (Miscanthus sp.) to produce bioenergy (ethanol). It may be cheaper and more practical to use these grasses and crop and wood waste to produce methanol etc. by the dry distillation of such biomass, or use it directly. I don't know if the 'energy' chapter discusses this? | Rejected, We are dealing with economic, not total biophysical potentials. Biophysical potentials of not the focus of modern assessments |
| 5669 | 11 | 1 | 1 | 73 | 29 | Figure 11.3 (page 12) gives global trends for three time periods. On the emissions side deforestation is separated from land use changes. This is very misleading. I suspect that some of this could be harvesting and thus is 'temporary deforestation'? What happens to these 'deforested' areas? Do they remain in a bare state or are they reclaimed to trees through natural regeneration or replanting? Nature abhors a vacuum and some plants will occupy these lands. I suspect most of it is 'land use change'! | Rejected, We are dealing with economic, not total biophysical potentials. Biophysical potentials of not the focus of modern assessments |
| 5670 | 11 | 1 | 1 | 73 | 29 | The principal causes of deforestation are clearing woody areas for farmland by the subsistence sector because of population increase and expanding cash crops to meet the increasing demand for food and energy. In order to reduce deforestation, agricultural productivity has at least to keep pace with population increase. But this is difficult for the subsistence sector, which has little means to improve its productivity. And by 2050 the population in developing countries is likely to increase by 2 billion of which up to half could be in rural areas. Such programs as REDD+ may be ineffective in slowing down deforestation, especially if subsistence agricultural productivity does not improve. The paper is quiet on ways to make this happen. | Rejected, We are dealing with economic, not total biophysical potentials. Biophysical potentials of not the focus of modern assessments |
| 5671 | 11 | 1 | 1 | 73 | 29 | Simple inputs could help improve productivity. For example, intercropping with marigolds (Tagets sp) in the field or home garden can reduce nematodes in the soil. Adding wood ash, lime, compost and mulch can improve soil fertility and friability. Planting brassicas (cabbage) with (nitrogen fixing) black beans can reduce the incidence of black bean aphids. Again planting napier grass (Pennisetum purpureum) around the rim of the field and then rows of molasses grass (Melinis minutiflora) between rows of maize, reduces the number of stem borers in the maize and increases the number of parasitic wasps that prey on the stem borers. Such a system may increase the maize yield by up to 30% and the two grasses provide nutritious animal feed. Similarly, a South American legume called Desmodium uncinatum (silverleaf) inhibits witchweed or striga (Striga asiatica), a major weed in some countries, when intercropped with the above grasses and maize and may more than double the yield of maize. Again, no-till farming helps maintain soil fertility and friability. These are all 'low-cost' options. | Rejected, This is an eclectic collection of marginal individual practices - does not fit here |

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| 5672 | 11 | 1 | 1 | 73 | 29 | Agroforestry systems can be a substitute for shifting cultivation and provide nitrogen inputs to at least maintain fertility. Abandoned agricultural and marginal lands can be reclaimed by 'biomass crops' rather than clearing forests for palm oil, soy bean and pastoral agriculture. Land invaded by Imperata cylindrica grass, an aggressive weed species growing in many developing countries, can be reclaimed by planting nitrogen-fixing trees such as Gliricidia sepium and Leucaena leucocephala. Similar dry areas can be reclaimed with Prosopis sp. Much of this work could be undertaken by the subsistence sector, thus helping with poverty alleviation. | Rejected, Thanks - but agroforestry is already included. Perhaps missed by the reviewer. |
| 5673 | 11 | 1 | 1 | 73 | 29 | A constraint is lack of adequate education. The above mentioned initiatives could greatly offset lack of education, but governments could help by introducing practical subjects in the school syllabus and run adult education classes. These could demonstrate simple and cheap agricultural techniques coupled with demonstration plots. | Partially Accepted, Included in the barrier section |
| 5674 | 11 | 1 | 1 | 73 | 29 | The paper talks about land use, but what is lacking is a table giving broad land use classes for the world. Section 11.2.1. First and foremost a table of land use should be given and inventories of the biomass growing on the land areas should be determined, particularly in areas of actual or potential use. | Accepted, Have given land area tables for the SOD (from central data spine) |
| 5675 | 11 | 1 | 1 | 73 | 29 | The following is an estimate of land use (Table 1). | Partially Accepted, Other estimates available (in core data spine) but this |
| 5676 | 11 | 1 | 1 | 73 | 29 | Table 1. Land use for the world 2006: units million hectares and 109 dry tonnes of woody biomass2.<br>World Forest Woodland Arable Grassland1 Desert Built up Arctic<br>14894 4021 1224 1638 4170 1787 298 1788 area<br>100 27 8 11 28 12 2 12 %<br>543.80 450.71 9.28 79.71 0 4.10 0 Growing stock<br>18.35 12.44 0.36 5.33 0 0.22 0 Annual yield<br>Note. 1 Grasslands include wetlands. 2. This is above ground biomass; total biomass is 20-33% more.<br>Annual yield is accessible yield. Total yield is 21.58 x 109 t. Carbon content is 50% of dry wood weight.<br>Source. FAO 2009 (State of the world's forests adjusted) and search of the WWW. Openshaw, K. 2011. □ | Partially Accepted, Other estimates available (in core data spine) but this was considered for the SOD |
| 5677 | 11 | 1 | 1 | 73 | 29 | Another table that should be in the text is an estimate of organic soil carbon in section 11.5.3 (page 45). The following is my estimate based on Chapter 2 –Land use and soil carbon in different agro-ecological zones by D. J. Greenland (1995). | Rejected, Very old reference - more up to date references available |
| 5678 | 11 | 1 | 1 | 73 | 29 | Table 2. Estimate of soil carbon by land use types: units million hectares and 109 t carbon<br>Land type Area Soil carbon Land type Area Soil carbon<br>Forest/woodland 5213 600-900 Desert 1787 85-130<br>Arable 1638 165-250 Built up 298 30-50<br>Grassland 2870 115-170 Sub-total 13106 1380-2100<br>wetland 875 35-50 Arctic 1788 190-280<br>Peat 425 350-550 Total 14894 1570-2380<br>Source. R. Lal et al. 1995. Soil management & greenhouse effect. CRS Press, 1995. ISBN 1-56670-117-1. | Rejected, Very old reference - more up to date references available |
| 5679 | 11 | 1 | 1 | 73 | 29 | With similar soil and rainfall types, there is more organic soil carbon under forests than under wood lands and grasslands, which have more than under arable agriculture. | Noted, Statement - not a comment |
| 5680 | 11 | 1 | 1 | 73 | 29 | Some of the units are not consistent. Weight is usually in metric tonnes of carbon or carbon dioxide equivalent, but some it is given in short tons. GC or GCO2 is the common weight but sometimes Pg is used. Sometimes CO2 is given as CO2. Likewise N2O is given as N2O etc. | Accepted, Harmonized units for the SOD |
| 5681 | 11 | 1 | 1 | 73 | 29 | The text needs a good edit as there are grammatical and spelling errors and too many brackets in parts. | Accepted, Thoroughly edited for the SOD |
| 5682 | 11 | 1 | 1 | 73 | 29 | In my opinion, there are too many references, some have up to twelve (P 44). These should be reduced. | Accepted, Selected only key references |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5798 | 11 | 1 | 1 | 103 | 20 | You could shorten the text considerably if you concentrated on messages and findings instead of listing study's results as it happens quite often throughout the text. This may be a choice of style, but if references are used as such and not chained following each other the text will be shorter without losing content. | Accepted, Thoroughly edited for SOD |
| 18287 | 11 | 1 | 4 | | | insert "and since it comprises a high diversity of management technologies and climate and location specific influences that interact with mitigation measures." | Rejected, Wrong page and line number - cannot locate |
| 5703 | 11 | 10 | | 11 | | After the sub-paragraph '11.2.2 Trends of C fluxes from land use and land use change', it will be useful to give a composite picture of C fluxes/emissions from Land Use, Land Use Change and Forestry (LULUCF) just after page 11. The treatise on AFOLU can be started thereafter, and it may also be indicated as to what additional land uses need to be added to LULUCF to make it more comprehensive in terms of reporting for all land uses coalescing in AFOLU. | Rejected, This is already done in figure 11.3 |
| 11113 | 11 | 10 | 1 | 10 | 2 | there is information that suggests that China's large-scale afforestation program is not a success, rather, on-the-ground surveys have shown that, over time, as many as 85 percent of the plantings fail. See at Earth Science Reviews, Excessive reliance on afforestation in China's arid and semi-arid regions: Lessons in ecological restoration - Review Article, Pages 240-245, Shixiong Cao, Li Chen, David Shankman, Chunmei Wang, Xiongbin Wang, Hong Zhang | Accepted, This is too country specific |
| 5701 | 11 | 10 | 10 | 10 | 14 | The text in these lines may be rephrased as "In addition, during the period from 2000 to 2010, ambitious tree planting programmes in countries such as China, India, The United States and Vietnam- combined with natural expansion of forests in some regions- have added about 7 Mha of new forests annually. However, due to deforestation in many other countries in Asia, Africa, and Central and South America, the net increase in forest area at the global level during the same period was reduced to 2.92 Mha y-1. | Accepted, Rephrased for SOD |
| 16210 | 11 | 10 | 13 | | | These numbers don't seem to match up right: 7 mha added ANNUALLY(?) in China, US etc vs. 8.3 M ha lost or 5.2 Mha lost in the tropics… is that number of added forest supposed to be over a longer time period? | Accepted, Checked numbers and revised for SOD |
| 10589 | 11 | 10 | 14 | | | Could add that in 2010 New Zealand, as part of its ETS, had 18.3Mt CO2 available from Kyoto plantation forests to offset other GHG emissions totalling 71.7 MtCO2eq/yr, 11.9 MtCO2eq higher than 1990 levels. Ref: MfE, 2012. New Zealand's greenhouse gas inventory 1990-2010 and net position, Environmental snapshot, April 2012. Ministry for Environment, http://www.mfe.govt.nz/publications/climate/greenhouse-gas-inventory-2012-snapshot/index.html | Noted, Too country specific - we cannot cite every paper and report for every country - this is a synthesis |
| 14592 | 11 | 10 | 15 | | | This section has several issues that I would be happy to help resolve in more detail. Ther is poor explanations or confusion here between co2 emissions from forest area change versus all land use change, between global and torpical only estimates, between gross and net emissions, and between fluxes due to human activity (LUC) versus fluxes due to indirect human induced change cliamte and CO2. The most up do date and comprehensive model results are not being used. I can provide input from Houghton et al 2012 and more recet data provided for WG1 and for the global Carbon project annual budget, I will just have to check with modelling groups. The section does not use the most appropriate references and mis uses others (e.g. le quere for fire. it totally lacks a proper discussion of the ucnertainties and recent estaitmes (SD across models alone is not th euncertainty). Pan et al is comapred to other refs that do not report on the same thing without explaining this. I list some additional line by line points below that are not dealt with in this general summing up | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 15961 | 11 | 10 | 16 | 14 | 47 | Section provides a nice overview of sinks & emissions per landcover type, a figure visualization the differences in sink/emissions per landcover type could provide a nice visual overview of the relative contribution of each | Noted, No space |
| 7335 | 11 | 10 | 16 | 10 | 34 | Better clarification is needed on why there are such big discrepancies among the estimates of C flux from land use change, especially between Houghton 2010 and Piao 2009. The reader should be given some idea as to at least what sign is most realistic. And which study is cited for the numbers in lines 31-32? | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 16541 | 11 | 10 | 19 | 10 | 23 | Is the considerably lower estimate from Piao et al. explicable by the different time period (i.e. by large emissions before 1901)? Or is there some other explanation for why it is so much lower? | Accepted, Section redrafted for SOD - new synthetic studies available since the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7058 | 11 | 10 | 19 | 10 | 23 | It is important to note that the Piao et. al. study from which these conclusions were drawn, observes that "...the effects of wood harvesting and forest regrowth are not included in our study, although they may play a significant role in shaping historic C fluxes...". The importance of such factors have been found to be very significant in more recent studies (e.g. Pan et. al.) and the text here should be modified to make clear that (a) the study in question did not examine wood harvesting and forest regrowth (as well as forest management and harvested wood products), and (b) these additional factors have been found to be very important to net carbon fluxes to the atmosphere attributable to forests. (See Pan, Y., Birdsey, R., Fang, J., Houghton, R., Kauppi, P., Kurz, W., et al. (2011). A Large and Persistent Carbon Sink in the World's Forests. Science Vol. 333 , 988-993.) | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 11805 | 11 | 10 | 19 | 10 | 23 | It would be good to include here the mechanism, namely that the amount of C lost due to LUC is the same but that bthere is increased growth (hence uptake) on the remaining land | Accepted, Included |
| 2603 | 11 | 10 | 19 | 10 | 19 | "(RA Houghton, 2010)." should be "(Houghton, 2010)." | Accepted, Zotero updated for SOD |
| 5494 | 11 | 10 | 20 | 10 | 23 | How have inputs such as fertilization and irrigation contributed to NPP and does this have an impact on the overall balance on emissions? | Rejected, Not known - we can only review what is known and published - these references mainly deal with LUC and not managed land so no relevance |
| 12373 | 11 | 10 | 20 | 10 | 20 | The acronym NPP should be spelled out the first time it is mentioned. | Accepted, Revised for SOD |
| 16211 | 11 | 10 | 22 | | | total' C emissions--not clear if this is net or gros, especially given the numbers above--I think they mean 'net' here (not total) which to me implies gross. | Accepted, Specified net vs. gross throughout |
| 16542 | 11 | 10 | 24 | 10 | 36 | Successive sentence in this part give different impressions of when the increasing trend ended. The initial sentence ("All studies agree…") says it was till "the middle of the 20th century", and the sentence at the end of that paragraph ("Within variations between...") suggests no further increase from 1980 to 2000, but then the first sentence of the following paragraph ("A major contribution to the overall increasing trend...") indicates increase through the beginning of the 21st century. Rephrase to clarify (or simply show the trend in a Figure). | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 5805 | 11 | 10 | 24 | 10 | 34 | This is confusing. Please re-order text so that periods are ordered along the time axis - "1990 - 2009 …" belongs at the end of the paragraph. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 2604 | 11 | 10 | 28 | 10 | 28 | "(RA Houghton et al., 2012)." should be "(Houghton et al., 2012)." | Accepted, Zotero updated for SOD |
| 12371 | 11 | 10 | 30 | 10 | 32 | In line 30-31 the mean values of annual C-flux in the 1980s are estimated to 1.1 +/- 0.8 Gt C/yr and in the 1990s - 1.1+/-0.g Gt C/yr, while the Median values are estimated to resp 1.3 and 1.1 Gt C/yr. The negative value in the 1990 s for the mean value seems not consistant with the positive value for the median value for the same period. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 16212 | 11 | 10 | 32 | | | is that supposed to be 'negative' 1.1? Why the dash? It is not supposed to represent uptake in the 1990s, right? Remove the dash. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 18925 | 11 | 10 | 34 | | | Correct reference to "Figure 11.1b" | Accepted, Revised for SOD |
| 9101 | 11 | 10 | 35 | 11 | 32 | See reference literature; Hashimoto S (2012) A New Estimation of Global Soil Greenhouse Gas Fluxes Using a Simple Data-Oriented Model. PLoS ONE 7(8): e41962. | Accepted, Included in SOD |
| 16213 | 11 | 10 | 35 | | | be careful: use 'net' c flux to atmosphere when you mean it; don't confuse with 'gross' flux. | Accepted, Specified net vs. gross |
| 7550 | 11 | 10 | 35 | 11 | 32 | Hashimoto estimated global emission of CO2, CH4 and N2O from soil of land uses including forests and farm lands. I recommend authors to refer the latest scientific paper. Hashimoto S (2012) A New Estimation of Global Soil Greenhouse Gas Fluxes Using a Simple Data-Oriented Model. PLoS ONE 7(8): e41962. doi:10.1371/journal.pone.0041962. | Accepted, Included in SOD |
| 16543 | 11 | 10 | 37 | 11 | 1 | The phrase "fire emissions from tropical deforestation" immediately raises the question of where these emissions are represented in Figure 11.1a -- in "fires" or in "deforestation"? If they are additional to, not part of "deforestation", it seems that deforestation should described as the "dominant source." If on the other hand these overlap, then it is incorrect to stack the boxes showing them in Figure 11.1a. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12372 | 11 | 10 | 4 | | | Please consider to replace the column "Country/area" with "Region". The word "total" after the name of each region could be deleted, as it is obvious information, and not consistantly used. The text in the section describes the forest cover in the period 2000-2010. It would be useful to find the same period in the table. | Accepted, Revised for SOD |
| 14413 | 11 | 10 | 4 | | | Can you add figures for the corresponding reductions in emissions from deforestation? | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod. the table shows both areas with increase and decrease in forest area. its not simple to convert forest area change to emissions or uptake e.g. the emissions.r/regrowth are not all immediate and they will depend on the model of clearing or planting and the land transition types before/after forest area change, etc. Since latest houghton data is from FRA we could ask him to |
| 14424 | 11 | 10 | 4 | | | First column. Change 'Country' to 'Continent'. There are no data at the country scale. | Accepted, Revised for SOD |
| 11202 | 11 | 10 | 6 | 10 | 14 | Suffers from potential definition problems vis-a-vis 'forests' 'new forests' and the distinction between natural forest (ecosystems) and planted forests/plantations. This might be corrected with insertion of the 'planted' in between the words 'new forests' (at line12). | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 11978 | 11 | 10 | 6 | | 14 | Needs some recongnition here that although new forests take up carbon, there's a time lag between C emissions from deforestation and C uptake. Soemthing like "However, this net approach may mask differences in the C content of newly regrowing forests, to that lost from deforestation of old growth forest". | Accepted, Added discussion of time issue in the redraft |
| 7549 | 11 | 10 | 6 | 10 | 14 | While planting programs increase forest area, natural/semi-natual forests are decreasing. They are not compatible often. Please don't look at only total forest area. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 10102 | 11 | 10 | 6 | 10 | 8 | The important role of drained peatlands should be mentioned here as a significant source of emissions, conserving existing wetlands /mires is an importatn mitigation action likewise rewetting of drained peatlands. | Accepted, Added for SOD |
| 7183 | 11 | 10 | 7 | 10 | 8 | o ("known as REDD+"). See earlier comment. REDD+ programs include the following activities: 1) decreasing emissions from forest deforestation 2) decreasing emissions from forest and/or peatland degradation 3) preserving and accumulation of carbon stocks through a. forest conservation, b. sustainable forest management c. rehabilitation and restoration of damaged areas, 4) the creation of additional benefits such as a. improvement of local people's welfare b. improved preservation of biodiversity c. improved protection of other ecosystem services | Accepted, A better description of REDD+ was added |
| 16539 | 11 | 10 | 8 | 10 | 10 | This sentence is quite important; it definitely needs one or more separate citations. The reduction in deforestation in Brazil is coming to be well known, but not a corresponding change in Indonesia, so it is important to have a strong reference for that change. I would also suggest expanding, for 2-3 sentences more, on what were the "concerted efforts" that resulted in these successes. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 2602 | 11 | 10 | 8 | 10 | 8 | "(J.G. Canadell and M.R. Raupach, 2008)."should be "(Canadell and Raupach, 2008)." | Accepted, Zotero updated for SOD |
| 3538 | 11 | 10 | | | | What is the situation with regard to 'Settlement' which is another land use category of LULUCF in addition to forest, cropland, grassland, wetlands? | Accepted, Refer to C1h3 in SOD |
| 14776 | 11 | 10 | | | | Petrokofsky et al. (2012) is reviewing comparative advantages of different methods for assessing carbon stocks in AFOLU sectors, with particular attentions to uncertainties in estimates -> Environmental Evidence 2012, 1:6 doi:10.1186/2047-2382-1-6 ,http://www.environmentalevidencejournal.org/content/1/1/6/abstract , The large variabilities found among estimates of carbon fluxes are due part to differences in methodologies. This is especially true in estimates at smaller scales than continental. | Accepted, Added to uncertainty Discussion |

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| 6930 | 11 | 10 | 15 | | | Please coordinate and ensure consistency with WGI, Chapter 6 on the land C fluxes. Suggest to refer to WGI AR5 Chapter 6 here whenever appropriate. Many parts of this section stray into the WGI area of expertise and will overlap with the assessment provided by Chapter 6. This should be avoided to avoid duplication and/or inconsistencies. | Accepted, Working with WGI authors to ensure this (ongoing) |
| 10239 | 11 | 10 | 15 | 14 | 47 | Need to clarify since the beginning of theis section that there terrestrials ecosystems a global terrestrial sink, resulting from the photosynthesis/respiration-mineralization inbalance, and separate sources from LU and LUC. | Accepted, Clarified for SOD |
| 15477 | 11 | 1005 | 35 | 1006 | 5 | The authors lists a number of sweeping comments on the negative impacts of reforrestation/afforestation by just relying on two references. The impact on water use can be positive or negative depending on the location. Surface flow water runoff can be far higher in grassland systems than in forest systems. Sodium increase in soils from forests only occur in certain regions of the world. Although forests do decrease the pH, in many regions reforrestation returns soil conditions to the "natural" state before the soil was deforestated and soil conditions dramatically changed for agriculture. A far more balanced view is required here - and certainly shouldn't rely on just two references. | Rejected, Cannot locate comment = wrong page number |
| 7609 | 11 | 11 | 0 | | | The forest has large influence for the increase and decrease of GHG gas through deforestatin and reforesttion, forest growth, way of forest manegement. However, I feel to have few descriptions about the forest and fortry. I expect substantiality of the description about the forestry. | Accepted, Better description of forest practices provided in section 11.3 for SOD |
| 15959 | 11 | 11 | 1 | 11 | 31 | This paragraph is unclear, it appears that there is no change in the C fluxes since the 1980's up to now, this is also indicated by figure 11.3; the paragraph could be substantially shortened, also to increase readability | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 15956 | 11 | 11 | 1 | 11 | 66 | The C02 emissions in the tropics are well explained and quantified, however the net sinks in the temperate zones are described in a generic way, adding more quantitative information on this would help relative comparison | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 18924 | 11 | 11 | 1 | | | "... of gross": Add "AFOLU" | Accepted, Specified net vs. gross |
| 3758 | 11 | 11 | 12 | 11 | 32 | Three relevant references on emissions from LULUCF are: 1) Baccini, A., S.J. Goetz, W.S. Walker, N.T. Laporte, M. Sun, D. Sulla-Menashe, J. Hackler, P.S.A. Beck, R. Dubayah, M.A. Friedl, S. Samanta, and R.A. Houghton. 2012. Estimated carbon dioxide emissions from tropical deforestation improved by carbon-density maps. Nature Climate Change 2:182-185. doi:10.1038/nclimate1354; 2) Houghton, R.A., G.R. van der Werf, R.S. DeFries, M.C. Hansen, J.I. House, C. Le Quéré, J. Pongratz, and N. Ramankutty. 2012. Chapter G2. Carbon emissions from land use and land-cover change. Biogeosciences Discussions 9:835-878. doi:10.5194/bgd-9-835-2012.; and 3) Nancy L. Harris1,*, Sandra Brown1, Stephen C. Hagen2, Sassan S. Saatchi3,4, Silvia Petrova1, William Salas2, Matthew C. Hansen5, Peter V. Potapov5, Alexander Lotsch6 Baseline Map of Carbon Emissions from Deforestation in Tropical Regions Science 22 June 2012:<br>Vol. 336 no. 6088 pp. 1573-1576 | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 15958 | 11 | 11 | 12 | 11 | 15 | This seems to be twice the same information, though with different emission figures, confusing | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 12374 | 11 | 11 | 12 | 11 | 32 | Here are a lot of different figures that seem partly also to conflict. Please consider to put the most important figures in a matrix or table so it would be easier to compare and perceive the meaning. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 14414 | 11 | 11 | 12 | | | Again, these numbers seem to say that deforestation (land use change) is far, far more important than “agriculture” (“land use”). | Accepted, Section redrafted for SOD - new synthetic studies available since the |

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| 5806 | 11 | 11 | 12 | 11 | 22 | Please rephrase this paragraph in a more concise way. Instead of using one sentence / study you could combine sentences. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 11114 | 11 | 11 | 14 | 11 | 19 | the numbers provided, i.e. 1.5 (without confidence intarval) and 1.2±0.7 are NOT different from a statistical point of view, so it cannot be stated that "Global emissions from land use change estimated for 2008 by Le Quere et al. (2009) suggest a slightly lower value" | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 16545 | 11 | 11 | 17 | 11 | 20 | Another important sentence that needs a supporting citation. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 12375 | 11 | 11 | 2 | 11 | 3 | Please consider the language in the sentence, especially the word "rather" which seems to not be correct. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 5702 | 11 | 11 | 2 | | | Please check the words 'southern Asia'. It seems, these need to be replaced with the words "South-Eastern Asia". | Accepted, Changed in SOD |
| 10103 | 11 | 11 | 2 | 11 | 2 | South East Asia large emissions due to draining conversion of peatlands to biofule plantations and agriculture, large fires have resulted in globally significan increased emissions | Accepted, Added for SOD |
| 11806 | 11 | 11 | 21 | 11 | 23 | Is there a reference for this statement or are you refering to the Zhao and Running paper? IN the latter case, why then the "Thus"? | Accepted, Change |
| 13309 | 11 | 11 | 22 | 11 | 24 | Suggest that clarify how Zhao and Running have made estimates of global NPP. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 5538 | 11 | 11 | 22 | 11 | 23 | . "--- indicate the reduction in global NPP of 0.55 Gt C for the period 2000-2009". Land based NPP is of the order of 53 Gt C. So the above reduction is about 1%. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 5539 | 11 | 11 | 26 | 11 | 26 | "--- up to 2100 --- fertilization might result in additional terrestrial uptake by global ecosystems in the range of 105-225 Gt C". This figure of an uptake of between 1.05 and 2.25 Gt C per year seems very optimistic. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 14593 | 11 | 11 | 27 | 11 | 28 | what is the reference for this? | Accepted, Added for SOD |
| 10104 | 11 | 11 | 27 | 11 | 27 | Are you dealing with CH4 emissions from melting permafrost somewhere else? | Rejected, No - this is not an emission from managed land and cannot be |
| 14594 | 11 | 11 | 31 | 11 | 32 | this does not seem relevant | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 12870 | 11 | 11 | 4 | 11 | 4 | Add here "Spatial analysis of Landsat data indicates that expansion of industrial agriculture is the main cause of tropical deforestation (Gibbs et al. 2010)." Gibbs, H.K., A.S. Ruesch, F. Achard, M.K. Clayton, P. Holmgren, N. Ramankutty, and J.A. Foley. 2010. Tropical forests were the primary sources of new agricultural land in the 1980s and 1990s. Proceedings of the National Academy of Sciences of the USA 107: 16 732-16 737. | Accepted, Added for SOD |
| 2605 | 11 | 11 | 5 | 11 | 6 | "(Y. Pan et al., 2011) Richter and Houghton, 2011)" should be "(Pan et al., 2011; Richter and Houghton, 2011)" | Accepted, Zotero updated for SOD |
| 16544 | 11 | 11 | 6 | 11 | 7 | I don't see how increasing secondary vegetation sinks can reduce the net conversion of primary forests to ag land -- perhaps of forests overall, but how does increase growth of secondary vegetation reduce the loss of primary forest? | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 15957 | 11 | 11 | 6 | 11 | 6 | Secondary vegetation sinks are not well explained | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 12376 | 11 | 11 | 6 | 11 | 8 | Please consider to define "secondary vegetation" and "primary production". | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 15150 | 11 | 11 | 6 | 11 | 11 | resutls of FACE sites could be covered here; those experimental findings contradictory to what's here? | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 8834 | 11 | 12 | | | | Position the numbers (the bar values, or x-axis values) so that they do not overlap any symbol (bar, error bar) | Accepted, Revised for SOD |
| 8317 | 11 | 12 | | | | The difference of definitions between a land-use change and deforestation must be made clear. | Accepted, Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14595 | 11 | 12 | | | | Need looking at carefully, not clear where all data comes from, lots of overlap (double counting), not comparable sources. Total LUC, Le quere et al result is houghton model, richeter and houghton is update, piao only on other estiamtes but lots out there, pan not LUC but forests only. USe Houghton et al 2012 synthesis or WG1 data (I can liaise). Pan paper itself in temepratue and boreal forests this is not LUC but all forest biomass change from inventories (ie LUC plus residual sink due to claitme and CO2). In tropics pan et al had totally different approach. confusing to show them together (it was in the Pan paper too). Pan and shevliakova mean different things by secondary vegetation. The real strength of Pan et al is that they pulled together an incredible data base of inventories to confirm a sink in extant forests that is likely due to climate and CO2. Other than that, the forest LUC in the tropics is just the same as houghton as it uses the bookeeping model and FAO data. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 7059 | 11 | 12 | | | | (1) The value for boreal forests is shown incorrectly. In the Pan et. al. paper it is 0.5 +/- , not 0.05 +/-.<br>(2) In addition, the value from Pan et. al. for the net global forest sink should be included.<br>(3) Finally,the legend does not accurately reflect the respective categories in the Pan et. al. paper. Each sink and source should be labeled as done in the Pan et. al. study to make clear, for instance, that the bars shown to the left for "land use change", "deforestation", and "secondary vegetation" all refer to tropical forests. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 5807 | 11 | 12 | | | | Please rework figure: Years should be given below all other graphic elements, legend should have white background to eliminate horizontal lines which disturb the text, boreal forests are given in the legend but not shown in the graph, numbers do not need to be shown (if you need them, put them in a table and delete the figure), and add space between the title of the vertical axis and numbers on the axis. | Accepted, Revised for SOD |
| 10590 | 11 | 12 | | | | This is a tricky figure to interpret. Do the bars for years 1990-2007 add anything? Suggest delete. If stay, then put a gap between first two bars as is done for 1990-1999 and 2000-2007 graphs. Boreal forests so small they are invisible so maybe better as a footnote in caption. What is a "tropical intact forest"? | Accepted, Revised for SOD |
| 11115 | 11 | 12 | | | | The figure is not clear as to what "land use change" means: does it include deforestation? what is secondary vegetation? Whereas land use change and deforestation are human activities, "secondary vegetation" does not mean anything without definition. Also, land use CHANGE data should be separated from carbon balance of existing forests (of any type) | Accepted, Revised for SOD |
| 2618 | 11 | 12 | | | | This figure was not clear because of the items that it included. Why was there a tropical intact forests group by itself? | Accepted, Revised for SOD |
| 8926 | 11 | 12 | | | | Although the presentation is common, it seems methodologically incorrect, to compare activities such as land use change and deforestation with vegetation forms. The activities result in change of land use and in turn leads to changes in average annual C fluxes | Accepted, Revised for SOD |
| 8927 | 11 | 12 | | | | given the massive deforestation of tropical and subtropical forests, the decreases in C fluxes appear very low, numbers verified? | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 14415 | 11 | 12 | 1 | | | Chart legend: what is the difference between deforestation and land use change? | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 15151 | 11 | 12 | 1 | 12 | 2 | graph is difficult to read and context of figure is confusing. One category is ""land use change", but other categories are also land-use change (like deforestation and secnfdary veg, perhaps). Note that the time periods metioned are not all decades (eg 2000-2007) | Accepted, Revised for SOD |
| 14425 | 11 | 12 | 1 | | | Number formatting is inconsistent between the figure and the text. The text uses the U.S. standard of a decimal mark as '.', the figure uses the European standard of the decimal mark as ','. | Accepted, Revised for SOD |
| 16214 | 11 | 12 | 11 | | | "total c flux" is it total? | Accepted, Specified net vs. gross |
| 5541 | 11 | 12 | 11 | 12 | 12 | How is the forest sink of 2.0 to 3.4 Gt C/yr estimated? Annual growth of woody biomass is of the order of 9 Gt C/yr. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 9078 | 11 | 12 | 11 | 13 | 35 | It would be better to add a latest article relating to carbon emissions as follows: Harris, NL et al. (2012) Baseline map of carbon emmissions from deforestation in tropical regions. Science 336: 1573-1576. | Accepted, Section redrafted for SOD - new synthetic studies available since the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 10592 | 11 | 12 | 11 | | | Not clear how the range of sink estimates quoted relates to Fig 11.3 sinks which appear to average 3.51 GtC/yr. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 16547 | 11 | 12 | 18 | 12 | 18 | Presumably "higher results" means higher sequestration -- clarify. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 12380 | 11 | 12 | 18 | 12 | 18 | The term "….report higher results" is used. The meaning of this is not clear to us. Please consider to rephrase or explain. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 14597 | 11 | 12 | 18 | | | what results, net sink?? Higher than what? | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 14596 | 11 | 12 | 18 | 12 | 31 | Inversions of atmopsheric measurments capture the total net flux from alnd ude to all drivers, it cannot distinguish LUC from indirect environmental change drivers (Cliamte and CO2). It cannot distinguish forest from non-forest. This is not comparable to Pan without explanation fo the fact that Pan is just forests, although forest LUC and sinks are the largest factors there is also other LUC and sinks. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 5045 | 11 | 12 | 18 | 12 | 18 | what is an "Inverse modelling studies" bottom up? | Accepted, No - clarified in redraft of the |
| 14598 | 11 | 12 | 19 | | | Again compared to what? | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 12381 | 11 | 12 | 23 | 12 | 30 | In the preceeding text contributions to sink or source from the different forest types are given in Gt C. For temperate forest the contribution is given in per cent. This makes it not easy to compare. Please add the contributions also in Gt. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 18928 | 11 | 12 | 24 | | | "sink": Add "increase" after it - at least I think that is missing. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 16548 | 11 | 12 | 25 | 12 | 26 | Is it increased forest area, or sequestration by forests that originated in earlier decades, that is the main contributor to the sink in the US and China? | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 14723 | 11 | 12 | 25 | | | " increased forest area in US (Y. Pan et al., 2011)(Yude Pan et al., 2009; Masek et al., 2011)", should it be (Pan et al., 2009; Pan et al., 2011;; Masek et al., 2011)? | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 5808 | 11 | 12 | 26 | 12 | 30 | Please consider deleting this text. The period of 7 years is quite short if statements on forest developments are to be made. Trends often show only if you use longer time series with repeated measurements, for the reasons you mention here: single-year (extreme) events can distort the picture. IF you need a reference: any forest inventory textbook should do. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 14724 | 11 | 12 | 29 | | | "2010; Zhao and Running, 2010(Y. Pan et al., 2011)" should it be " 2010; Zhao and Running, 2010; Pan et al., 2011) ? | Accepted, Zotero updated for SOD |
| 12377 | 11 | 12 | 3 | | | The mean value and uncertainty could be given for all other parameters in the same way as for boreal forests in the draft. More information in connection to the legends makes it redundant to print the values in connection to the bars, resulting in better readability. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 12378 | 11 | 12 | 3 | | | The strongest sink seem to be "secondary vegetation" Can it be explained what "secondary vegetation" is | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 12379 | 11 | 12 | 3 | | | The categories land use change and deforestation should be merged, as deforestation is one type of land use change. The text below the figure should say: "…land use change for the periods 1990-1999, 2000-2007…", since the periods are not decades. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 13310 | 11 | 12 | 3 | 12 | 10 | Many problems with brackets around citations, need to fix citations throughout the document | Accepted, Zotero updated for SOD |
| 12382 | 11 | 12 | 30 | 12 | 30 | The unit "Pg" is used. To improve understanding, the consequent use of one unit should be practiced, eg Gt. | Accepted, Harmonized units for the SOD |
| 10593 | 11 | 12 | 30 | | | Best to stick with Gt as used in rest of report - not Pg | Accepted, Harmonized units for the SOD |
| 10591 | 11 | 12 | 4 | | | Do sources arise from deforestation and sinks arise from reforestation and afforestation? If so could clarify | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 5540 | 11 | 12 | missing words: with defores | | | This figure cannot be true. About 99% of deforestation is caused by land use changes. The table is equating harvesting with deforestation! | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 8318 | 11 | 13 | | | | Forest fires are important as a source of carbon emission. Then this figure should show carbon emissions derived from forest fires. | Accepted, Section redrafted for SOD - new synthetic studies available since the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11203 | 11 | 13 | | | | Suggest inserting the word 'unsustainable forms of' prior to 'shifting cultivation' at line 17. Science has shown that low intensity shifting cultivation can even act as a carbon sink in certain circumstances and net emissions may be neutralised over the medium and long term - sustainable systems of rotational farming also generate range of other benefits for soils and biodiversity. cf. Thilde Bech Bruun & Andreas de Neergaard & Deborah Lawrence & Alan D. Ziegler (2009) Environmental Consequences of the Demise in Swidden Cultivation in Southeast Asia: Carbon Storage and Soil Quality Hum Ecol (2009) 37:375388. See also Ziegler, A. D., Agus, F., Bruun, T. B., van Noordwijk, M., Lam, N. T., Lawrence, D., Rerkasem, K., and Padoch, C. (2009). Environmental consequences of the demise in swidden agriculture in Montane Mainland SE Asia: Hydrology and geomorphology Human Ecology (2009) 37 | Accepted, Revised for SOD |
| 15960 | 11 | 13 | | 13 | | figure is interesting but not clear, difference between sinks/sources is difficult to distinguish, increasing size of the figure, or indicating sinks with negativenumbers, could improve readability | Accepted, Revised for SOD |
| 15152 | 11 | 13 | | | | too small as is | Accepted, Revised for SOD |
| 14599 | 11 | 13 | | | | see earlier comments about pan et al data that should be explained better here than was in the original paper | Accepted, Revised for SOD |
| 7537 | 11 | 13 | | 13 | | Positive and negative bars are not distinguishable. | Accepted, Revised for SOD |
| 11807 | 11 | 13 | | | | Whether bars are negative (below x axis) or positive (above x axis) is as far as I understand not visible from this figure | Accepted, Revised for SOD |
| 5809 | 11 | 13 | | | | Please consider giving signs with the numbers. It is not easy to detect the X-axis in Asian Russia, Australia & New Zealand and Europe. | Accepted, Revised for SOD |
| 10594 | 11 | 13 | | | | Could be more logical to discuss stocks before sinks in this section | Accepted, Revised for SOD |
| 2619 | 11 | 13 | | | | This figure works well. | Noted, Thank you |
| 12871 | 11 | 13 | 1 | | | Fix the distortion in the map, which is currently compressed latitudinally. Preferably use an equal-area global map projection. | Accepted, Revised for SOD |
| 14426 | 11 | 13 | 1 | | | Since there isn't a common 'x-axis', describing a bar as above or below the axis is not sufficient. Because the bars are of different lengths it is possible to infer when a bar is meant to be positive or negative, but this is not sufficiently clear for a general audience. | Accepted, Revised for SOD |
| 14427 | 11 | 13 | 1 | | | Numerical values do not reflect the direction of the bars. The numbers on the figure currently only indicate magnitude of the flux, but not direction of the flux. Perhaps putting a '-' sign when appropriate would be sufficient to show when the bars indicate a net source or sink. | Accepted, Revised for SOD |
| 16215 | 11 | 13 | 10 | | | number here is 13 M ha converted; harmonize this with the earlier numbers on deforestation (5.2-8.3 M ha/yr), or recognize the difference. | Accepted, Revised for SOD |
| 16549 | 11 | 13 | 12 | 13 | 13 | Does this "20% of global emissions" figure refer to the 90s or the 2000s? Is this figure consistent with your other estimates? Seems too high, at least for the 2000s, particularly since it says GHG emissions, not CO2 emissions. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 14601 | 11 | 13 | 12 | | | according to houghton modelling results presented in Friedlingstein et al 2010 (global carbon project budget calcualtion) LUC total is about 12% of net emissions in the 2000s. This would be consistent with other data you present here e.g. le Quere (fireldingstein was the update o fle quere). stick to that data | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 16550 | 11 | 13 | 13 | 13 | 15 | Is degradation 15-19% higher than deforestation, or does it add an additional 15-19% to the deforestation amount? If the first, it would be very large, and should show up as a large separate segment in Figures 11.1a and 11.3. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11979 | 11 | 13 | 13 | | 14 | Maybe add here that forest degradation leads to increased vulnerability to drought and fire in some forests, such as teh Amazon (Nepstad, D.C., Stickler, C.M.,Soares, B.& Merry, F. 2008. Interactions among Amazon land use, forests and climate: Prospects for a near-term forest tipping point. Philosophical Transactions of the Royal Society B 363:1737–1746.<br>Ray, D.; Nepstad, D. C. & Mourinho, P. 2005. Micrometeorological and canopy controls of fire susceptibility in mature and disturbed forests of an east-central Amazon landscape. Ecological Applications 15: 1664-1678.<br>Laurance, W.F. 2004. Forest-climate interactions in fragmented tropical landscapes. Philosphical Transactions of the Royal Society. 359: 345-352.) | Accepted, Dealt with in the section on susceptibility to future climate change (11.5) |
| 14602 | 11 | 13 | 13 | 13 | 18 | forest degradation should have its own paragraph. See also Imai et al 2009, archard et al., 2004 an d Putz et al 2012 synthsis in conservation letters http://onlinelibrary.wiley.com/doi/10.1111/j.1755-263X.2012.00242.x/abstract | Accepted, Added for SOD |
| 5542 | 11 | 13 | 13 | 13 | 14 | ”Additionally forest degradation, particularly selective logging is responsible for 15-19% higher C emissions than reported from deforestation alone. (Huang and G.P. Asner 2010)”. Much of this is harvesting and compared to annual growth should not be considered as C emissions. Also, if the logs are converted into sawnwood and panel products, they are still a store of C! | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 2620 | 11 | 13 | 13 | | 18 | degradation is used frequently in this chapter but is a 'human value' laden word that is typically seen as negative. It needs to be clearer. Is it a loss of productive capacity? Is it a loss of nutrients like after fires? Forest degradation is written as the impacts of firests which is correct but then shifts to NTFP and shifting cultivation which does not fit into the same category. This mixes impacts that are major and others that do not fit into the same grouping. These have very different spatial and temporal scales. | Accepted, Glossary issue |
| 16551 | 11 | 13 | 15 | 13 | 17 | Why is shifting cultivation called degradation -- isn't it clearing of forests, but just on a smaller scale? If so it would seem to be deforestation. | Accepted, Section redrafted for SOD - new synthetic studies available since the |
| 5543 | 11 | 13 | 15 | 13 | 17 | “Forest degradation includes --- collection of firewood and NTFP, and production of charcoal ---“. This is harvesting not degradation. Much fuelwood collection is dead wood and charcoal production is usually managed on about a 15 year cycle unless areas are being cleared for agriculture. Collection of NTFP in most cases in managed sustainably! | Accepted, Agreed - clarified what is deforestation and what is harvest for SOD |
| 12386 | 11 | 13 | 18 | 13 | 25 | It is not clear if "wildfires" and its figure of 2.0 Gt C/yr for 1997-2001 is limited to forest fires, since this is under the heading "Forests". But it seems less consistent with line 24: "…global emissions from all types of fires in diffrenent ecosystems in 2010 were as high as 2,2 Gt C. Forest fores contributed with 0,3 Pg C (= 0,3 Gt C). This should be clarified. | Accepted, Agreed - clarified for SOD |
| 12383 | 11 | 13 | 2 | | | It is a bit confusing that tropical deforestation and regrowth is added in the same figure that shows the flux. May be it is a good idea streamlining fluxes in the world map figure, and add a separate figure or table separating the deforestation and regrowth in tropical areas. | Accepted, Revised for SOD |
| 12384 | 11 | 13 | 2 | 13 | 3 | The axis' in the figure should be more clear. It would be helpful if sinks were represented with not only negative bars, but also with negative values. | Accepted, Revised for SOD |
| 15153 | 11 | 13 | 22 | 13 | 22 | Delete "Data available …" sentence | Accepted, Deleted |
| 11293 | 11 | 13 | 22 | 13 | 35 | The mixture of raw numbers and proportions would be better shown through graphs that show both simultaneously (e.g. pie charts that visually demonstrate proportions while overlaying actual quantitative numbers). | Accepted, Revised for SOD |
| 11808 | 11 | 13 | 23 | 13 | 35 | You are not only refering to forest fires but this is in the forest section, maybe a special section on fires may help? Or move the estimates of fire emissions in specific sectors to their respective subsections. | Accepted, Agreed - clarified for SOD |
| 16216 | 11 | 13 | 24 | | 25 | use same units (have GT and Pg in same sentence). Not celar where the other 1.1 Gt are? You should 0.8, 0.3 out of 2.2---where are the rest?is 0.3 for forest firest NOT including forest fires that lead to conversion for agriculture? Or is 0.3 boreal? Not clear how this 2.2 has been parsed. | Accepted, Harmonized units for the SOD |
| 12387 | 11 | 13 | 25 | 13 | 27 | Is the figure 0,7Pg C for the increase in 2010 of emissions from fires from deforestation and degradation or is this the contribution from high emissions in S America and SE Asia? Please clarify. | Accepted, Clarified for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5544 | 11 | 13 | 25 | 13 | 26 | Units –PgC not Gt? | Accepted, Harmonized units for the SOD |
| 5810 | 11 | 13 | 25 | 13 | 25 | Please use either Gt or Pg consistently. | Accepted, Harmonized units for the SOD |
| 2621 | 11 | 13 | 27 | | | the contribution of peat fires needs to mention that this is being done to plant palm oil plantations so this is not a simple deforestation example. If written as is, it appears to be driven by someone wanting to cut the forests for the wood but it is a conversion of forests to other uses. | Accepted, Agreed - clarified for SOD |
| 15154 | 11 | 13 | 28 | 13 | 28 | Delete "be in the" | Accepted, Deleted |
| 5545 | 11 | 13 | 29 | 13 | 31 | . “Additionally, biomass burning --- could contribute up to 42-52 % of global black carbon emissions and comprise as high as 2600 Mt of black carbon per year”. I think this should be 2.6 Mt C not 2600 Mt c per year. The US EPA black carbon world figures for 2000 are as follows in Mt C: Biomass burning 2.70 (36%); Domestic 1.90; Transport 1.44; Industry 1.47; | Accepted, Checked numbers and revised for SOD |
| 5546 | 11 | 13 | 29 | 13 | 31 | “Additionally, biomass burning --- could contribute up to 42-52 % of global black carbon emissions and comprise as high as 2600 Mt of black carbon per year”. I think this should be 2.6 Mt C not 2600 Mt c per year. The US EPA black carbon world figures for 2000 are as follows in Mt C: Biomass burning 2.70 (36%); Domestic 1.90; Transport 1.44; Industry 1.47; Energy 0.05; Other 0.04; Total 7.60. Therefore, 42-52% for biomass burning seems high. | Accepted, Checked numbers and revised for SOD |
| 14726 | 11 | 13 | 31 | | | (van der Werf et al., 2006) instead of (Van Der Werf et al., 2006). | Accepted, Zotero updated for SOD |
| 5547 | 11 | 13 | 33 | 13 | 33 | I think 47.7 Mt of black carbon should be 0.477 Mt. (the US figure is 0.266 Mt C). | Accepted, Checked numbers and |
| 13313 | 11 | 13 | 34 | 13 | 34 | Should indicate that the CATF is a special report, not a scientific publication, not peer-reviewed. | Accepted, Replaced with peer reviewed paper. Plus Zotero updated for SOD |
| 12388 | 11 | 13 | 35 | 13 | 35 | In the preceeding text, a lot of relevant information about emissions of black carbon was given in Gt or Mt. It would be very useful if the figure "11 % of China's total black Carbon output" could be given also in Gt or Mt. | Accepted, Checked numbers and revised for SOD |
| 15155 | 11 | 13 | 36 | 14 | 2 | is it worth being so non-committal? | Accepted, Revised for SOD |
| 14603 | 11 | 13 | 36 | 13 | 37 | is this really correct, what is meant by this number. My undesrtanting from memory of the shevliakova paper is they do LUC but do not really model croplands in terms of their emissions, it is merely conversion between forest PFT, and grassland PFT and possibly some very generic crop PFT, but not emissions for extant/permanent croplands. I suspsect this is the LUC emission from conversion of natural lands to croplands and if so is double counting with deforestation emissions, which is not a problem if it is clearly flagged. If it really is ongoing emissionf rom croplands after LUC is it is land use emissions not land use change emissions , then this number seems very high. Surely croplands are more or less in balance once established. | Accepted, Section redrafted for SOD - new synthetic studies available since the Fod |
| 13314 | 11 | 13 | 38 | | | remove bracket, no closing bracket | Accepted, Zotero updated for SOD |
| 5046 | 11 | 13 | 39 | 13 | 39 | I don’t think caroplands chan have a "negative C balance" mayber some words are missing | Accepted, Checked numbers and |
| 14600 | 11 | 13 | 6 | 13 | 13 | I would put this text earlier up front with information onf orest area change on page 9 line 18 | Accepted, Checked numbers and |
| 7060 | 11 | 13 | 6 | 13 | 7 | The FAO work, suggesting a net reduction in global forest biomass, was performed before the analysis by Pan et. al. which shows that, contrary to the findings shown here, global forest carbon stocks are increasing. The Pan et. al. work involves many of the world's leading forest carbon experts and should not be dismissed so easily. Its findings should be included in this text - espeically given that the results are highlighted immediately above in Figures 11.3 and 11.4. (See Pan, Y., Birdsey, R., Fang, J., Houghton, R., Kauppi, P., Kurz, W., et al. (2011). A Large and Persistent Carbon Sink in the World's Forests. Science Vol. 333 , 988-993.) | Accepted, Checked numbers and revised for SOD |
| 14725 | 11 | 13 | 7 | | | (FRA, 2010; FAO, 2011) instead of “(FRA, 2010)( FAO, 2011).” | Accepted, Zotero updated for SOD |
| 12385 | 11 | 13 | 8 | 13 | 8 | "…decreases soil C-stocks by 12-30 %". Please clarify if this is 12-30 % of the C-stock in the soil effected, or of the global C-stock in soils | Accepted, Checked numbers and revised for SOD |
| 13312 | 11 | 13 | 9 | | | change: reduced to declined | Accepted, Checked numbers and |
| 4389 | 11 | 13 | | 13 | | inconsistent units (Gt C, Pg C) affect readability | Accepted, Harmonized units for the SOD |
| 4388 | 11 | 13 | | 13 | | fig would be clearer if negative numbers appeared as such, as 0 axis is not easily readable | Accepted, Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12186 | 11 | 13 | 25 | 13 | 25 | Two different units Gt C and Pg C for tha same item makes the comparison difficult | Accepted, Harmonized units for the SOD |
| 12187 | 11 | 13 | 25 | 13 | 27 | It is not clear, which previous year and what is the source? | Accepted, Revised for SOD |
| 16217 | 11 | 14 | | | | Mangroves belong in the forest section; can be separated out, but should be in that section. | Accepted, Agreed - moved to forest |
| 14604 | 11 | 14 | 1 | 14 | 2 | compared with? | Accepted, Revised for SOD |
| 14606 | 11 | 14 | 13 | 14 | 15 | this is the only place in this whole section you talk about mitigation potnetial, belongs later as my understanding is this part is about trends | Accepted, Agreed - moved to potentials section |
| 8928 | 11 | 14 | 14 | | | the C sequestration of permanent pastures might be as shown but the emissions of the grazing animals should be mentioned too to avoid misinterpretation | Accepted, Clarified for SOD |
| 3759 | 11 | 14 | 16 | 14 | 30 | A relevant reference on emissions from peat lands is: Murdiyarso D, Hergoualc'h K, and Verchot LV (2010) Opportunities for reducing greenhouse gas emissions in tropical peatlands. Proc Nat Acad Sci,107(46):19655-19660. | Accepted, Added for SOD |
| 15156 | 11 | 14 | 16 | 14 | 30 | need references for peat | Accepted, Agreed - added for SOD |
| 14607 | 11 | 14 | 16 | | | suggest add text to make clear there si ahole carbon balance on peatlands: "while CO2 UPTAKE AND CO2 and CH4 release…." | Accepted, Revised for SOD |
| 7061 | 11 | 14 | 16 | 14 | 47 | The text should also note, however, that methane releases can be significantly affected (often reduced) when peat is drained. This is not to justify draining peat, but a fair and complete treatment of the topic requires that this complex phenomena (impacts of drainage on methane emissions) be discussed here. To ignore it compromises the objectivity of this document. To the extent possible, the role of methane with respect to GHG emissions from wetlands, should be woven throughout this section (which completely ignores the phenomenon and its potential significance). See, for instance,<br>- Segers R (1998) Methane production and methane consumption: a review of processes underlying wetland methane fluxes. Biogeochemistry, 41, 23–51.<br>- Wahlen SC (2005) Biogeochemistry of methane exchange between natural wetlands and the atmosphere. Environmental Engineering Science, 22, 73-94<br>- Lay DYF (2009) Methane dynamics in northern peatlands: A review. Pedosphere, 19, 409-421.<br>- Inubushi, K, et. al. (2005) Factors influencing methane emission from peat soils: Comparison of tropical and temperate wetlands, in Nutrient Cycling in Agroecosystems, Volume 71, pg 93-99 | Partially Accepted, Added post 2007 reference and revised for SOD |
| 16553 | 11 | 14 | 17 | 14 | 18 | Saying "as high as" is misleading unless you give a low estimate also. It's particularly confusing when you say "as high as" a range -- is the high figure 2 or 3? | Accepted, Revised for SOD |
| 12389 | 11 | 14 | 20 | 14 | 20 | It is not clear if the figure "500 000 km2" includes all global drained peatland. | Accepted, Checked numbers and |
| 10167 | 11 | 14 | 21 | 14 | 22 | an increase of 0.2 Gt CO2/yr from 1.1 to 1.3 Gt CO2/yr represents an increase of 18.18% not >20% | Partially Accepted, Cannot be that precise - but we have added approx. |
| 5811 | 11 | 14 | 21 | 14 | 22 | Please recalculate your percentages or give values in line 21 with more decimal places: 1.3 - 1.1 = 0.2 < 1.1*0.2. If the difference was larger than 20% of the 1.1, the value given for 2008 should be "1.4" | Accepted, Checked numbers and revised for SOD |
| 18929 | 11 | 14 | 21 | 14 | 22 | The difference between 1.1 and 1.3 is not 20% - is this due to the numbers having been rounded? Please consider adding a significant digit or mentioning that this difference is due to rounding. | Partially Accepted, Cannot be that precise - but we have added approx. |
| 5549 | 11 | 14 | 25 | 14 | 25Sounc | Sounding should be surrounding. | Accepted, Revised for SOD |
| 12390 | 11 | 14 | 26 | 14 | 26 | Please clarify if "wetlands" in this context means "drained wetlands in developed countries". | Accepted, Checked numbers and |
| 14608 | 11 | 14 | 27 | 14 | 20 | this is the only place in this whole sectionw here you talk about future cliamte impacts on ecosystem, well there is a bit on croplands. Be consistent. I think it is fine to have it here. For peatland futures Also refer to Joanna Clarke et al papers and recent Gallego sala nature cliamte change paper on global boglands | Accepted, Moved to climate susceptibility section and added references |
| 16552 | 11 | 14 | 3 | 14 | 5 | Are "grasslands" and "pastures" as used here synonyms? If not, what are the areas to which these two estimates of GHG flux correspond? | Accepted, Glossary issue - clarified for SOD |
| 8602 | 11 | 14 | 3 | 14 | 15 | Please, consider contributions on tropical savannas such as Grace, J., San José, J., Meir, P., Miranda, H. & Montes, R. 2006. Productivity and carbon fluxes of tropical savannas. J. Biogeogr. 33:387-400 and San José, J. & Montes, R. 2007. Resource apportionment and net primary production outcome across the Orinoco savanna-woodland continuum. Acta Oecol. 32:243-253. | Partially Accepted, Replaced with post 2007 papers |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10240 | 11 | 14 | 31 | 14 | 31 | an an subitem header as previously (line 3: grasslands, line 16 wetlands"), could be "other ecosystems". | Accepted, Revised for SOD |
| 5495 | 11 | 14 | 31 | 47 | | Agreed that it is important to include this- but not clear on lakes how human influence- apart from changes in climate can alter these to be sources or sinks- so not clear if it is appropriate here or in a separate section on unmanaged ecosystems | Accepted, Agreed - moved to a new section on unmanaged ecosystems and put lakes and permafrosts there (briefly |
| 14609 | 11 | 14 | 31 | 14 | 40 | delete frost sentence and give subheading of mangroves and put ins eparate paragraph from text below | Partially Accepted, Moved mangroves to |
| 11809 | 11 | 14 | 31 | 14 | 47 | Are lakes and mangrooves a part of wetlands? Or should this be a new sub-section? | Partially Accepted, Moved mangroves to |
| 18930 | 11 | 14 | 31 | | | Start this paragraph with "Others:" following the logic of previous paragraphs. | Accepted, Moved mangroves to forest |
| 16554 | 11 | 14 | 32 | 14 | 33 | Do these figures for mangroves overlap with those for forests? (Mangroves are forests after all; were they included in the previously given figures for forests?) | Accepted, Moved mangroves to forest section |
| 4276 | 11 | 14 | 40 | 14 | 44 | Refers to potential changes in fluxes from lakes without giving an indication of the magnitude of these fluxes, leaving the reader the impression the fluxes are large enough to matter but not knowing how big they are. Magnitude of flux is given later for saline lakes only. Possible reference (there are probably better and more recent ones, but it is a start): Campbell, I.D., Campbell, C., Vitt, D.H., Kelker, D., Laird, L.D., Trew, D., Kotak, B., LeClair, D., and Bayley, S. 2000. A first estimate of organix carbon storage in Holocene lake sediments in Alberta, Canada. Journal of Palaeolimnology 24: 395-400. This paper estimates that Alberta Lakes may represetn 1/1700 of total global lake sediment carbon, and that Alberta lakes sequester ~ 15 gCm-2yr-1, or .23 TgCyr-1 in total, which would make the global total (assuming the 1/1700 is accurate) 391 TgCyr-1 for global lakes. | Accepted, Agreed - moved to a new section on unmanaged ecosystems and put lakes and permafrosts there (briefly as unmanaged) |
| 14610 | 11 | 14 | 40 | 14 | 47 | New paragraph on disolved organic carbon in lakes and rivers. Presuming that is that the lake emissions being referred to are DOC, but may also be due to plant die back and exposed carbon rich soil? This is all about future, do we have anything on trends. Some disussion there may be a lot of DOC in river run off that is not accunted for in budgets, or is emitted elswehere from where the carbon is sequestered. I seem to rememebr a paper a long time ago by pacala that estiamted this in the USA, but I am sure there are more recent refs. | Accepted, Agreed - moved to a new section on unmanaged ecosystems and put lakes and permafrosts there (briefly as unmanaged) |
| 12391 | 11 | 14 | 43 | 14 | 44 | Could it be explained why a wet scenario will result in more C-emissions from lakes in N.USA than a dry scenario? | Accepted, Checked numbers and revised for SOD |
| 14605 | 11 | 14 | 6 | | | again I assume this is due to LUC and thus has some overlap witht eh forest number and the crop number, no problem there as long as it is clear. | Accepted, Checked numbers and revised for SOD |
| 5369 | 11 | 14 | 16 | 14 | 47 | Rooney et al (2012) describe another anthroprogenic impact on wetlands that I think is worth mentioning in this chapter as I dont see any other chapter taking this up. Rooney, R.C., S.E. Bayley, and D.W. Schindler, Oil sands mining and reclamation cause massive loss of peatland and stored carbon. Proceedings of the National Academy of Sciences, 2012. 10.1073/pnas.1117693108 | Accepted, Added reference for SOD |
| 11116 | 11 | 15 | | | | suggest to replace "measures" with "options" | Accepted, Revised for SOD |
| 14727 | 11 | 15 | 0 | | | CO2, CH4 and N2O instead of CO2, CH4 and N2O | Rejected, No difference in comment |
| 12392 | 11 | 15 | 1 | 15 | 15 | A lot of interesting information, but not easy accesible. A table with the different sources mentioned in the text, emissions in the same units, eventually also in percentages would improve the information value. | Accepted, Tabulated for SOD |
| 14612 | 11 | 15 | 1 | | | when you do have data…I would like to see some total numbers here not just %. Becomes confusing. First you have % global totals, then % agric emissions. But don't know what total emissiosn and total agric emissions are.. Have the numbers presented been checked for consistency with WG1? | Accepted, Tabulated for SOD |
| 11906 | 11 | 15 | 1 | 15 | 32 | Consider add a figure to show the trends of non-CO2 GHG and shorten the statements. | Partially Accepted, Tabulated for SOD |
| 10595 | 11 | 15 | 1 | | | What about a similar section for forests? Whole chapter needs to clearly dsitinguish between agriculture and forests throughout the text. When discussing both could use the term LULUCF. Also helps reader if keep to same order (eg forests discussed before agriculture) in each section. | Partially Accepted, But used AFOLU instead of LULUCF as LULUCF did not include agricultural emissions |
| 12393 | 11 | 15 | 10 | 15 | 12 | For better transparency; Indication of type of gas could be given inside the brackets for rice cultivation, biomass burning and manure management. | Accepted, Checked numbers and revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7185 | 11 | 15 | 10 | 16 | 10 | If CH4 emissions from rice cultivation account for 11% of the agricultural non-co2 emissions and biomass burning CH4 for 12%, why is CH4 from biomass burning not given in fig. 11.1 | Accepted, Checked numbers and revised for SOD |
| 12394 | 11 | 15 | 15 | 15 | 29 | A lot of interesting information, but not easy accesible. A table with the different sources mentioned in the text, emissions in the same units, eventually also in percentages would improve the information value. | Accepted, Tabulated for SOD |
| 10106 | 11 | 15 | 15 | 15 | 17 | What about china, East Asia is missing, increased fertilizer use is a major source of N2O emissions from China | Accepted, Checked numbers and revised for SOD |
| 13316 | 11 | 15 | 18 | 15 | 20 | Expand discussion of N. N fertilizer requires significant contribution of energy to convert N2 to reactive N. Generally more reactive N in the biosphere. Link increase in crop residues to increased crop production. Give a more precise description of N cycle. | Accepted, Expanded text on N - under-represented |
| 16555 | 11 | 15 | 2 | 15 | 2 | Give a date to explain what you mean by "at present". | Accepted, Updated with 2010 values |
| 14611 | 11 | 15 | 2 | 3 | | again the question , is this CO2 emissiosn from LUC and from established corplands (LU) | Accepted, Checked numbers and |
| 11062 | 11 | 15 | 2 | 15 | 14 | Two comments in this paragraph: (1) The USEPA reference appears to be used in more than one instance to support statements regarding global emissions; this reference is a primary source for US emissions but not global emissions, thus it seems that there is an error here or that another source would be a better primary reference. (2) The units used here are CO2eq and thus it appears these units are inconsistent with those used earlier in the chapter, for example, Fig. 11.1 which uses C not CO2. Units should be clarified and consistent. | Partially Accepted, These are the USEPA global estimates - but should be augmented with other studies |
| 2622 | 11 | 15 | 2 | | 5 | Shouldn't deforestation and conversion to agriculture also show up here?? | Accepted, Checked numbers and |
| 14613 | 11 | 15 | 20 | | | wy are crop residues a N source in particualr, why is this in addition to crop production? | Accepted, Clarified for SOD |
| 13665 | 11 | 15 | 20 | 15 | 21 | Change (South Asia) to (South, southeast and east Asia) | Accepted, Revised for SOD |
| 13666 | 11 | 15 | 22 | | | Add the following reference because it updates the global estimation of CH4 emission from rice cultivation and showing the greatest contribution of south, southeast and east Asia: Yan, X., Akiyama, H., Yagi, K., and Akimoto, H.: Global estimations of the inventory and mitigation potential of methane emissions from rice cultivation conducted using the 2006 IPCC Guidelines. Glob. Biogeochem. Cycles, 23, GB2002, doi:10.1029/2008GB003299 (2009); a PDF file for the reference is attached. | Accepted, Added for SOD |
| 14614 | 11 | 15 | 24 | | | suggest instead ot "rpduction cycle" to say "trends in" | Accepted, Revised for SOD |
| 10107 | 11 | 15 | 24 | 15 | 15 | It would be usefull to mention trends in animal numbers development in different regions and relate the emissions to produced units (of protein) FAO Getrber et all 2012 LCA anaylis of milm and a new report just coming on meat | Accepted, Added reference for SOD - provided breakdown of numbers |
| 9326 | 11 | 15 | 26 | | | The increase of harvest rice' is not clear. | Accepted, Clarified for SOD |
| 5048 | 11 | 15 | 26 | 15 | 26 | what is harvest rice in "increase of harvest rice" is this harvested rice land? | Accepted, Clarified for SOD |
| 5049 | 11 | 15 | 29 | 15 | 29 | the numbers in this paragraph cast doubt on 76% estimate | Accepted, Check numbers and revise for |
| 9327 | 11 | 15 | 30 | 15 | 32 | Please see if the word 'from' in line 30 and 32 can be replaced with 'in'. | Accepted, Revise for SOD |
| 14617 | 11 | 15 | 33 | | | eems odd that in this section you give mitigation potential for AFOLU sections not icnluded in comparable AR4 chanpter in past, but you don't give the updated mitigation ptoential of things that were presented in AR4, even though there must be newer estaimtes. SOme people will jsut look to heare and will not want to look back to AR4 so at least summarise and update what was in AR4, rather than merely present totally new sectors. However I also appreciate this hcapter is already over page limit. Covnersely you could cut down what is presented on bioemergy, and more sumarise what wsa in SRREN. | Accepted, reduce bioenergy section - refer back to AR4 and show updates |
| 2606 | 11 | 15 | 33 | | | suggest to add the part to emphasize "the sensitivity and uncertainty of carbon budget" | Accepted, Do in climate susceptibility |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10242 | 11 | 15 | 34 | 15 | 35 | It is written: “Greenhouse gases can be reduced by production-side mitigation measures (i.e. by reducing GHG emissions per unit of land or per unit of product)”. This kind of sentence is dangerous, thus it could be completely wrong when balance take into account the whole dimension of the land, and crosscutting issues. As it is stated in the item 11.1, the balance should consider feedbacks between mitigation options related to land surface. For instance, in Africa, most future policies will rely on increasing N-fertilizer level, and thus more N2O emission by unit of land, but this will avoid degradation of other lands, and at the end certainly less GHG emissions.<br>It should also be stated here that mitigation technology options and practices should be compared with baseline emissions, thus mitigation in the AFOLU sector are rarely absolute, but relative to other alternative which must comply with increasing food and biomass demand. | Partially Accepted, Clarify for SOD |
| 7539 | 11 | 15 | 34 | 15 | 38 | Chapter 9 in AR4 focused on both sides measures. | Accepted, Revise for SOD |
| 16557 | 11 | 15 | 35 | 15 | 36 | "by reducing demand" is a misleading way to describe demand-side options; the most feasible ones change the composition of demand towards foods that produce lower emissions, rather than reducing the amount of food people have to eat. | Accepted, Revise for SOD |
| 5550 | 11 | 15 | 36 | 15 | 36 | “Reducing the demand for --- fibre products”. I have argued that demand could be substantially increased to use much more of the annual growth of biomass including bioenergy and biochar. This would give employment opportunities, especially to the rural poor. | Rejected, Does not belong in this section |
| 5047 | 11 | 15 | 4 | 15 | 4 | I don’t think I believe "In total 76% of GHG emissions on croplands comes 4 from the application of fertilizers and 7.6% - from field operations (Ceschia et al., 2010)." as I think the emissions from tillage, uptake from no till, emissions from fossil fuel use, legumes, histosoils, rice etc are such that 76% is high | Accepted, Check numbers and revise for SOD |
| 10105 | 11 | 15 | 4 | 15 | 14 | I do not think it is good idea to lump CH4 and N2O this way, the different sources presented play different role in emissions of these two gasses | Accepted, Revise for SOD |
| 13664 | 11 | 15 | 4 | 15 | 5 | Is this estimation (76% from fertilisers and 7.6% from field operation) included CH4 emissions from rice cultivation? If not please recalculate. | Accepted, Check numbers and revise for SOD |
| 5812 | 11 | 15 | 40 | | | You mean chapters 8 and 9, not 7 and 8. | Accepted, Revise for SOD |
| 15158 | 11 | 15 | 41 | 15 | 43 | awkward to get through; fix phrasing | Accepted, Revise for SOD |
| 12395 | 11 | 15 | 44 | 15 | 44 | It says that measures described in detail in AR4 are not described further here. Have new information since AR4 changed any of the conclusions on measures? For instance, new information on pay-back time and the possible responses on the climate and the albedo? Due to the albeo, afforestation in boreal areas could have a negative climate effect. Please consider to include such information in the chapter. It would also be helpful with a sum-up of the information on measures in AR4. | Accepted, Refer back to AR4 and show updates |
| 13315 | 11 | 15 | 5 | 15 | 5 | Not clear what "field operations" is referring to, clarify in text. | Accepted, Clarified for SOD |
| 16218 | 11 | 15 | 6 | | | going back and forth here with CO2e and C; perhaps try to keep consistent | Accepted, Harmonized units for the SOD |
| 15157 | 11 | 15 | | | | weak section overall, repetiitve, and can be tightened | Accepted, Conducted a thorough edit for |
| 3539 | 11 | 15 | | | | When data is updated, please include figures to illustrate trends and changes. | Accepted, Revised for SOD |
| 15607 | 11 | 15 | 1 | 15 | 32 | Consider mentioning projected emissions from animal agriculture. Pelletier N. and P. Tyedmers (2010). Forecasting potential global environmental costs of livestock production 2000-2050. Proceedings of the National Academy of Sciences of the United States of America 107(43), 18371-74. Available at: http://www.pnas.org/content/early/2010/09/27/1004659107.full.pdf+html. | Accepted, Expanded and updated livestock sector for SOD |
| 13963 | 11 | 15 | 1 | | | Appropriate references for global data needed. The US GHG inventory is an inventory of US GHG emissions and should not be used as a reference for global emissions. All uses of the US GHG inventory in this section should be removed and appropriate data and data sources added. | Rejected, The USEPA also produces reports on global emissions - it is that one we use here - but have included |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10241 | 11 | 15 | 1 | 15 | 32 | This section is by far too short and incomplete, thus AFOLU sector is responsible for the majority of N2O emissions and more than half of methane emissions. This section should highlights that there are still too many uncertainties both for source and sink.<br>Concerning sink, add regional estimates (e.g. Bernardier A.B. and Conant R.T. 2012. Global Change Biology (2012) 18, 928–935, doi: 10.1111/j.1365-2486.2011.02554.x).<br>Concerning sinks, see papers by Chapuis-Lardy et al. (Chapuis-Lardy L., Wrage N., Metay A., Chotte J.L, Bernoux M. 2007. Soils, a sink for N2O? A review. Global Change Biology. 13, 1-17. Doi: 10.1111/j.1365-2486.2006.01280.x).<br>Also it should be stated somewhere that human activities in AFOLU influence also indirect emissions (e.g. termites communities may change with LU and managements options). | Accepted, Expanded on the importance of the sector in emissions of N2O and CH4 |
| 7538 | 11 | 15 | | 31 | | Dividing mitigation options into production-side and demand-side is not good idea. Even AR4 deals with both side options in Chapter 9. All options are linked tightly each other. All options should be summerized in a table. Categorization by sectors and common options (i.e. Agricilture, Forestry, other land uses , land use change and bioenergy) is enough. | Rejected, Since demand side measures in agriculture were not considered at all in AR4, it is useful to consider here. We deal with the inter-relatedness of the |
| 3170 | 11 | 15 | 33 | | | Sections 11.2 and 11.3: streamline the tables and the prose; much of the prose in the main text repeats the tabular points. | Accepted, Revised for SOD |
| 5370 | 11 | 15 | 34 | 15 | 36 | Much later on in Chapter 11 considerable discussion is devoted to the Wise et al (2009) paper in Science that shows how intelligent climate policy can also mitigate land use emissions. I strongly encourage the authors of Chapter 11 to bring those ideas up to this point in the chapter or at least introduce those ideas up here. This framing of either production-side or demand-side is too simplistic and is not in keeping with the more nuanced set of options availiable to society that are covered in the Wise et al (2009) paper and which are described later in Chapter 11 itself. | Partially Accepted, It is a matter or where best to place this material |
| 3541 | 11 | 15 | | | | In the title 'Production-side mitigation measures', I have the impression that the term 'Production' is appropriate for sectors like industry. But for AFOLU, probably not. I would suggest that we say something like 'Source-side mitigation measures'. | Rejected, This terminology does not help - but we will seek alternatives, or define better |
| 3540 | 11 | 15 | 40 | | 45 | Please check the correct way to write references in IPCC documents. Replace 'i.e.' with 'for e.g.' on line 45. | Accepted, Zotero updated for SOD |

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| 9092 | 11 | 15 | 40 | 15 | 45 | I think measures already described in AR4 should be described again (or at least included in Table 11.2), if new estimates of carbon sequestration potential were published after AR4 because the number of such publication, especialy at country-scale, increased after AR4 publication. For example, please include the following paper, which estimated the soil C sequestration potential in Japanese cropland by high input carbon practices, in references of "Croplands-agronomy" in Table 11.2; 1); Yokozawa, M., Shirato, Y., Sakamoto, T., Yonemura, S., Nakai, M., Ohkura, T. (2010) Use of the RothC model to estimate carbon sequestration potential of organic matter application in Japanese arable soils. Soil Science and Plant Nutrition, 56, 168-176.<br>In addition, the following papers should be included, too; 1) Alvaro-Fuentes J;Paustian,K 2011: Potential soil carbon sequestration in a semiarid Mediterranean agroecosystem under climate change: Quantifying management and climate effects. Plant and Soil, 338, 261-272; 2) Prechtel A, von Lutzow M, Schneider BU, Bens O, Bannick CG, Kogel-Knabner I, Huttl RF 2009: Organic carbon in soils of Germany: Status quo and the need for new data to evaluate potentials and trends of soil carbon sequestration. JOURNAL OF PLANT NUTRITION AND SOIL SCIENCE-ZEITSCHRIFT FUR, 172, 601-614; 3) Girmay G, Singh BR, Mitiku H, Borresen T, Lal R 2008: Carbon stocks in Ethiopian soils in relation to land use and soil management. Land Degradation & Development, 19, 351-367; 4) Maquere V, Laclau JP, Bernoux M, Saint-Andre L, Goncalves JLM, Cerri CC, Piccolo MC, Ranger J 2008: Influence of land use (savanna, pasture, Eucalyptus plantations) on soil carbon and nitrogen stocks in Brazil. European Journal of Soil Science, 59, 863-877; 5) Katterer T, Andersson L, Andren O, Persson J 2008: Long-term impact of chronosequential land use change on soil carbon stocks on a Swedish farm. NUTRIENT CYCLING IN AGROECOSYSTEMS, 81, 145-155; 6) Schulp CJE, Veldkamp A 2008: Long-term landscape - land use interactions as explaining factor for soil<br>organic matter variability in Dutch agricultural landscapes. Geoderma, 146, 457-465; 7) VandenBygaart AJ, McConkey BG, Angers DA, Smith W, de Gooijer H, Bentham M, Martin T 2008: Soil carbon change factors for the Canadian agriculture national greenhouse gas inventory. Canadian Journal of Soil Science, 88, 671-680. | Partially Accepted, Agree to refer back to AR4 - but many of the references listed are far too specific - there are 10s or 1000s of references in this filed and be have to choose the most synthetic - we cannot cite all individual studies |
| 12926 | 11 | 15 | 1 | 15 | 32 | Since the mechanisms of N2O and CH4 production in each ecosystem, these GHG should be discussed in sepeartely. After the trend of contribution of these GHG emission is discussed, detail of these source or regional distribution of the source of each GHG should be discussed in different sub-sections like in "Trend of N2O emission" and "Trend of CH4 emission" sub-sections. | Accepted, Disaggregated |
| 11204 | 11 | 16 | | | | Table 11.2: In final cell on left hand column it would be useful to add specific reference to and "including through recognition of communal/customary tenure systems" after 'community forests'. In the right hand column it might be good to add the above references of Agrawal and others? | Accepted, Add for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10243 | 11 | 16 | | 20 | | Most references are not listed, thus it is difficult to judge if there are all adequate! It should be given here priority to paper already synthetizing available information (review paper) for instance a search on the ISI web of Science with the key words “crop* carbon review” in the field “title” return only 4 papers. Citing review paper will permit to cite fewer references and allowing readers to summarized and synthetized information.<br>For the “Croplands – tillage/residues” (page 17) : Tillage effect have to be differentiated from the residues effect; As it is, it sums too different management options: tillage and residues, tillage without residues, no-tillage and no-residues, and no-tillage and residues<br>For “Biochar” (page 17): researches are still in the infancy, and first meta-analysis showed that biochars is not always synonymous of increasing biomass productivity (e.g. Jeffery et al. 2011. Agriculture, Ecosystems and Environment 144 (2011) 175–187, doi:10.1016/j.agee.2011.08.015)<br>Livestock – feeding (page 18): It should be underline that some dietary additive suggested here might be forbidden or limited in some countries (e.g. bST in Europe)<br>“Other mixed biomass production systems”: this heading is too vague, it would be better to consider on one hand something like integrated crop-livestock systems, and double-cropping systems. □ | Accepted, Replace many papers with reviews since 2007 in SOD |
| 10622 | 11 | 16 | | | | Please consider the paper Caparrós et al. (2011). This paper analyzes avoided degradation costs in Spain and in Tunisia. Caparrós, A., Ovando, P., Oviedo, and Campos, P., 2011. Accounting for carbon in avoided degradation and reforestation programmes in Mediterranean forests. Environment and Development Economics 16(4): 405-428.. This paper reviews different studies which estimate economic and physical potentials for bienergy and forestry options in Europe. | Rejected, Considered but too country specific |
| 9448 | 11 | 16 | | 20 | | Table 11.2 is helpful however it mixes one nascent set of mitigation options (REDD) with numerous technologies that on their own do not constitute mitigation options. Avoided deforestation is a potential outcome of set of incentives and rules that provide the mechanisms for mitigation. Other technologies in the list would require similar rules and incentives to be mitigation options. Biochar is not a mitigation option. A scheme to promote farmers to make and bury biochar is a mitigation option. | Partially accepted, A sentence was added in the opportunities column |
| 11980 | 11 | 16 | | | | "Forest management in plantations". Not clear why this is a mitigigation option | Rejected, Improved management in plantations can enhance C sinks |
| 2364 | 11 | 16 | | | | This table is very helpful and contains good information in a concise form. Consider to add "abatement cost" and "investment needs" (link appropriatelywith 11.10 and avoid duplication) | Rejected, Better to leave these until the later sections where these are dealt with |
| 6825 | 11 | 16 | | 19 | | The table starts with some activities and describes the impact eg avoided emissions or additional sequestration. These explanations are useful to explain the impact on the atmosphere - should be extended to all activities in the table, perhaps as a separate column? in some cases eg bioenergy, impacts may be in other sectors eg energy | Accepted, Harmonize the table entries across all practices for the SOD |
| 3542 | 11 | 16 | | | | Check again the way references are writen; for e.g. Gibbs, Brown et al. 2007; Saatchi, Harris et al. 2011; Lehtonen and A. 2005 are not common ways to present references. | Accepted, Zotero updated for SOD |
| 14618 | 11 | 16 | | | | row 2, afforestation, reforestation, needs more up to date refs. | Accepted, Replaced references with |
| 14619 | 11 | 16 | | | | row 4. forest management in plantations. Surely this is overlap with section above Also how will improving productivity of fruits, cofee, gum etc improve carbon balance | Rejected, Less emissions per unit product - but removed specification of |
| 14620 | 11 | 16 | | | | sustaitnable management in native forests, this is not so much management but conservation really it is REDD and more clear to state as such. | Rejected, Conservation includes management |
| 7611 | 11 | 16 | | 16 | | "Plantation" meams about 5 to 20 years rotation forestry in tropical regions. It is not include planted forest such as Europa and Japan. Replace "forest manegement. FAO classifies plantation of fruit and cocoa, coffee ,NTFP in agricultural land. Fruit and cocoa, coffee, NTFP will be delete from "Forest manegement in plantion" in plantations" with "forest mangegement in planted forest" option. | Accepted, Done |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7612 | 11 | 16 | | 16 | | I think "Protection for wild fire" is very important for GHG gus reduction. Plese add "Protection for wild fire" or "Wild fire manegement" in option. | Rejected, Evidence is not clear - some studies this increases fuel load leading to larger fire events - have discussed, |
| 9328 | 11 | 16 | | | | Most of the reference listed pertain to pre-AR4 period, i.e. before 2007. It is suggested that references pertaining to 2007 and the later years only may be given. | Accepted, Replaced references with post-2007 reviews |
| 7336 | 11 | 16 | | | | citations all messed up | Accepted, Zotero updated for SOD |
| 5705 | 11 | 16 | | | | Table on Forestry Option needs to be reoriented in tune with the terminologies that are being used in the UNFCCC decisions and text on REDD-plus. At the top of the Table, under heading Option, 'Forestry' should be replaced by "Forestry (REDD-plus)". Next, elements below "Forestry (REDD-plus)" will need to be regrouped. For example, 'Afforestation/Reforestation' and 'Forest Management in Plantations' could be grouped together under the new sub-head "Enhancement of Forest Carbon Stocks", 'Improved Forest Management' could be put under "Sustainable Management of Forest", and similarly, 'Sustainable Management in Native Forest' could be put under "Conservation". The terms in bold font are coming from the UNFCCC decisions on REDD-plus. | Accepted, Revised for SOD |
| 7540 | 11 | 16 | | 16 | | REDD is the name of a policy in UNFCCC, and it is not appropriate as a name of a mitigation option. | Accepted, Revised for SOD |
| 7541 | 11 | 16 | | 16 | | Categorization of mitigation options is not reasonable and not comfortable. Respecting Subsection 9.4.2 in AR4, categorization and illustration should be revised. | Accepted, Revised for SOD |
| 7542 | 11 | 16 | | 16 | | Replace "forest manegement in plantations" with "forest management in planted forests" because plantation means short rotation forestry in toropical regions. Use generic words. Delete "in native forest" in "sustainable forest management in native forest". "Native" is not appropriate but generic SFM here. | Accepted, Revised for SOD |
| 5551 | 11 | 16 | | 16 | | REDD will not be successful in reducing deforestation, if agricultural productivity, especially for the subsistence sector does not increase in line with population increase and the increase demand for food and fibre products. REDD may be most successful in attacking forest degradation. Under Forestry options, which I would rename Tree planting and management options, I would have: Encouraged the planting/management of trees outside the forest, especially on farm in shelterbelts and along roads, rivers and railways (RRR), Use trees to improve fertility and soil friability. But above all need good inventory information on all land use types, especially in areas of high population densities. | Accepted, Discussed in the policy section (11.10) |
| 11810 | 11 | 16 | | | | IN the option "Forest management in plantations": Why are fruits and NTFPs named here? Are they a mitigation option? If yes, explain how. | Rejected, Less emissions per unit product - but remove specification of the |
| 10262 | 11 | 16 | | | | To improved Forest Management : Add fresh reference: Routa,J., Kellomäki, S. and Strandman, H. : Effects of Forest Management on Total Biomass Production and CO2 Emissions from use of Energy Biomass of Norway Spruce and Scots Pine. BioEnergy Research: Volume 5, Issue 3 (2012), Page 733-747. | Rejected, Considered but too country specific |
| 11117 | 11 | 16 | | | | This table is a simple list of possible options - a reference would be needed to later sections where quantitative assessments are provided. However, it would be nice to have an indication of the relative importance of the various options. Also, the references in this format are not informative at all, maybe some quantitative information from them would be interesting. | Accepted, Reference to later sections will be added for SOD |
| 11118 | 11 | 16 | | | | For reducing deforestation…, REDD (actually: REDD+) is only a program for developing countries, however, deforestation may also be a (considerable) problem for countries such as Australia (mentioned in the draft), Russia, Canada, Finland and others. Thus, additional forms of mitigation are required. | Accepted, Revised for SOD |
| 11119 | 11 | 16 | | | | For afforestation: the definition of afforestatin and reforestation may not be important here at all (most people know what these are), and providing any definition may result in a conflict with "official" definitions under the Kyoto Protocol - please check and modify | Accepted, Revised for SOD |
| 11120 | 11 | 16 | | | | "Sustainable management in native forests" - this is a rather odd term. "Improved forest management" should cover management in native forests, thus, preserving carbon in UNMANAGED forest should be mentioned here. | Accepted, Revised for SOD |
| 11160 | 11 | 16 | | | | Difference between the "Improved Forest Management" and the "Sustainable management in native forest" is not clear. These can be merged into "Sustainable forest management" | Accepted, Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11161 | 11 | 16 | | | | "Plantations" and "planted forest" should be discriminated. Orchards, cacao, coffee and rubber trees are not always defined as "forests". | Accepted, Revised for SOD |
| 11162 | 11 | 16 | | | | In the table, use of unclear terms should be avoided as possible. For example, "native forest" | Accepted, Revised for SOD |
| 11163 | 11 | 16 | | | | Forest fire control, water level control in the peat forest should be included as mitigation options. | Accepted, Revised for SOD |
| 2623 | 11 | 16 | | 20 | | What is 'forest degradation' - it needs to be defined. Does the Afforestation/Reforestation part need to include that it is afforestation only if it was not in forest conditions for 50 years? The Biochar is not something that is just found in agriculture but is also practiced in forests. The Grasslands - fire mgt includes fire prevention but this is part of the ecophysiology of grasses - they self generate fires. Fire prevention has to be cautiously implemented if the ecosystem needs it. The unhealthy forests in western US are due to fire prevention. There needs to be a definition for Degraded soils. The Bioenergy from dedicated crops are plants that have a significant potential to become invasive so this should be approached cautiously, i.e., probably not a good idea to plant outside of their normal range. | Accepted, Defined in glossary and clarified in the SOD; biochar in forestry is difficult economically and practically. The impacts on forests negative of wood used for production. But unlikley, as charcoal more valuable as a fuel |
| 12397 | 11 | 16 | 1 | 16 | 2 | Production of artificial meat is one way of reducing emissions from production of meat. Especially ruminant meat may show dramatic reduced GHG-emissions when artificially produced. Could also be assessed being a measure reducing the demand side (meat demand). | Accepted, Included mention in livestock demand-side Discussion |
| 12396 | 11 | 16 | 1 | 20 | 2 | Please consider to start the explanation box by giving a reference to which greenhouse gas the measure is relevant. | Partially Accepted, Changed table to include gas or reference to other section |
| 12872 | 11 | 16 | 1 | | | This table currently omits forest management actions that are adaptations to future climate change. Add a line "Column 1: Adaptation of forest management to climate change. Column 2: Prescribed burning, mechanical thinning, and retention of large trees; These adaptation measures also mitigate greenhouse gas emissions because long-term storage of carbon in large trees outweighs short-term emissions from prescribed burning; Fire management to control bark beetle outbreaks, projected to emit, in boreal forests in Canada, 8-67 Mt C y-1. Column 3: Stephens et al. 2009, Hurteau and Brooks 2011, Kurz et al. 2008. Stephens, S.L., J.J. Moghaddas, C. Edminster, C.E. Fiedler, S. Haase, M. Harrington, J.E. Keeley, E.E. Knapp, J.D. McIver, K. Metlen, C.N. Skinner, and A. Youngblood. 2009. Fire treatment effects on vegetation structure, fuels, and potential fire severity in western U.S. forests. Ecological Applications 19: 305-320. Hurteau, M.D. and M.L. Brooks. 2011. Short- and long-term effects of fire on carbon in US dry temperate forest systems. BioScience 61: 139-146. Kurz, W.A., G. Stinson, G.J. Rampley, C.C. Dymond, and E.T. Neilson. 2008. Risk of natural disturbances makes future contribution of Canada's forests to the global carbon cycle highly uncertain. Proceedings of the National Academy of Sciences of the USA 105: 1551-1555. | Accepted, Revised for SOD |
| 9079 | 11 | 16 | 1 | | | Some references in this table were not cited in the References section | Accepted, Zotero updated for SOD |
| 9080 | 11 | 16 | 1 | | | For description in "Sustainable management in native forest" , it would be better to add biodiversity issue. | Accepted, Revised for SOD |
| 14615 | 11 | 16 | 26 | | | suggest instead of "harvest rice" to say "rice production". | Accepted, Revised for SOD |
| 14616 | 11 | 16 | 26 | | | should you make the point here that carbon realeased as CH4 was taken up as CO2 so small net change in carbon, but methane greater raditive forcing effect in the short term. (in the longer term the CH4 turns back to CO2) | Accepted, Revised for SOD |
| 9130 | 11 | 16 | 28 | | | To avoid confusion, it is better use "plantation" and "planted forest" separately. Column 1 : change "Forest management in plantations" to "Forest management in planted forests and plantations", Column 2: "Planted forest are" to "Planted forests and plantations are", "timber, fruits" to "timber, or fruits". | Accepted, Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5496 | 11 | 17 | | | | Biochar in the agricultural recommendations- while this amendment has its devotees- research on behavior in soils is mixed with some studies showing N immobilization and yield decreases. Also it isn't clear in others if an observed response is the result of a pH increase or some other factor related to the char. I would suggest that char be replaced here with a more generic reference to residuals based soil amendments. There is a wealth of literature on benefits associated with organic amendments derived from residuals and this would have the added benefit of reduced landfill emissions for redirected organics. Using this term also would include biochar as a type of amendment and so would not upset any char devotees. | Accepted, Moved biochar to amendments section and treated as char. It is correct that biochar can deprive plants of N through ammonium sorption if added in large quantities without consideration for N supply from soil or other inputs. Positive effects on retention / supply to plants look to cancel out negative effects later, so small annual additions may be best; Biochar would have potential to impact crop yield in multiple ways, only one of which is pH - others are direct supply of mineral |
| 14621 | 11 | 17 | | | | row 6, not sure if you need LUC here | Accepted, Revise for SOD |
| 14622 | 11 | 17 | | | | row 7. biochar. Not sure this fits here quite as biochar probably produced from wood products, like timber in long lived prodcuts where you store it may not be so critical. I guess it may icnrease crop productivity, but this is a side issue to the carbon storage. | Partially Accepted, Moved biochar to amendments section and treated as char. It is correct that biochar can deprive plants of N through ammonium sorption if added in large quantities without consideration for N supply from soil or other inputs. Positive effects on retention / supply to plants look to cancel out negative effects later, so small annual additions may be best; Biochar would have potential to impact crop yield in multiple ways, only one of which is pH - others are direct supply of mineral nutrients, improved retention of |
| 11907 | 11 | 17 | | | | Add a new reference for nitrient management: Akiyama et al. (2010) Evaluation of effectiveness of enhanced-efficiency fertilizers as mitigation options for N2O and NO emissions from agricultural soils: meta-analysis. Global Change Biology, 16: 1837-1846. | Accepted, Add for SOD |
| 11908 | 11 | 17 | | | | Add a new reference for rice management: Ito et al. (2011) Mitigation of methane emissions from paddy fields by prolonging midseason drainage. Agriculture, Ecosystems and Environment, 141: 359-372. | Accepted, Add for SOD unless review / meta-analysis is available |
| 5706 | 11 | 17 | | | | Please add an additional row, and discuss enhancement of soil organic carbon separately for cropland management and grassland management. | Accepted, Revise for SOD |
| 13317 | 11 | 17 | | | | The real mitigation potential of biochar is not established. It could be removed from this table as its inclusion is premature. | Rejected, We are specifically asked to consider it in the chapter outline |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5552 | 11 | 17 | | | | Land-based agriculture. Croplands-set-aside & LUC. I have never heard of 'holly forest'. What is it? It does not seem to be very common. It should be explained. Will it make significant in-roads? Biochar. This could be produced using crop residues (and tree waste), but at what cost? Who will pay for the spreading on fields? Surely soot serves the same purpose? This could be collected from chimneys? Under grassland could promote browse (and shade) trees. Under this heading could be a section on reclaiming land such as that invaded by 'weed' species, irrigated land that has become saline etc. | Partially Accepted, Moved biochar to amendments section and treated as char - and removed specific details such as holly forest. No one has made a global assessment of the potential for economic biochar deployment. Currently, lack of a price on carbon abatement (and/or a methodology for claiming a price at least for directly for sequestered carbon, however small) is a barrier. Refining predictability and certainty of crop impacts by matching biochar and soil, making biochar from wastes rather than virgin biomass, improving availability and cost of pyrolysis technologies, adopting sensible deployment strategies |
| 15608 | 11 | 17 | | | | For grasslands management option, consider citing: Thornton P.K. and M. Herrero (2010). Potential for reduced methane and carbon dioxide emissions from livestock and pasture management in the tropics. Proceedings of the National Academy of Sciences of the United States of America 107(46), 19667-72. | Accepted, Added for SOD |
| 10597 | 11 | 17 | | | | Why "Land-based" agriculture? I guess trying to distinguish from livestock - so better term is "Agronomy". | Rejected, Agronomy often only refers to cropland so land-based is better |
| 10598 | 11 | 17 | | | | Biochar rewording suggestion: Biochar is a soil amendment that sequesters C from source biomass and could possibly increases "crop" productivity in some soils. | Accepted, Moved biochar to amendments section and treated as char - Accepted wording change. Slight change to suggested wording to include |
| 10599 | 11 | 17 | | | | last line "mgt" in full | Accepted, Revised for SOD |
| 13964 | 11 | 17 | | | | under agronomy -- remove reference to agricultural biotechnology unless real data can be provided that unequivocally link a particular new variety to a measurable increase in soil carbon content. Include references (e.g., ongoing work by Six of UC Davis) regarding use of compost and manures in cropping systems and measured increases in soil carbon content. | Rejected, It has to be considered - even if it is just as a future possibility. We cannot pretend it doesn't exist |
| 13965 | 11 | 17 | | | | under nutrient management, remove reference to increased fertilizer input reducing land conversion pressures. This is a simplistic and highly contestable link. See for example several recent reviews of the science by doug boucher/union of concerned scientists. | Accepted, Remove for SOD or see comment on line 558 |
| 15230 | 11 | 17 | | | | Croplands - nutrient management. Missing remark about organic fertiliser inputs. Fertiliser input can minimised GHG emissions if they are from organic sources or from green manure, for example. Beneficial in economically poor regions and low yielding locations. Ref. "Increased carbon sequestration by a management practice may increase other GHG emissions and, as such, decrease or even negate the sequestered CO2 in the soil. The application of synthetic fertilizer, for example, was considered to result in net GHG emissions when considering emissions from fertilizer production and nitrous oxide emissions after application (Powlson et al., 2011)". From Bellarby et al. 2012. Bellarby, J., Tirado, R., Leip, A., Weiss, F., Lesschen, J. P. & Smith, P. 2012. Livestock greenhouse gas emissions and mitigation potential in Europe. Global Change Biology, in press. http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2486.2012.02786.x/abstract | Accepted, Add for SOD |
| 15231 | 11 | 17 | | | | "Biochar favours C sequestration, but does not increase soil fertility." Galvez et al. 2012. Galvez, A., Sinicco, T., Cayuela, M. L., Mingorance, M. D., Fornasier, F. & Mondini, C. 2012. Short term effects of bioenergy by-products on soil C and N dynamics, nutrient availability and biochemical properties. Agriculture, Ecosystems & Environment, 160: 3-14. | Accepted, Have provided review that considers all studies rather than citing many studies. I would be cautious citing this work, it does not actually assess effects on plants, only (limited) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14429 | 11 | 17 | | | | Typo. Row “Croplands – water management”. Correct ‘avaialability’ | Accepted, Revise for SOD |
| 11064 | 11 | 17 | | | | Column 2, Row 7: Summary information on biochar does not include potential impacts on N2O emissions although mentioned in text. | Accepted, Revise for SOD |
| 11063 | 11 | 17 | | | | Column 3, Row 2: none of the references for Croplands-nutrient management are included in Reference List. Perhaps more importantly, none of them is more recent than 2005. Several efforts have been made since then to integrate information regarding mitigation potential for cropland nutrient management, for example: Eagle et al., 2012. Greenhouse Gas Mitigation Potential of Agricultural Land Management in the United States: A Synthesis of the Literature. Nicholas Institute for Environmental Policy Solutions NI R 10-04, available at http://nicholasinstitute.duke.edu/ecosystem/land/TAGGDLitRev. Also see comment and references below for section 11.8.3 | Accepted, Update with post 2012 references |
| 12398 | 11 | 17 | 1 | 17 | 2 | Cropland - water management may also include drainage of too wet soil, to gain better harvests. | Accepted, Revise for SOD |
| 12399 | 11 | 17 | 1 | 17 | 2 | It could be mentioned that bio char does have a number of other advantageous properties in the soil environment. | Accepted, Revise for SOD |
| 11526 | 11 | 17 | 1 | 17 | 1 | you may also refer to Meyer-Aurich et al. 2012 in the second line of the table on page 17 (croplands-nutrient management) In Meyer-Aurich et al 2012 we elaborated on the issue "fertilizer input to increase yields causes GHG emissions but reduces land conversion pressures and increases residue for recirculation to soils (Meyer-Aurich, A., Olesen, J., Prochnow, A., Brunsch, R. (2012). Greenhouse gas mitigation with scarce land: The potential contribution of increased nitrogen input. Mitigation and Adaptation Strategies for Global Change:1-12. doi:10.1007/s11027-012-9399-x.) | Accepted, Remove for SOD or see comment on line 550 |
| 13667 | 11 | 17 | | | | Description column, line 4: Add 'use of nitrification inhibitors', because the effectiveness of this option has well demonstrated. | Accepted, Add to SOD |
| 13668 | 11 | 17 | | | | References: Add the following reference because it analyzed average mitigation potentials of nitrifivation inhibitors to reduce N2O from cloplands: Akiyama, H., Yan, X., and Yagi, K.: Evaluation of effectiveness of enhanced-efficiency fertilizers as mitigation options for N2O and NO emissions from agricultural soils: meta-analysis. Global Change Biol., 16, 1837–1846 (2010); a PDF file for the reference is attached. | Accepted, Add to SOD |
| 13669 | 11 | 17 | | | | Description column, line 4: Add 'organic matter management (composting and aerobic decomposition of rice starw and stubbles)', because these options are well known and their effectiveness has well demonstrated as shown in Yagi et al., 1997 (Yagi, K., Tsuruta, H. and Minami, K.: Possible options for mitigating methane emission from rice cultivation, Nutrient Cycling in Agroecosystems 49: 213–220, 1997); a PDF file for the reference is attached. | Accepted, Find a more up to date reference, but add to SOD |
| 13670 | 11 | 17 | | | | References: Add the following reference because it provides an avarage mitigation rate of improved mid-season drinage to reduce CH4 from Japanese rice fields by a nation-wide field campaign: Itoh, M., Sudo, S., Mori, S., Saito, H., Yoshida, T., Shiratori, Y., Suga, S., Yoshikawa, N., Suzue, Y., Mizukami, M., Mochida, T., and Yagi, K.: Mitigation of methane emissions from paddy fields by prolonging mid-season drainage. Agric. Ecosys. Environ., 141, 359– 372 (2011); a PDF file for the reference is attached. | Accepted, Add to SOD |
| 14623 | 11 | 18 | | | | row 4, bioenergy from forestry residues, column 2. The last logn sentence is a qulifying statement that is otut of line with the rest of the table which describes the category, but does not discuss its effects. This belongs in main text discussions | Accepted, Revise for SOD |
| 9329 | 11 | 18 | | | | Against 'Degraded soils - restoration', under column 'Description', the phrase 'soil fertility reduction', is suggested to be changed to 'soil fertility improvement'. | Accepted, Revise for SOD |
| 5707 | 11 | 18 | | | | In the row for ‘Degraded soils- restoration’ in the second column, replace words ‘soil fertility reduction’ with “soil fertility reduction or enhancement”. | Accepted, Revise for SOD |
| 13318 | 11 | 18 | | | | Under manure management, could refer to anaeorobic digestions. | Accepted, Revise for SOD |
| 13319 | 11 | 18 | | | | Under livestock should seperate genetic selection and manipulations of rumen microbial community. | Accepted, Revise for SOD |
| 5553 | 11 | 18 | | | | Livestock. Under this section or under bioenergy should mention small and large-scale methane production. | Accepted, Revise for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11294 | 11 | 18 | | | | Under header 'Livestock', row 'Livestock-feeding', column 'Description', one should be cautious about referencing 'antibiotics' in this positive context; in the current political climate this could be distorted as an endorsement. | Accepted, Change wording for SOD |
| 15232 | 11 | 18 | | | | Manure management - What is missing In my opinion, also in AR4, is an analysis on how much GHG emissions could be saved in N fertilisers production, distribution, etc, if all manure would be managed and used efficiently for food production, i.e. substituting emissions from some % of synthetic N, even when emissions from manure remains similar. Globally, about 50% of manure is not returned to agriculture land, so if they were and synthetic N inputs adjusted accordingly, there will be some additional savings in GHG emissions. | Accepted, This has been addressed in Davidson, Ready et al. and Erisman et al., so we can perhaps find these numbers |
| 12844 | 11 | 18 | 0 | | | Please add a new block 4 after Livestock-Manure management, with the title: Crop-livestock integration. Coupling crop and livestock production offers possibilities for better utilisation of animal manure. In this way artificial fertiliser can be saved and subsequently emissions associated with fertiliser production are avoided. Reference: Oomen et al., 1998. Publication is attached | Partially Accepted, Covered generically under better use of livestock manures |
| 12402 | 11 | 18 | 1 | | | Combustion or catalysis of air from livestock rooms has been reported as a possible technique of reducing methane emissions from ruminants. Applying these techniques on large farms may be possible without too high costs. Please consider to include this in table 11.2, if relevant references are found in the literature. | Noted, Literature does not exist as far as I can ascertain - concentration too low for combustion from animal house. |
| 12403 | 11 | 18 | 1 | | | The table lists a number of mitigation options. in the 3.row, 2.colon the expression "soil fertility reduction" is used. Is this correct? | Accepted, Revise for SOD |
| 12400 | 11 | 18 | 1 | 18 | 2 | Organic soils - restoration. In some countries existing peatlands may have a demonstrable risk for changed land use. E.g. drainage of the water and use for crop production or grasslands will release CO2 to the atmosphere compared to if the areas had not been converted. This comparison with a "business-as-usual scenario" for peatlands is comparable to REDD concept on forest management. | Noted, Statement - not a comment |
| 12401 | 11 | 18 | 1 | 18 | 2 | Degraded soils; Reduced soil compaction is relevant in countries with a high degree of motorized agricultural machinery. Has relevant publications on this topic been investigated? | Accepted, Add for SOD |
| 7656 | 11 | 18 | 17 | 18 | 17 | I recommend to cite Shinkai et al. (2012) as a reference for mitigation options in "Livestock - feeding". They reported reduction of enteric methane emission from dairy cattle using cashew nut shell liquid (CNSL).<br><br>Shinkai et al. (2012) Mitigation of methane production from cattle by feeding cashew nut shell liquid. J. Dairy Sci. 95:5308-16 | Accepted, The section does not try to include every reference but focuses on comprehensive post 2007 reviews. These cover the use of oil by-products |
| 14267 | 11 | 18 | 26 | 19 | 44 | Repitions in Sec. 11.2.3 and 11.2.3.1 needs to be removed. | Accepted, Sections completely revised |
| 7657 | 11 | 18 | 35 | | | I recommend to cite Fukumoto et al. (2006) or (2012) as a reference for mitigation options in "Manure management". They reported reduction of N2O emissions from animal manure composting by promotion of nitratation.<br><br>Fukumoto et al. (2006) Reduction of nitrous oxide emission from pig manure composting by addition of nitrite-oxidizing bacteria. Environ. Sci. Technol. 40(21):6787-91.<br>Fukumoto (2012) Nitratation Promotion Process for Reducing Nitrogen Losses by N2O/NO Emissions in the Composting of Livestock Manure, Soil Health and Land Use Management, Dr. Maria C.<br>Hernandez Soriano (Ed.), ISBN: 978-953-307-614-0, InTech. | Accepted, The section does not try to include every reference but focuses on comprehensive post 2007 reviews. These cover reducing emissions from manure treatment. |
| 7655 | 11 | 18 | 40 | 18 | 40 | Ahh et al. (2011) is not listed in References. | Accepted, Zotero updated for SOD |

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| 7658 | 11 | 19 or 20 | 18 or 18 | 19 or 20 | 22 or 22 | I recommend to cite Ogino et al. (2007) or (2012) as a reference for mitigation options in "Integration of biomass production with subsequent processing in food and bioenergy sectors" or "bioenergy (and biomaterials) from organic wastes". They reported GHG mitigation by producing animal feed from food residues/wastes.<br><br>Ogino et al. (2007) Environmental impact evaluation of feeds prepared from food residues using life cycle assessment. J. Environ Qual. 36(4):1061-8<br>Ogino et al. (2012) Life-cycle assessment of animal feeds prepared from liquid food residues: A case study of rice-washing water. J. Environ Qual. (in press) | Noted, References have been reviewed and included where possible |
| 15962 | 11 | 19 | | | | unutilzied forest growth is not very clear, not clear why the distinction is made with forest resideus , an example may clarify | Accepted, Text has been revised |
| 13320 | 11 | 19 | | | | Under, Other mixed biomass production systems: This discussion is not clear as to how it reduces carbon emissions. It is definitely agronomically a good idea, but the link between good environmental practice and mitigation of GHGs should be made much more clear | Accepted, Text has been revised |
| 13321 | 11 | 19 | | | | Under, Integration of biomass production with subsequent pocessing in food and bioenergy sectors: Same comment as above, this explanation is not clear as to how it mitigates GHGs. Reformulate explanation. | Accepted, Text has been revised |
| 13322 | 11 | 19 | | | | Space between words: category.Environment | Accepted, Text has been revised |
| 5554 | 11 | 19 | | | | Integrated systems. The principal wood products from agroforestry systems are fuelwood and poles. Timber is a minor product. There are also NTFP. Under this should also mention inter-cropping with species that inhibit pests as mentioned on page 1 – General comments. | Accepted, Text has been revised |
| 10600 | 11 | 19 | | | | Change "Bioenergy" to "Biomass for energy" and in sections below change "bioenergy" to biomass - which is the resource provided from agriculture that is converted to bioenergy. | Accepted, Text has been revised |
| 14674 | 11 | 19 | | | | In row 1 on this page, agroforestry can also be for biofuel feedstock biomass production. | Accepted, Text has been revised |
| 9131 | 11 | 19 | 35 | | | Column 1: change " Bioenergy from forest unutilized forest growth" to " Bioenergy from unutilized forest growth". | Accepted, Text has been revised |
| 5497 | 11 | 20 | | | | Bioenergy from crop residues- can be expanded to include residuals from food processing. Food processing residuals can be used either directly as soil amendments or as a source of energy through anaerobic digestion, co-digestion with manures has been shown to be more effective- with nutrients largely preserved | Accepted, Text has been revised |
| 3847 | 11 | 20 | | | | 2nd. Row, 2nd column. Why not include as conventional agriculture crops sugar cane, as an example from dedicated crops? This is a real example while some of the ones quoted are not yet in the market? | Accepted, Text has been revised |
| 5555 | 11 | 20 | | | | Under bioenergy, should emphasize much more use of annual growth for bioenegy, especially for direct use of wood for rural industries including charcoal production (and biochar) and electrical generation with conventional boilers (small-scale) or by gasification, for large-scale production. Need inventory data of waste products, especially animal waste for methane production and direct use for electrical generation where industrial production of meat is undertaken (pigs, poultry and cows etc.). | Accepted, End uses of bioenergy are treated in other chapters, but the text has been revised |
| 5556 | 11 | 20 | | | | Bioenergy from dedicated crops. Mention is made of oil from Jatropha sp. This can be grown in low-rainfall areas, but production is a function of water and nitrogen availability. It is good as a hedge plant in keeping animals in or out. Then the oil-bearing fruit could be used on a small-scale for heating. Large-scale Jatropha plantations have been relatively disappointing in India. Regarding switchgrass and Miscanthus sp. if grown for ethanol production the economics are not very favorable. It is not very cost effective to break down the cellulose into simple sugars (See Scientific American). It should be cheaper to use the grasses and other 'waste' biomass to produce methanol etc. by dry distillation, or used directly for energy. The methanol could be used directly as a fuel or as a building block for other organic compounds, including energy. | Rejected, Too detailed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15233 | 11 | 20 | | | | Bioenergy from crop residues - Crop residues are not considered wastes in many situations. For example, in econonmically poor rural regions, crop residues as wheat and rice straw are used for animal feed, construction, etc. In addtion, maintaining or increasing SOM need returning of crop residues to soils. Seems essential to add these concerns and further analyse (here or elsewhere) how much global agriculture residue is left for bioenergy generation once other uses are taken into account. This will avoid double counting and/or counter effective policies (e.g. increase soil erosion and SOM losses due to residues removal). | Accepted, Text has been revised |
| 14624 | 11 | 20 | 13 | 20 | 17 | language needs improving here | Rejected, Not clear which section this |
| 5548 | 11 | 20 | 13 | 20 | | . 500,000 km2 = 50 M ha. | Rejected, Wrong page and line number - |
| 7613 | 11 | 20 | 14 | 20 | 14 | "maximum sustainable technical potential" is incomprehensible term for citizen. This sentence would be improved. | Accepted, Clarified |
| 5557 | 11 | 20 | 14 | 20 | 15 | "--- maximum sustainable technical potential" for 1.8 GtCe/yr abatement from 2.27 Gt biomass C. Explain what is GtCe? The conversion from biomass C to Ce is 79% and is extremely high; normally a 50% conversion is the upper limit. Also, the sustainable potential, subtracting existing use of wood alone is over 7 Gt C (see my article), this does not take into account crop residues. | Accepted, Checked numbers and revised for SOD. If I understand the comment properly: only 50% of the carbon abatement is from bicohar C, 30% is from fossil fuel substitution in energy from pyrolysis, 20% from suppression / avoided N2O and CH4 emissions; not sure about ZGt. Woolf et |
| 12404 | 11 | 20 | 16 | 20 | 16 | Use Gt in stead of Pg since Gt already is used ; | Accepted, Revised for SOD |
| 5051 | 11 | 20 | 16 | 20 | 16 | I waw early drafts of "Woolf et al" on biochar and would have been very reluctant to use given assumptions about land coverage. Don't know if they fixed them, hope so. | Accepted, Checked numbers and revised for SOD |
| 5558 | 11 | 20 | 16 | 20 | 16 | 1.0 GtCe/yr from 1.01GtC. This is a 99% conversion. This is impossible. | Accepted, Checked numbers and revised for SOD. If I understand the comment properly: only 50% of the carbon abatement is from bicohar C, 30% is from fossil fuel substitution in energy from pyrolysis, 20% from suppression / avoided N2O and CH4 emissions; not sure about ZGt. Woolf et |
| 5559 | 11 | 20 | 16 | 20 | 16 | "--- and the accrual of 66-130 Pg (GtC) abatement over 100 years". This seems very high at 0.66 – 1.30 GtC per year. | Accepted, Checked numbers and revised for SOD |
| 10602 | 11 | 20 | 16 | | | use Gt not Pg - especially in same sentence! | Accepted, Corrected units for the SOD |
| 14625 | 11 | 20 | 17 | | | suggest replace "supports" with "indicates" | Accepted, Revised for SOD |
| 14626 | 11 | 20 | 19 | | | I am not sure what this means | Accepted, Clarified for SOD |
| 15234 | 11 | 20 | 19 | | | Assumed increases in productivity are very uncertain. See for example: "Biochar favours C sequestration, but does not increase soil fertility." Galvez et al. 2012. Galvez, A., Sinicco, T., Cayuela, M. L., Mingorance, M. D., Fornasier, F. & Mondini, C. 2012. Short term effects of bioenergy by-products on soil C and N dynamics, nutrient availability and biochemical properties. Agriculture, Ecosystems & Environment, 160: 3-14. | Accepted, Revised for SOD. I am cautious citing this work, it does not actually assess effects on plants, only (limited) 'indictators' of soil fertilty. Also, only one type / rate of biochar. I have |
| 10601 | 11 | 20 | 2 | | | Suggest just "Production mitigation measures not considered in AR4". But Bioenergy was included extensively in AR4 - though spread across several chapters. So why does it come under this sub-heading? So could have "11.3.1.1 Biochar" and put all Bioenergy section into the Biomass/bioenergy annex rather than here. | Accepted, Moved to bioenergy annex |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5050 | 11 | 20 | 29 | 20 | 29 | biochar is not necessarily a stable C-rich co-product it is highly vcombustable after production, some percentage oxidizes on application. Also it comes in very different rates from fast and slow pyrolysis and also creates vastly different amount of C in char under fast and slow. we did an economic analysis considering c prices in McCarl, B.A., C. Peacocke, R. Chrisman, C.C. Kung, and R.D. Sands, "Economics of Biochar Production, Utilisation and GHG Offsets", Biochar for Environmental Management: Science and Technology, Chapter 19, Edited by Johannes Lehmann and Stephen Joseph, Earthscan Publications, UK, 341-358, 2009. and in Kung, C.C., and B.A. McCarl, "Economics of Taiwanese Biochar Production, Utilization and GHG Offsets: A Case Study on Taiwanese Rice Fields", 2011.<br>(that paper is under second review at an energy journal) | Accepted, Revised for SOD. I think this is captured in the box with the range in estimates of cabron stability in biochar (haf life ranging from 50-10,000 yr). |
| 15963 | 11 | 20 | 3 | 21 | 8 | Chapter on Biochar is not very clear, some sentences do not seem to be complete. | Accepted, Revised for SOD |
| 10244 | 11 | 20 | 4 | 21 | 8 | Biochar: as stated before, Biochar application is still controversial, potential risks (HAPs, hydrophobicity, …) have to be considered, even more that this is a nearly non-reversible option thus biochar is stable!<br>Biochar can also be made with animal wastes (manure but also bones when processing the animals) | Accepted, Revised for SOD. Hydrophobicity seems to be very short term and not likely to be a problem at real rates of application - however, contaminants worth a note. Now added to the box "Standards to ensure that |
| 16559 | 11 | 20 | 4 | 21 | 8 | Given the small amount of field data showing that biochar is an effective mitigation technique in practice, this section could be shortened very considerably. | Accepted, Shortened and revised for SOD. Actually the scale of the opportunity warrants maintaining share of document, but if the document is shrinking…. The stabilisation of carbon is the main element of the abatement from biochar and is both pretty certain |
| 5498 | 11 | 20 | 4 | 21 | 8 | The discussion on biochar makes it clear that research to date on this amendment has not provide clear answers on appropriate ways to use this amendment or on predictable results related to use of char. High variability in outcomes suggests that recommendations for use of this amendment are not appropriate. A recent review (Ippolito et al, 2012) noted a wide range in results for plant productivity with biochar with approximately 50% of studies reporting yield reduction. The authors suggested N immobilizationas the primary cause of reduced yield with immobilization observed for low temperature biochars. High temperature biochars, while they are less likely to result in nutrient deficiencies are sited here as high in potentially hazardous PAHs. Energy balance for biochar production is related to both feedstock characteristics and gassification conditions. Using nutrient rich, wet materials such as animal manures to produce biochar with no net or a negative energy balance as well as loss of a significant portion of N does not seem to be a viable or recommendable practice. As the primary end of these materials is on highly weathered tropical soils, and as characteristics of chars and associated outcomes are highly variable- it would seem that the end use market is not likely to enforce the strict production guidelines necessary to produce high quality amendments | Accepted, Revised for SOD. The Spokas review is now cited in Table 11.4 - in conjunction with Jeffery et al - is a better assessment than Ippolito, who focuses on soil N. Crop N supply would not be suppressed if bicohar was added each yr in small amounts (or beyond yr 1 after a large slug) - that is reported in the literature - Spokas says 50% studies are +yield, 30% no change and 20%- ... not good enough, but we're still learning about when / where / how much. |
| 6826 | 11 | 20 | 4 | 21 | 8 | Biochar section could be shortened - highly speculative and uncertain impacts. Reducing energy output of biomass to produce char means alternative (fossil?) energy supplies required. | Accepted, Shortened and revised for SOD, but not uncertainty alongside the |
| 3543 | 11 | 20 | | 21 | | Are there examples of implementation of biochar? Please provide. The problem I see here is the origin of the biomass used in the production of biochar; if the biomass is derived from forest, that is an issue. Please include some text on life cycle analysis to demonstrate that biochar is environmentally sound. | Accepted, Revised for SOD. More elaboration in box now on 'sustainable' restriction in the analysis of Woolf et al. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13323 | 11 | 20 | | | | Biochar does deserve mention as a possible mitigation method currently being researched, but I feel an entire section over estimates its potential as a panacea for mitigation. | Partially Accepted, The estimate of potential is quite detailed, it is *potential*. I think we can be more cautious about what can actually happen - but that applies to all mitigation options e.g. diet change. Must admit I worry a |
| 14430 | 11 | 20 | 11 | 20 | 24 | This section emphasizes the large potential abatement from using biochar, but simultaneously emphasizes that the effects on N2O are not predictable. This section could be shortened and streamlined for clarity regarding the unknowns of biochar management. | Accepted, Revised for SOD. Sensitivity analysis is included in the box - the N2O / CH4 component is not critical. |
| 5371 | 11 | 20 | 4 | 21 | 8 | This seems to be an overly optimistic discussion of biochar. Do any of these studies look at the energy or life cycle impacts associated with mechanically encorporating the biochar into the soil? The biochar isn't just droped on the top of the soil is it? This section would benefit from a few sentences that shed light on the difference between "maximum sustainable technical potential" and what might happen in the messier real world. Also be careful of words like "sustainable" that might be described (or might not be described) in the paper being cited but are not described in Chapter 11. "Sustainable" has many different potential means and will be read by different readers in very different ways. | Accepted, Revised for SOD. Biochar has been incorproated into the soil as per / with other residues. It can also be surface applied to perrenial crops and probably stubble (not to bare soil). Intended not to involve any additional soil disturbance. Sustainable - fair point - |
| 10603 | 11 | 21 | 1 | | | Lehmann reference missing. Guess "y" in this section means "years". Put in full. | Accepted, Which Lehmann reference? Yr has been expanded to 'years' |
| 8835 | 11 | 21 | 10 | 21 | 17 | What about exhaustpipe emissions (GHG and non-GHG emissions)? | Rejected, Not a land use issue - belongs elsewhere in the volume |
| 12405 | 11 | 21 | 10 | 21 | 46 | It would be useful with consideration of pay-back times for different biomass-fractions and how/if the pay-back time will affect the climate. | Rejected, Too detailed for the chapter. The issue is mentioned however. |
| 10444 | 11 | 21 | 10 | 21 | 46 | This paragraph is too dense for 1st time read. Please rewrite | Accepted, Section was shortened |
| 5813 | 11 | 21 | 10 | 21 | 21 | In your list, you forgot to include replacement effects. Biomass used in bio-energy production could also be used in other products, notably if "biomass" is wood of any kind. The net effect is thus not only the balance between energy systems, but also between e. g. HWP CO2-replacement in both biomass utilization paths. So, if wood that could be used in e. g. building materials is used in bio-energy instead and the construction is built from concrete instead of wood the net effect is negative - you have higher emissions than you would have had without bioenergy use. | Noted, Trade-offs are discussed in section 11.4 and in the Bioenergy Annex |
| 7190 | 11 | 21 | 10 | | | Bioenergy. It is important to highlight the significance of considering the whole life-cycle of bioenergy production in the light of 'sustainability'. An example of a bioenergy that has been identified as low-carbon energy source, is that produced from palm oil. With advanced understanding it has turned out that when oil palms, are grown on peat they instead create a 'carbon debt' and increase overall global carbon emissions (e.g. Fargioneet al., 2008; Gibbs et al., 2008). There are some lines that touch on this topic (e.g. lines 29/30 page 22, lines 29-34 page 21), but this is not enough. Considering the total life cycle (production to end-of-life) includes: production, processing, transport, packaging, 'end-of-life'. Transport, processing and packaging is not mentioned in this chapter, shall this be discussed here (if food-demand is being discussed then its perhaps logical that also the other issues are being discussed)? Or elsewhere? Is this production-side or demand-side? Table 11.4 could be extended with mitigation measures in the total life-cycle of products from the AFOLU sector. | Noted, These issues will be discussed in the LCA/MCA annex |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12076 | 11 | 21 | 10 | 21 | 21 | In this section please note that the mitigation benefit of bioenergy will critically depend on the varying timing of emissions and sequestration associated with use of various biomass sources. There are different pathways of causation for use of biomass for energy and each different causation pathway/ biomass source leads to a different sequence and timing of biomass emissions and C sequetrationon the land. For example one causation pathway is a policy supporting planting energy crops including trees (for energy) and then using it for energy. Sequestration occurs before emissions. A policy that supports use of logging residue causes logging residue to be used for energy rather than decay in the forest. In this case emissions occur before avoided emissions (which occur over time - and depend on avoided decay rate). I would argue that it is critical to understand these causation pathways and timing to understand the emission offset over time. Each pathway entails a different risk of attaining offsets. Please find a place to discuss how risk of attaining offset benefits can vary notably among the alternate causation pathways/ use cases. | Noted, Timing issues will be discussed in the Bioenergy Annex |
| 5499 | 11 | 21 | 11 | 21 | | Start this paragraph with the last two sentences- add a graphic to the paragraph to clarify what you are talking about showing the range of potential sources and sinks associated with biofuel production | Accepted, Text has been revised |
| 15163 | 11 | 21 | 11 | 21 | 18 | hard to follow | Accepted, Text has been revised |
| 5052 | 11 | 21 | 11 | 21 | 11 | the biofuel points seem to miss regrowth and carbon uptake, cargon replacement of long term sequestered carbon in replaced fossil fuels, emissions from inputs like N fertilizer to raise feedstocks. hauling related emissions. Indirect effects on livestock from higher prices of commodities | Rejected, This issue is discussed in the LCA Section Bioenergy Annex |
| 10604 | 11 | 21 | 11 | | | Production of biomass and use of bioenergy…….. | Accepted, Text has been revised |
| 2624 | 11 | 21 | 11 | 22 | 47 | These paragraphs jump from agriculture and then to forests which suggests that agricultural impacts are the same as forest impacts. They are different and their impacts are different. This could be confusing for the reader and will probably make them attribute ag impacts as really being forests. Combining forests and agriculture doesn't work well since they have different contexes and different mitigation efforts. THis can be confusing for the reader. This chapter should mention rural communities who use forests for energy. Most of the discussion appears to be relevant for commercial or industrialized operations. There are many other models of forest uses and management. | Accepted, Text has been revised |
| 12072 | 11 | 21 | 18 | 21 | 21 | In order to evaluate the net effect of shifting from fossil energy to bioenergy an evaluation is needed of the change in emissions associated with a set of processes within a system boundary over some time horizon. The comparison is between the operation of all the processes with the system boundary in one case versus all the processes in another case. It is not correct or at least misleading to suggest that the comparison is between two separate systems. Please consider an alternative such as - "The net effect of harnessing the climate change mitigation benefit of bioenergy use is determined by estimating the change in emissions and radiative forcing over a given time for biomass and fossil energy processes within a given system boundary." If you think you are replacing one system with another you can miss the need to include emissions for forest or ag land in the case where fossil fuels are used in the comparison of the with bioenergy case to the without bioenergy case. | Noted, This issue is discussed in the Bioenergy Annex |
| 15162 | 11 | 21 | 2 | 21 | 4 | delete sentence | Accepted, Text has been revised |
| 5560 | 11 | 21 | 2 | 21 | 2 | What is 'y'? | Accepted, Text has been revised |
| 5055 | 11 | 21 | 20 | 21 | 20 | int the statement about "between total climate forcing of the 19 bioenergy system" I would include and massociated market adjustments in iLUC and livestock herds | Accepted, Text has been revised |
| 7667 | 11 | 21 | 22 | 21 | 24 | This is a very misleading statement. Even if bioenergy systems replace coal they could cause higher CO2 emissions compared to coal use for centuries, see for example Searchinger et al. (2008) and Fargione et al. (2008) and Holtsmark, B. 2012 Harvesting in boreal forests and the biofuel carbon debt. Climatic Change 112: 415—428. | Accepted, Text has been revised |
| 14728 | 11 | 21 | 23 | | | " of reliable empirical data". Please explain to which data is this referred to. | Accepted, Text has been revised |
| 5053 | 11 | 21 | 25 | 21 | 25 | in the sentence "Alternative methods of quantification lead to variation in estimates of GHG 24 savings" neglects the substantial regional variation in yields plus big differences in hauling needs for low yielding items. | Accepted, Table with Regional Values has been added |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5054 | 11 | 21 | 25 | 21 | 25 | in the statement "However, GHG emissions from LUC of some bioenergy schemes" you are missing big references, searchenger et al and fairgone et al both in science 2007 plus a wide variety of estimates as summarized in recent nas report led by tyner | Accepted, Text has been revised |
| 11981 | 11 | 21 | 29 | | 31 | LUC bioenergy schemes may be large. Maybe add "and entail negative biodiversity impacts if natural ecosystems are converted to cropland" | Accepted, This issue is discussed in the Bioenergy Annex |
| 5500 | 11 | 21 | 35 | 46 | | Is there sufficient knowledge of albedo affects to put as much emphasis on it as you have here? | Noted, This issue is discussed in the |
| 15164 | 11 | 21 | 35 | 21 | 46 | paragraph can be tightened. Betts reference not in ref. list. Kirchbaum et al 2011 also not in ref. list. What's temporal difference in albedo effect? | Accepted, Text has been revised |
| 10605 | 11 | 21 | 35 | | | Albedo effects are not just from biomass plantations - could delete from here. (Need to check throughout this section on the use of "bioenergy" often used where "biomass" is the proper term - eg "forest bioenergy" and page 22 line 1 "Bioenergy feedstock supply....." | Accepted, This issue is discussed in the Bioenergy Annex |
| 16560 | 11 | 21 | 38 | 21 | 41 | It should be clarified that this sentence refers to temperate and particularly boreal regions, not the tropics. | Noted, This issue is discussed in the |
| 11982 | 11 | 21 | 38 | | 40 | ditto. Again maybe need to add that when forests are convented to croplands - biodiversity is negatively affected although albedo maybe increase. | Noted, This issue is discussed in the Bioenergy Annex |
| 6827 | 11 | 21 | 9 | | | The bioenergy section needs some rationalisation and context eg compare total supply estimates with total energy demands, and relate supply potential with different bioenergy types to reflect conversion efficiency and hence derive GHG mitigation potential eg 1 tonne 'raw' biomass contains X GJ (avoided coal), or Y GJ if refined as liquid biofuel (avoided petrol or diesel). For example, EU seems to favour bioethanol over biodiesel for lower total emissions? | Rejected, These issues are covered in other Chapters of the Report |
| 5561 | 11 | 21 | 9 | 21 | 46 | Bioenergy. If annual growth is used to manufacture bioenergy then there will be no net-CO2 emissions, because if it is not used it will be returned to the atmosphere. If there is a land use change, using the biomass, rather than burning it in situ, makes environmental sense. | Accepted, Text has been revised |
| 5562 | 11 | 21 | 9 | 21 | 46 | . Bioenergy. If annual growth is used to manufacture bioenergy then there will be no net-CO2 emissions, because if it is not used it will be returned to the atmosphere. If there is a land use change, using the biomass, rather than burning it in situ, makes environmental sense. | Noted, The section needs to be much shorter - how does it fit with other chapters and x-cut piece |
| 5563 | 11 | 21 | 9 | 21 | 46 | Paragraph from line 35. I had difficulty in following the logic. | Accepted, Text has been revised |
| 12073 | 11 | 21 | 9 | 22 | 47 | The climate mitigation benefits of current period use o f(e.g. change in radiative forcing) of using forest-based or ag-based biomass can differ widely over time yet there is no discussion in this section about this time dimension of mitigation benefits. To judge merit of actions we need to clarify the timing of benefits. I think such a discussion is needed here and in section 11.3.3 where mitigation effectiveness is discussed. Some examples - planting of trees that are later used for energy decreases raditive forcing prior to harvest and emission which would then increase radiative forcing. Use of logging residue for energy causes a change from a no use case where there is slow emission in the forest and slow build up of radiative forcing with a case where there is burning and immeadiate increase in radiative forcing. The benefit could be viewed is the difference in the two radiative forcing curves. Increase in use of roundwood for energy from an existing forest calls for estimate of the change in radiative forcing over time between a no use for energy case and a roundwood use for energy case. In this case the benefit of decreased radiative forcing may be many decades into the future. Cherbini et al. (2011) gives a simplified example of the timing in the change in radiative forcing for a case of roundwood use and forest regrowth. The main point is that time dimension of mitigation benefit (change in radiative forcing) matters. Where benefits are aquired over time the uncertainty of benefit can also be greater. [Cherubini, F., Peters, G., Berntsen, T., Stromman, A. and Hertwich, E. (2011). CO2 Emissions from Biomass Combustion for Bioenergy: Atmospheric Decay and Contribution to Global Warming. Global Change Biology Bioenergy, 413 - 426.] | Noted, This issue is discussed in the Bioenergy Annex |
| 11164 | 11 | 21 | 9 | 22 | 47 | Information regarding the life cycle assesment of bioenergy crops should be incorporated in this section | Accepted, This issue is discussed in the LCA Section Bioenergy Annex |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3544 | 11 | 21 | | | | In the section on bioenergy, it will be very helpful to provide clear answers to the following questions: what is bioenergy? How bioenergy carries potential for climate change mitigation and give some examples of countries? What are the different options of bioenergy (i.e. sources of bioenergy)? What are the barriers for the adoption of bioenergy? For e.g. bioenergy should be implemented in a sustainable manner and should not compromise the food security which is a priority in developing countries. | Accepted, This issue is discussed in the Bioenergy Annex |
| 5372 | 11 | 21 | 2 | 21 | 8 | The Wise et al (2009) paper and its UTC scenario describes how "stabilized C can be monitized". Suggest referencing that paper here so readers understand that there has been some thinking about this issue and the benefits that would accrue under such a policy/scenario. | Accepted, Text has been revised |
| 5373 | 11 | 21 | 29 | 21 | 31 | The GHG emissions can be "more than a hundred times larger" than just burning fossil fuels. 100 times!! Wow that's a big number. Are these 100 times worse than fossil fuel bioenergy schemes realistic or are they implausibly bad ideas that would never be put into practice. If it is the later, then perhaps cite literature that surveys a more realistic set of bioenergy options. I have no doubt that some bioenergy options are potentially worse than burning natural gas in a highly efficient natural gas turbine to generate electricity but I am skeptical that most bioenergy options are 100 times worse than burning coal in an 50 year old power plant. | Noted, No action needed |
| 8836 | 11 | 21 | | | | Maybe the report could devote a section or box on the accounting discussion of these exhaustpipe emissions (see EEA opinion http://bit.ly/onyPg7) | Noted, These issues will be discussed in the LCA/MCA annex |
| 10245 | 11 | 21 | 9 | 27 | 11 | This section is too long and can be shortenned | Accepted, Text has been revised |
| 14432 | 11 | 22 | | | | This bioenergy text could be made more concise to reduce page length. | Accepted, Text has been revised |
| 11983 | 11 | 22 | 1 | | 1 | "Primary and secondary residues". I couldn't find where these were defined. Maybe add a definition? | Accepted, A definition will be included in |
| 10177 | 11 | 22 | 1 | 22 | 47 | The discussion on the trade-off between mitigation within the agroforestry sector, in the form of production of bioenergy, and biodiversity could be expanded, with for example reference to where in the world this trade-off potentially has the largest effects and where it has less effects. | Rejected, We have very strict space limitation |
| 14729 | 11 | 22 | 17 | | | “conversion”. Is it referred to feed conversion? | Accepted, Text has been revised |
| 5565 | 11 | 22 | 17 | 22 | 17 | (--- biofuel production base on lignocellulosic resources), ADD especially through dry distillation. | Accepted, Text has been revised |
| 5057 | 11 | 22 | 18 | 22 | 18 | offsets also depend on energy product replaced with higher offsets when it is elecricity (McCarl, B.A., "Bioenergy in a greenhouse mitigating world", Choices, 23(1), 31-33, 2008.) | Accepted, Text has been revised |
| 11984 | 11 | 22 | 19 | | 19 | "other products" maybe add e.g. food | Accepted, Text has been revised |
| 5564 | 11 | 22 | 2 | 22 | 8 | The main biomass resources are: a) using more fully the annual growth of wood, crops and dung; b) primary and secondary residues etc.; c) biomass from cropping systems etc. | Noted, A Table explains each potential source of biomass |
| 15349 | 11 | 22 | 20 | 22 | 23 | Harley, M. and Hodgson, N. (2008) Review of existing international and national guidance on adaptation to climate change: with a focus on biodiversity issues. AEA report to Bern Convention Group of Experts on Biodiversity and Climate Change, Council of Europe. http://www.coe.int/t/dg4/cultureheritage/nature/bern/ClimateChange/default_en.asp | Accepted, Text has been revised |
| 15350 | 11 | 22 | 20 | 22 | 23 | Smithers, R.J.; Cowan C.; Harley, M.; Hopkins, J.J.; Pontier, H. and Watts, O. (2008) England Biodiversity Strategy: Climate Change Adaptation Principles. Conserving biodiversity in a changing climate. Defra, London. 16pp. www.defra.gov.uk/publications/files/pb13168-ebs-ccap-081203.pdf | Accepted, Text has been revised |
| 15167 | 11 | 22 | 24 | 22 | 24 | what's the point of this statement? | Accepted, Text has been revised |
| 5708 | 11 | 22 | 24 | 22 | 47 | As regards production of biofuels, trade-offs between production of biofuels like Jatropha, and food production in developing countries like India and other South Asian countries are considered to be very serious, which are further compounded by lack of information on impact of biofuel (Jatropha) cropping on soil quality. Text to this effect needs to be incorporated appropriately in this context. | Accepted, Trade-offs are discussed in section 11.4 and in the Bioenergy Annex |
| 2569 | 11 | 22 | 24 | 22 | 30 | Refer to SRREN Ch 9 explicitly | Accepted, Text has been revised |
| 10606 | 11 | 22 | 24 | | | Biofuels implies liquid fuels for transport - not what is meant here I think. | Rejected, Biofuels are liquid, solid and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14433 | 11 | 22 | 24 | 22 | 30 | Adding specific outcomes regarding GHG uncertainty in a biofuel LCA would provide more information to the reader. | Accepted, This issue is discussed in the Bioenergy Annex |
| 16561 | 11 | 22 | 27 | 22 | 28 | The modifier "Where unregulated…" is too vague to be helpful. Suggest deletion of this sentence. | Accepted, Text has been revised |
| 3848 | 11 | 22 | 29 | 22 | 29 | The statement that full fuel-cycle GHG emission is uncertain conflicts with results from AR4. There it is claimed that as more precise evaluations are being made, the literature shows that iLUC is lower than previously assumed. Thus, a more complete discussion deserves to be included in the text. | Noted, This issue is discussed in the Bioenergy Annex |
| 5566 | 11 | 22 | 29 | 22 | 30 | This will not occur if significant use is made of annual growth of existing and new tree planting efforts. | Accepted, This issue is discussed in the |
| 15964 | 11 | 22 | 3 | 22 | 3 | MSW - acronym not explained | Accepted, A definition will be included in |
| 5814 | 11 | 22 | 3 | | | What does "MSW" stand for? | Accepted, A definition will be included in |
| 14431 | 11 | 22 | 3 | | | MSW not previously described in the text. | Accepted, A definition will be included in |
| 3849 | 11 | 22 | 36 | 22 | 37 | "Including GHG emission or CO2 sequestration associated with LUC". Please, check this sentence since direct CO2 sequestration associated with LUC will be extremely difficult due the large areas involved, the loe gas flux per area, and economic barrier. | Rejected, This is routinely done with LCA |
| 2131 | 11 | 22 | 37 | 22 | 39 | add the reference Muller, A. (2009). Sustainable Agriculture and the Production of Biomass for Energy Use, Climatic Change 94(3-4): 319-331 to the reference list as it adds a further, often neglected trade-off, namely between biomass use for energy production and biomass use as a fertilizer. | Accepted, Text has been revised |
| 5058 | 11 | 22 | 42 | 22 | 42 | tradeoffs with adaptaion are also a big factor | Accepted, Text has been revised |
| 5567 | 11 | 22 | 43 | 22 | 47 | All the figures cited are less than the current annual growth of wood and much less if agricultural crop and animal residues are included. | Accepted, Text has been revised |
| 12406 | 11 | 22 | 44 | 22 | 44 | It would be interesting to know how much 100-300 EJ/yr bioenergy in 2050 is of the total demand for energy in 2050. | Accepted, Text has been revised |
| 16219 | 11 | 22 | 44 | | | put in context of global demand for EJ/yr. all these numbers mean what in the context of global demand? Give reader context | Rejected, Other chapters deal with total energy demand |
| 5056 | 11 | 22 | 6 | 22 | 6 | somewhere in the sentence "Biomass from cropping systems (annual and perennials) established on lands ranging from prime" I would have stuck the words "dedicated energy crops" | Accepted, Text has been revised |
| 15165 | 11 | 22 | 8 | 22 | 8 | Put (Table 11.3) at end of preceding sentence and delete "describes these resources". Suggest that this the way figures and tables are dealt with throughout (rather than writing sentences about what table and figures are showing) | Accepted, Text has been revised |
| 15166 | 11 | 22 | 9 | 22 | 23 | tighten paragraph | Accepted, Text has been revised |
| 15609 | 11 | 22 | 12 | 22 | 12 | Consider citing Stehfest et al (2009) after "…in diets…" Stehfest E., L. Bouwman, D.P. van Vuuren, M.G.J. den Elzen, B. Eickhout, and P. Kabat (2009). Climate benefits of changing diet. Climatic Change 95, 83-102. | Accepted, Text has been revised |
| 5374 | 11 | 22 | 9 | 22 | 23 | This is a very long paragraph that doesnt say anything concrete. | Accepted, Text has been revised |
| 13324 | 11 | 23 | 1 | 23 | 16 | Requires a discussion of undertainty around the impact of the removal of residue on soil carbon. Lack of extensive long-term studies. | Accepted, Text has been revised |
| 5815 | 11 | 23 | 13 | 23 | 16 | This is not completely true. If the wood is used for bioenergy the emission of the C stored in the wood is "immediately" and if the wood is left for decomposition the emissions are "gradually". However, you have to add the emissions of the fuels used (instead of the wood now left for decomposition) to generate energy to the balance. | Accepted, Text has been revised |
| 5060 | 11 | 23 | 16 | 23 | 16 | these are some implication fro increased fertilizer use plus there may be substantial storage losses (some of this is treated in Flugge, M., T. Buchholz, C. Canham, G. Marland, B.A. McCarl, S.M. Ogle, S. Prisley, and N. Sampson, "Accounting framework for GHG emissions from bioenergy and other biogenic sources", Draft report for EPA, 2011. | Accepted, Text has been revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2132 | 11 | 23 | 16 | 23 | 16 | add the following sentence: "A particular trade-off may arise however from the potential to use the biomass as organic fertilizers in certain sustainable agricultural production systems that rely on nutrient recycling, such as organic agriculture. Widespread adoption of biomass residues use for energy production is likely incompatible with widespread adoption of organic and related production practices, where compost and mulching play an important role (Muller, A. (2009). Sustainable Agriculture and the Production of Biomass for Energy Use, Climatic Change 94(3-4): 319-331). This is of particular relevance as application of these organic fertilizers tends to increase soil carbon levels (Cross Ref within the chapter). " | Accepted, We have improved the discussion on potential trade-offs |
| 5568 | 11 | 23 | 17 | 23 | 21 | This gives estimates of potential in 2050 for biomass as follows: agricultural residues, 15-70 EJ/yr (800 – 3745 Mt wood equivalent [we]); dung, 5-50 EJ/yr (270-2675 Mt we); forest residues, 0-110 EJ/yr (0-5890 Mt we). This gives a total of 20- 230 EJ/yr (1070 – 12300 Mt we). This is much less than the accessible annual growth of wood, estimated to be 980 EJ/yr (18350 Mt we). NOTE sometimes per year is given as yr-1 other times as/yr. | Accepted, The statement is correct |
| 5061 | 11 | 23 | 19 | 23 | 19 | dung also involves methane | Accepted, Text has been revised |
| 12077 | 11 | 23 | 22 | 23 | 30 | By identifying forest biomass for energy from forest growth that is in excess of current use for paper and sawnwood it seems there is an unspecified assertion that policy should not consider cases where some current use of wood for paper and sawnwood could be diverted to use for energy. I think I would tend to agree with this point but I think you should make an explicit arguement that the reason for avoiding displacing current uses is that they will provide more mitigation benefit than use of wood for energy. It does not make sense (in this mitigation report) that you could argue that use of wood for energy should not displace use for paper and sawnwood simply because those markets have some priority. I think as a scientific issue I think there can be cases where uses of wood for paper could be worse than use for energy if the paper goes to lanfills and emits a notatble amount to methane. | Accepted, Text has been revised |
| 7668 | 11 | 23 | 23 | 23 | 42 | This text should take into account the findings in Holtsmark, B. 2012 Harvesting in boreal forests and the biofuel carbon debt. Climatic Change 112: 415—428. No other study to date has considered the long term consequenses of a permanent increase in harvesting forests. With regard to Cherubinie et al. (2011). The following forthcoming paper will here be very relevant and present another view: Holtsmark, B. 2012: The outcome is in the assumptions: analyzing the effects on atmospheric CO2 levels of increased use of bioenergy from forest biomass. GCB Bioenergy (in press) | Accepted, Text has been revised |
| 2625 | 11 | 23 | 23 | | 30 | Natural forests and plantations are not discussed as separate forest types. Much of the industrial forestry is occurring on plantations even though natural forest management is occurring in some tropical areas. The discussion appears to be focusing on conservation of natural forests even though much of forestry is plantations globally. | Rejected, There is no space to discuss separate forest types. Plantations are included in the discussion, and we have improved the text. |
| 5569 | 11 | 23 | 27 | 23 | 27 | The sentence should read --- present global roundwood production (not industrial roundwood production). Fuelwood, charcoal and building poles account for over half of current use. These are not considered to be industrial production. | Accepted, Text has been revised |
| 12407 | 11 | 23 | 29 | 23 | 29 | Related to bioenergi from forest biomass and timing of C flows, is it possible to say more about the optimal timing and how long the pay-back time could be without affecting the long-term stabilization of the temperature? | Rejected, There is no space for detailed discussion |
| 3851 | 11 | 23 | 29 | 23 | 29 | Timing of C flows is really significant for temperate climate countries. Tree growth in tropical countries occurs in 10 to 20 years. | Accepted, Text has been revised |
| 16562 | 11 | 23 | 3 | 23 | 4 | Doesn't the energy cost of transportation represent a major constraint at least for dung and straw? | Accepted, Text has been revised |
| 5502 | 11 | 23 | 30 | | | Are there estimates of the % of forest land that is currently managed for biomass production and harvest? | Accepted, FAO Statistics provide these |
| 8929 | 11 | 23 | 30 | | | it should be made clear that a larger forest output cuts disproportionately the potential for C sequestration | Accepted, Text has been revised |

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| 12078 | 11 | 23 | 31 | 23 | 42 | I think this paragraph should help the reader understand what kind of analysis framework is needed to assess the prospective mitigation benefit of forest biomass use. In my view it is critical to 1) carefully define the system boundaries that define what processes are inside the system (e.g. forest carbon change, energy emissions, fossil emissions, indirect land use change from market forces, change in wood products production/consumption ) 2) define the time horizon for the evaluation e.g. 20 yrs, 100 yrs, more years?, 3) specify the metrics that will be used to estimate mitigation benefit, eg, radiative forcing (GWP), global temperature potential (GTP), other. 4) Specify the CHANGE in the system that is being evaluated - this will identify the fluxes before any changes (over time) and the fluxes of the system AFTER changes. This report could do a service to clarify what is needed to clearly evaluate the impact of forest biomass mitigation actions/system changes. We need to recognize that some minimal consistency is needed in defining analysis frameworks in order to compare evaluations and understand how alternate frameworks can influence findings. | Accepted, Text has been revised |
| 2626 | 11 | 23 | 36 | | 42 | These are industrial forests since non-industrial forest owners cannot afford fertilizers. | Accepted, Text has been revised |
| 15168 | 11 | 23 | 40 | 23 | 42 | is this statement necessary? | Accepted, Text has been revised |
| 8930 | 11 | 23 | 40 | | | from a climate protection perspective the intensification of forest productivity will then be rational when the C stored in harvested wood is sequestrated for a longer period such as lumber or furniture. | Accepted, Text has been revised |
| 14774 | 11 | 23 | 41 | | | There is currently an systematic review of literature to compare different methods for quantifying carbon/biomass in forest and other terrestrial system components. -> Environmental Evidence 2012, 1:6 doi:10.1186/2047-2382-1-6 , http://www.environmentalevidencejournal.org/content/1/1/6/abstract | Accepted, Text has been revised |
| 11985 | 11 | 23 | 43 | | 48 | biodiversity considerations are important here - especially with the conversion of old growth forsets to planted production forests. Suggest add at end "In addition, conversion of old-growth forests to plantations generally entails negative impact biodiversity. | Rejected, Biodiversity issues will be discussed in Bioenergy Annex |
| 15169 | 11 | 23 | 43 | 23 | 48 | really? A bit controversial, but totally uncited… | Accepted, Text has been revised |
| 7063 | 11 | 23 | 43 | 23 | 48 | There is large body of literature documenting the carbon benefits of active forest management but these benefits are barely mentioned in this material. The value of active forest management in providing output while maintaining forest stocks needs much more attention herein. As a starting point, the Fourth Assessment Report should get far more credit. Importantly, it contained the following finding. "Each mitigation activity has a characteristic time sequence of actions, carbon benefits and costs. Relative to a baseline, the largest short-term gains are always achieved through mitigation activities aimed at emission avoidance (e.g. reduced deforestation or degradation, forest protection, and slash burning). But once an emission has been avoided, carbon stocks on that forest will merely be maintained or increased slightly. .... In the long term, sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual yield of timber, fibre, or energy from the forest, will generate the largest sustained mitigation benefit." (continued below) | Accepted, In the section regarding mitigation options, we have mentioned benefits from active forest management |

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| 7064 | 11 | 23 | 43 | 23 | 48 | (continued from above) The only thing that has changed significantly since the Fourth Assessment Report was written (including the conclusion dealing with the long-term benefits of a sustainable forest management strategy), is the growth in literature examining the emissions profile over time of various forest management and forest product scenarios (i.e. the "carbon debt" literature). This new work has been very valuable in clarifying the factors that determine how "long-term" the period is before the benefits of a "sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual yield of timber, fibre, or energy from the forest" become apparent. This work has not, however, provided a basis for retreating from the conclusion in the Fourth Assessment Report. By giving so little attention to the benefits of a sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual yield of timber, fibre, or energy from the forest, the draft Fifth Assessment Report risks giving the impression that these long-term benefits were discovered to be false. Nothing could be further from the truth. (continued below) | Accepted, In the section regarding mitigation options, we have mentioned benefits from active forest management |
| 7065 | 11 | 23 | 43 | 23 | 48 | (continued from above) Some newer references pointing to the value of working forests managed under sustainable forest management are shown below.<br>- "Fox, T. E. et. al. (2004). The Evolution of Pine Plantation Silviculture in the Southern United States. In H. M. Rauscher, & K. e. Johnsen, Southern forest science: past, present, and future: Gen. Tech. Rep. SRS-75 (p. 394). U.S. Department of Agriculture, Forest Service, Southern Research Station." - This reference shows the dramatic improvements in standing stock and productivity that have been made possible through investments in sustainable forest management. (continue below) | Accepted, Text has been revised |
| 7066 | 11 | 23 | 43 | 23 | 48 | (continued from above)- More reverences on the value of active forest management.<br>- Ince, P. (2010), Global Sustainable Timber Supply and Demand, Chapter 2 in Sustainable development in the forest products industry, Chapter 2. Porto, Portugal : Universidade Fernando Pessoa, 2010: p. 29-41. This reference examines the distribution of deforestation around the world and finds that "...In general, the data show that the global regions with the highest levels of industrial timber harvest and forest product output are also regions with the lowers rates of deforestation. Thus, a ... appropriate economic hypothesis is that global loss of forest cover and carbon emissions from deforestation are driven primarily by systematic conversion of economically marginal forest land to other land uses.... [This] hypothesis suggests that forest products and industrial roundwood demand provide revenue and policy incentives to support sustainable forest management, and in turn industrial timber revenues and economical forest management have helped avoid large-scale systematic deforestation in those regions with the highest levels of industrial timber harvest." (continue below) | Accepted, Text has been revised |
| 7067 | 11 | 23 | 43 | 23 | 48 | (continued from above) More references documenting the benefits of active forest management include:<br>-Gillespie, A; Gustavsson, L; Eriksson, E; Langvall, O; Olsson, M; Sathre, R; Stendahl, J; " Integrated carbon analysis of forest management practices and wood substitution"; Canadian Journal of Forest Research, Volume 37, Number 3, March 2007 , pp. 671-681(11)<br>-Albaugh, T.; E. Vance; C. Gaudreault;, T. Fox; H. Allen; J. Stape and R. Rubilar; "Carbon Emsisions and Sequestration from Fertilization of Pine in the Southeastern United States", Forest Science, 2012 published by the Society of American Foresters, published online February 23, 2012<br>- Carle, J., & Holmgren, P. (2008). Wood from planted forests: A global outlook 2005-2030. Forest Products Journal Vol 58 , 6-18.<br>- R. Sathre and L. Gustavsson in "Time-dependent climate benefits of using forest residues to substitute fossil fuels". in Biomass and Bioenergy 35 ( 2011 ), where the authors note that in addition to considering the type of fossil fuel being replaced, "biomass productivity is also important, with more productive forests giving greater cumulative radiative forcing reduction per hectare." (continued below) | Accepted, Text will be revised |

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| 7068 | 11 | 23 | 43 | 23 | 48 | (continued from above) Yet more references documenting the benefits of active forest management include:<br>- Perez-Garcia, J., B. Lippke, J. Comnick, and C. Manriquez, " An assessment of carbon pools, storage, and wood products market substitution lusing life-cycle analysis results", Wood and Fiber Science, 37 Corrim Special Issue, 2005, pp. 140 – 148<br>-Oneil, E. and B. Lippke; "Integrating products, emissions offsets, and wildfire into carbon assessments of inland northwest forests", in Biomass and Bioenergy 35 ( 2011 )).Wood and Fiber Science, 42,2010, pp.144–164<br>- Hennigar, C., D. MacLean, L. Amos-Binks, "A novel approach to optimize management strategies for carbon stored in both forests and products", in Forest Ecology and Management, Volume 256, Issue 4, August 2008<br>(continue below) | Accepted, Text has been revised |
| 7069 | 11 | 23 | 43 | 23 | 48 | (continued from above) Studies that fail to identify benefits related to active forest management often ignore substitution effects (as in J. Nunery and W. Keeton, "Forest carbon storage in the northeastern United States: net effects of harvesting frequency, post-harvest retention and wood products", Forest Ecology and Management, 2010) or consider only a limited time scale (for a discussion of the importance of time see R. Sathre and L. Gustavsson in "Time-dependent climate benefits of using forest residues to substitute fossil fuels".) In other cases, extreme circumstances are examined which are not representative of managed forests as as a whole.<br>(continue below) | Accepted, Text has been revised |
| 7070 | 11 | 23 | 43 | 23 | 48 | (continued from above) In cases where studies fail to find benefits from active forest management it is often because they fail to include some of the GHG benefits of the forest product value chain. The benefits of "cascading" in the forest products value chain, for instance, are often ignored - as in Seidl, R. et. al. "Assessing trade-offs between carbon sequestration and timber production within a framework of mult-purpose forestry in Austria" in Forest Ecology and Management 248 (2007)), where the work excludes secondary GHG benefits associated with the use of forest products in a cascading fashion where the fossil fuel displacement benefits are first indirect (e.g. via displacing more fossil fuel intensive construction materials) and then direct (via use of wood debris as biomass fuel to directly displace fossil fuel). The benefits of cascading in the forest product value chain are is examined in more detail in Dornburg, V. and A. Faaij, "COst and CO2-emissions reduction of biomass cascading: methodological aspects and case study of SRF poplar", in Climatic Change (2005) ,71: 373–408. | Accepted, Text has been revised |
| 5816 | 11 | 23 | 43 | 23 | 48 | This statement is correct, but changing the forest type can be a viable option IF the wood cut is put to good use, i.e. in products with high replacement effects. According to Sathre & O'Connor the mean replacement effect of wood used in products is 2.1, so if 50% of the wood cut in the forest enter the product chain in any way the emissions are balanced and C stock changes on the landscape level are cancelled. (Sathre, R. and J. O'Connor (2010). "Meta-analysis of greenhouse gas displacement factors of wood product substitution." Environmental Science & Policy 13(2): 104-114.) | Accepted, Text has been revised |
| 3852 | 11 | 23 | 45 | 23 | 45 | Timing of C flows is really significant for temperate climate countries. Tree growth in tropical countries occurs in 10 to 20 years. | Accepted, Text has been revised |
| 5570 | 11 | 23 | 45 | 23 | 48 | With improved management, will have production from thinnings. Also, short-rotation tree growth, especially outside the forest, may compensate for conversion of old-growth forests. | Accepted, Text has been revised |
| 5059 | 11 | 23 | 5 | 23 | 5 | there are methane implications and lost sequestration form diversion of wood wastes | Accepted, Text has been revised |
| 3850 | 11 | 23 | 7 | 23 | 7 | Replace "but methane emission from wood chip storage" by "but methane emission from long-term wood chip storage". Rationale - CDM methodologies discussing this issue consider that storage for less than one year implies on negligible emission. | Accepted, Text has been revised |
| 9484 | 11 | 23 | 7 | 23 | 8 | What is the case "methane emissions from wood chip storage is important"? Do you mean wooden waste in landfill? | Accepted, Text has been revised |
| 9485 | 11 | 23 | 8 | 23 | 8 | The quote Wiersaari (2005) and Cherubini and Ulgiati (2010) are missing in the reference list. | Accepted, References have been cross- |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5501 | 11 | 23 | 9 | 23 | | Distance and conversion technology are also really important factors here. Location of residues in relation to converision sites, energy use sites can have a large impact on both the economic viability of conversion as well as emissions balances | Accepted, Text has been revised |
| 14675 | 11 | 23 | 16 | 23 | 16 | When soils become depleted of organic matter they are less able to buffer against variations in water and nutrient levels and yield less on average, so that the ability of the crops to take up carbon dioxide is diminshed. Climate change conditions can be expected to result in more frequent and more extreme droughts so that having soils high in organic matter becomes more and more important. | Accepted, Text has been revised |
| 4390 | 11 | 23 | 17 | 23 | 21 | translating EJ in CO2 eq emission would help interpret bioenery potential, this comment applies to other parts of the text where EJ unit is used | Rejected, Translation to CO2 emissions is done in other chapters. Here, we don´t know which is the system replaced |
| 15965 | 11 | 24 | | | | table is not clear, the different numbers in the same cell are not explained, it seems this table can be simplified considerably | Accepted, Table has been changed |
| 9330 | 11 | 24 | | | | The table is not easily understable. There are many values under different columns. Are these the values reported by different authors or for different sub-regions by the same authors? How are the global and total figures on page computed? | Accepted, Table has been changed |
| 5709 | 11 | 24 | | | | Can we define EJ (Exajoule) on this page, possibly in a footnote? Can some equivalence like 1EJ= energy produced by burning of …..million tonnes of dry biomass, or= energy produced by burning of ……million tonnes of oil, be also mentioned in the footnote? It will make the comprehension of the subject easier. | Accepted, EJ are defined in the Metrics Annex |
| 5572 | 11 | 24 | | | | This table makes little sense at present. For example the waste sub-totals add to 7 EJ, yet for global the total is give as 1-3 & 11 EJ. The dung subtotals add to 22 EJ, but the total figures are given as 9-25 & 39 EJ. The unutilized forest growth adds to 2.9 EJ, (155 Mt we), but the global figures are 64 to 74 EJ (3.42 to 3.96 Gt we). The former figure is much too low and at present the estimated annual growth minus present use is 14.82 Gt. I do not understand the other columns. | Accepted, Table has been changed |
| 10265 | 11 | 24 | | 26 | | Please compare the figures also with this working paper: Anttila, P., Karjalainen, T. and Asikainen, A. Global Potential of Modern Fuelwood. 2009. Working Papers of the Finnish Forest Research Institute 118<br>http://www.metla.fi/julkaisut/workingpapers/2009/mwp118.htm<br>ISBN 978-951-40-2160-2 (PDF)<br>ISSN 1795-150X | Accepted, Text has been revised |
| 10607 | 11 | 24 | | | | Define "Waste". Is it MSW for example? "Plantations" better as "Energy crops" perhaps. Whole tbale is confusing with lists of numbers in each box. If from different references, then need to assess and then use ranges. Why is there no regional data for Marginal/degraded lands- only a global total? Maybe not found in literature - if so needs a footnote to clarify. | Accepted, Table has been changed |
| 11121 | 11 | 24 | | 26 | | References will be needed for each number. | Accepted, Table has been changed |
| 14434 | 11 | 24 | | 26 | | This table needs better formatting and clarification. I do not understand the significance of the multiple ranges noted for each region in many columns. | Accepted, Table has been changed |
| 14435 | 11 | 24 | | 26 | | Reformatting table could reduce chapter length. | Accepted, Table has been changed |
| 2627 | 11 | 24 | | | | Unutilized forest growth does not exist. You have to be able to define what this is since most forests are used by someone. Should these be targeted for conversion to a higher energy source if forest dependent communities use them? | Accepted, Table has been changed |
| 5571 | 11 | 24 | 11 | 24 | 13 | For an annual production of 1000 EJ/yr from biomass crops (53.5 Gt we) would require a planting area of between 3.6 and 5.4 million ha, assuming an annual yield of 10 to 15 dry t of biomass with an annual precipitation of 1500mm to 2000mm. This is about 1% of the forest area and 3% of the arable area, so it is possible. For 300 EJ/yr (16.0 Gt we), the required plantation area will be between 1.1 and 1.6 million ha. | Noted, There are many trade offs that need to be examined in addition to the energy potential |

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| 3853 | 11 | 24 | 14 | 24 | 23 | The concept that large extension of land area is required for some biomass-based fuels to make real impact on global GHG mitigation has to be changed if new demand side technologies become available. An example is the extension of soils needed to power a hybrid plug-in fleet of cars, See Pacca and Moreira, 2011. - Pacca, S. and J. R. Moreira, 2011. A Biorefinery for Mobility? Environ Sci Technol. 2011 Nov 15;45(22):9498-505. | Accepted, Text has been revised |
| 15171 | 11 | 24 | 17 | 24 | 23 | delete | Accepted, Table has been changed |
| 12408 | 11 | 24 | 24 | | | This table seems hard to understand and needs editing and more explanation | Accepted, Table has been changed |
| 9081 | 11 | 24 | 24 | | | More than one data are shown in one column. What does it mean? Each data was refered from different source? | Accepted, Table has been changed |
| 15170 | 11 | 24 | 5 | 24 | 6 | nutrient limitation is also a factor here… | Accepted, Table has been changed |
| 11812 | 11 | 24 | 9 | 24 | 13 | It would be interesting to include here the reason for this diference (e.g. different assumptions about land availability) | Accepted, Table has been changed |
| 5375 | 11 | 24 | 14 | 24 | 16 | If the Ramankutty et al, 2002 reference is supposed to support the assertion that we don't have good data on the slopes of lands then I think the authors should look up some more recent literature. Most GIS systems have digital elevation models that have useful resolution and certainly better than what was the case in 2002. I'm not sure if we are going to have perfect knowledge about this for the globe but I dont see this as a major issue given today's tools and datasets. | Accepted, Text has been revised |
| 10623 | 11 | 25 | | | | Please consider the paper Ovando and Caparrós (2009). This paper reviews different studies which estimate economic and physical potentials for bioenergy and forestry options in Europe. Reference: Ovando, P. and Caparrós, A., 2009. Land Use and Carbon Mitigation in Europe: A Survey of the Potentials of Different Alternatives. Energy Policy 37(3): 992-1003. | Accepted, Text has been revised |
| 16564 | 11 | 26 | 10 | 26 | 12 | This is an important point but only makes the distinction between animal and plant products. There are also very large differences among the different animal products, with beef having much larger land requirements, and lower efficiency in terms of either calories or protein, than chicken or pork (see, e.g. the Wirsenius et al. 2010 paper cited here). These between-animal-differences should be mentioned also; in terms of potential changes in trends, they are considerable more acceptable to a broad public than vegetarianism, and thus an important policy option. | Rejected, Changes in diet are discussed in Section 11.4 |
| 15235 | 11 | 26 | 12 | 27 | 2 | It should mention that other analysis suggest available abandoned / degraded land does not amount to a very significant potential for bioenergy production and could impact food security and biodiversity conservation. Eg. Field, C. B., Campbell, J. E. & Lobell, D. B. 2008. Biomass energy: the scale of the potential resource. Trends in Ecology & Evolution, 23: 65-72. | Accepted, Text has been revised |
| 5573 | 11 | 26 | 14 | 26 | 16 | I would argue that the trade off may be much less serious if existing annual biomass growth is more fully used and if marginal land and land invaded by 'weed' species is converted to plantations. This latter should lead to a positive GHG capture. | Accepted, Text has been revised |
| 10108 | 11 | 26 | 7 | 27 | 16 | One importatn option are integrated food endrgysystems which optimise the use of resrources to produce both food and energy needed in househjolds and farm operations (FAO 2010 Making Integrated Food-Enery systems work for people and climate. Working paper 45.) | Accepted, Text has been revised |
| 3854 | 11 | 26 | 8 | 26 | 8 | When considering "efficiency in the use of biomass" consider results quoted in Pacca and Moreira, 2011 - Pacca, S. and J. R. Moreira, 2011. A Biorefinery for Mobility? Environ Sci Technol. 2011 Nov 15;45(22):9498-505. | Accepted, Text has been revised |
| 5376 | 11 | 26 | 2 | 26 | 5 | I read the footnote for this table as saying that there will always and everwhere be decreased econmies of scale for biomass production and therefore increased biomass production will lead to higher costs. I am not sure that is strictly true. Luckow et al 2010, Hamelink et al, 2005 and others have shown that there are potentially scales of economy that can arise from dedicated biomass production. | Accepted, Table has been changed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3855 | 11 | 27 | 14 | 27 | 15 | Complete your information since there are plenty of literature explaining that hungry is mainly driven by difficulties in carrying out food distribution and poverty. Food supply is above consumption. This should be stated here and not further down in the text. | Accepted, Revised |
| 12843 | 11 | 27 | 15 | | | Please add here another argument. Globally the human diet is based on 33% animal-based protein and 67% plant-based protein. In Europe this is just opposite; 67% animal-based protein and 33% plant-based protein (Data from FAOSTAT). As animal-based protein has a higher environmental impact than plant-based protein, a shift in developed countries is desirable. | Partially Accepted, Revised |
| 15173 | 11 | 27 | 16 | 27 | 18 | delete | Accepted, Deleted |
| 10246 | 11 | 27 | 19 | 27 | 30 | A third option (or can be included under (2)) are dietary shifts towards more local, more seasonal and less processed food. See for instance Weber C.L.W & Matthews H.S. 2008. Food-miles and the relative climate impacts of food choices in the United States. Envion. Sci. Technol. 42, 3508-3513. | Partially Accepted, The quoted article argues that shifting diets is more important than food miles because for most food production accounts for a much larger fraction of GHG emissions than transport. Nevertheless, less |
| 12409 | 11 | 27 | 19 | 27 | 27 | The demand-side is extremely important when assessing possibilities for reducing GHG emissions. Hence, it is very satisfactory that this aspect now is included in the report. Both the focus on reducing losses and changes in diets are highly relevant, since the goal is to still be able to supply a growing population with healthy food. | Noted, Thank you |
| 6828 | 11 | 27 | 19 | | 25 | There could be a case for adding another here: local and seasonal food. Demonstrate why complete impact is not just an issue of distance (food miles). | Partially Accepted, See comment line 754 |
| 7614 | 11 | 27 | 21 | | | "FSC" is the name of internatinal forest certification organaization that very famous in forest and consevation sector. "food in the supply chain" will be just use without abbreviating as coufuse with "certified sustainble wood" in Table 11.4 | Accepted, Abbreviation removed |
| 9082 | 11 | 27 | 21 | 27 | 22 | In general, FSC stand for "Forest Stewardship Council" in forest sector. | Accepted, Abbreviation removed |
| 11165 | 11 | 27 | 21 | | | Food in the supply chain should not be abbreviated into "FSC" because this may be confused with "Forest Stewardship Council" . | Accepted, Abbreviation removed |
| 9449 | 11 | 27 | 23 | | 25 | Changed diet is not a mitigation option, but rather a potential outcome of mitigation options. More discussion of interventions to change diet would be helpful here. | Rejected, Changed diet is a mitigation option. The interventions suggested are |
| 11295 | 11 | 27 | 23 | 27 | 24 | It would be better if animal products were not so unilaterally dismissed and plant products not necessarily assumed to be less resource-intensive. Instead a brief discussion of the nuances would be in order (e.g. livestock v fish, or local fowl v air-freighted soya beans cultivated on recently deforested land). Species, locality and seasonality all matter a great deal when it comes to resource intensity. Insects in particular convert the calories they consume into consumable protein and fatty acids at very high efficiencies, largely because they are cold-blooded (see Durst, Patrick and Kenichi Shono 2010: 'Edible forest insects: exploring new horizons and traditional practices.' In P Durst, D Johnson, R Leslie and K Shono, eds, 'Edible forest insects: humans bite back. Bangkok: FAO Regional Office for Asia and the Pacific: 1-4). Moreover, the emissions that result from farm-to-table distances may outweigh food type; consuming seasonal food is therefore just as important a part of demand-side mitigation of emissions from AFOLU. | Accepted, Text has been revised and additional references included. |
| 13528 | 11 | 27 | 25 | 27 | 25+ | (3) Quality changes in nutrition and suitability (meaning: viable and healthy) of different kinds of diets, choosing between all different options (traditional, predominant, new and adaptable) the less resource intensive, to solutions involving both food supply chain (FSC) and food consumption chain (FCC). | Rejected, Statement - not a comment; not clear what changes should be made. Text describing losses and diet changes |
| 15174 | 11 | 27 | 27 | 27 | 27 | delete "Demand side options are summarised in" and append (Table 11.4) to previous sentence. | Accepted, Done, thanks |
| 15175 | 11 | 27 | 28 | 27 | 34 | wordy | Accepted, Revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9083 | 11 | 27 | 28 | 27 | 46 | In this idea, local food supply and comsumpition would be important. Eating and depending on imported foods from outside region or country cariies more carbon (or ecological) footprint. | Noted, Statement - not a comment. Moreover, this is not generally valid because production emissions are usually much higher than those related |
| 7071 | 11 | 27 | 3 | 27 | 3 | Add "forestry research" to sentence, i.e. in addition to "agricultural research". | Accepted, Revised for SOD |
| 15176 | 11 | 27 | 35 | 27 | 40 | tighten paragraph | Accepted, Revised |
| 14730 | 11 | 27 | 35 | | | : “avoidable’ or ‘potentially avoidable’ …” This need further explanations as the definitions are not clear enough in all parts of the world. | Accepted, Revised |
| 10608 | 11 | 27 | 41 | 27 | 46 | Also losses from use-by-dates in supermarkets, seasonal surpluses, etc. Point is that losses mean a waste of land use, water and energy. FAO, 2011 ( referenced above) showed 32% of end-use energy and 22% of total GHG emissions are related to the food supply chain | Accepted, Revised; however, space limitations do not allow to discuss specific mechanisms behind losses and |
| 15177 | 11 | 27 | 45 | 27 | 46 | delete sentence | Accepted, Done, thanks |
| 13529 | 11 | 27 | 46 | 27 | 46+ | Indeed, the challenge to reduce food wastes is not just a matter of data gaps, but also focus to include the views of key players, the householders. | Accepted, Revised, sentence deleted. |
| 5749 | 11 | 27 | 6 | 27 | 9 | please add "...services, such as integrated food-energy systems,.." (reference: http://www.fao.org/docrep/013/i2044e/i2044e.pdf) | Accepted, Revised for SOD |
| 15966 | 11 | 27 | 7 | 22 | 11 | Sentence does not seem correct | Accepted, Revised for SOD |
| 13966 | 11 | 27 | | | | this section is an essential addition to the analysis. Some additional references include E.A. Davidson. 2012. Representative concentration pathways and mitigation scenarios for nitrous oxide. Environmental research letters doi: 10.1088/1748-9326/7/2/024005 and t. Garnett. 2011. Where are the best opportunities for reducing greenhouse gas emiaaions in the food system? Food Policy 36: S23-S32 | Accepted, Revised |
| 15002 | 11 | 27 | 12 | | | This section should also discuss demand-side efforts to reduce consumption of wood and wood products harvested through unsustainable logging of primary forests. Third-party certification mechanisms such as the Forest Stewardship Council certification can help to drive demand toward more sustainable - and lower carbon - sources of wood and wood products. Laws, such as the U.S. Lacey Act, can be used to block imports of wood harvested illegally from protected areas, including those with primary forests. | Accepted, It does - see section beginning on page 30, line 4. There are several comments regarding use of certificated wood. Certification is to some extent discussed in the policy |
| 4396 | 11 | 27 | 12 | 30 | 32 | contribution of sea derived food products is not covered | Accepted, Revised, see description of |
| 7615 | 11 | 28 | | | | It is important to do't use wood by illegal logging before to use certificated wood. It is better to add such description. | Accepted, Revised, cross-reference to policy section (11.10) added, see above line 775 |
| 7072 | 11 | 28 | | | | Regarding the row "Substitution of wood for carbon intensive products"; an important reference is missing. In 2010, FP Innovations reviewed 66 studies that speak to the substitution effect. It is a key reference in this area. See Sathre, R., & O'Connor, J. (2010). A synthesis of research on wood products and greenhouse gas impacts - 2nd Edition. Vancouver BC: FPInnovations. | Accepted, This is no peer-reviewed publication. While it provides a useful overview, it does not change the conclusions we have reached in the text, so it does not seem justified to include |
| 5574 | 11 | 28 | | | | ‘Change consumption of wood products’. Mitigation option. Buying wood products from ‘certified sustainable wood’. It can be argued that most wood products are sustainable, even though they may not be certified as such. This is because the rate of wood growth is an estimated 5 times more than wood demand! Also, according to FAO statistics only about 8% of industrial wood and zero percent of fuelwood is exported. Therefore, in practice, certification is only dealing with a small fraction of wood products. The other two mitigation options cannot be overemphasized. | Accepted, Revised, cross-reference to policy section (11.10) added, see above line 775 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5817 | 11 | 28 | | | | Substitution: Please have a look at Sathre, R. and J. O'Connor (2010). "Meta-analysis of greenhouse gas displacement factors of wood product substitution." Environmental Science & Policy 13(2): 104-114 and Sathre, R. and J. O'Connor (2010). A Synthesis of Research on Wood Products & Greenhouse Gas Impacts. Vancouver, B.C., FPInnovations. TR - 19R: 123 and the literature cited therein, respectively. "Increased C stocks": Why don't you explicitly recommend to use MORE wood provided that it comes from sustainable sources? | Accepted, Revised, the paper is now cited (see comment line 778). Table 11.4 includes a recommendation to substitute wood for other products under defined circumstances. |
| 10609 | 11 | 28 | | | | Missing are energy efficiency opportunities on farms, forests, fisheries and throughout the food supply chain, - covered in FAO, 2011. | Accepted, Revised, energy savings from reduced losses in the food supply chain |
| 11122 | 11 | 28 | | | | Here, too, it would be nice to have at least indicative values of the relative potentials of the options. Also, a table heading is needed. | Partially Accepted, Table heading revised. Potentials are given elsewhere |
| 11123 | 11 | 28 | | | | Last row: "coordinated understanding" - what does this mean? | Accepted, Revised |
| 11166 | 11 | 28 | | | | Title of the table "consumption-side"? "demand-side"? | Accepted, Revised |
| 11296 | 11 | 28 | 1 | 28 | 4 | Storage technologies may be helpful; reducing farm-to-table distances in the first place would be even better. In this regard urban and peri-urban agriculture is a promising alternative. | Accepted, Revised, food miles are now explicitly mentioned. |
| 16565 | 11 | 28 | 11 | 28 | 11 | A citation like "Popp et al. paper in preparation" is an open invitation to the kind of criticism of sources that was so damaging to AR4. Delete it, and the assertions that depend on it. | Accepted, Revised, replaced by citation of Smith et al, submitted |
| 12410 | 11 | 28 | 12 | 28 | 13 | Production of artificial meat should be mentioned as one possible way of reducing the consumption side in the AFLOU-sector. It might be regarded as a change in diet, even if the meat more or less are of the same quality compared to meat from animals. | Accepted, Did not find any studies confirming that meat analogue is equivalent in terms of GHG emissions to other plant-based food. Also, the comment is difficult to integrate in the |
| 15611 | 11 | 28 | 12 | 28 | 13 | Global studies cited in previous comment should be cited in Table 11.4 for "Change in diet" section. | Accepted, Not able to find out what the "studies mentioned in the previous |
| 16566 | 11 | 28 | 13 | 28 | 17 | Same point as number 47 -- only distinguishes animal vs plant sources. I don't object to giving data that support vegetarianism, but you need to discuss other diet change options -- some of which are more broadly acceptable at present -- as well. | Accepted, We are not supporting vegetarianism - just exploring the relative impacts of animal and plant based food |
| 5504 | 11 | 28 | 13 | | | Are there associated estimates of land base required for each diet described? | Accepted, Estimates of area savings |
| 12411 | 11 | 28 | 13 | 30 | 3 | This part deals with the effect of diets/diet changes on emissions from the whole food chain. The referred studies seem to indicate mitigation potentials of up to 8-10 Gt CO2-ekvivalents in 2050/2055, a very significant amount. It would be a great advantage if the assumptions could be clearified more; whether and how the effect of land use, land use change and deforestation is taken into consideration seem to differ between the referred studies. It would be useful to clearify this and if posible display the results in a comparable way e.g. an extension of table 11.5. The different diets seem also to result in quite different needs for land area. Given the limitations of arable land and the increasing competition between needs for food/feed, C-sequestration, bioenergy and ecosystem conservation, it would be useful to elaborate this more. Such information could also be taken into the context of 11.9 "Sectoral implications of transformation pathways and sustainable development", especially the land use implications. This issue is also mentioned clearly in WGII chapter 19, p.16, line 7-11 with reference to the same report (Stehfest et al.2009) ; "Dietary changes could reduce the land requirements of food cropping embodied in these tradeoffs. Specifically, a transition to a vegetarian diet would free up 2700 Mha of pasture and 100 Mha of cropland, 75% of which could be used for biofuel cropping (Stehfest et al 2009), whilst the remainder could revert to natural vegetation becoming a carbon sink (see 19.3.2.1)." This text implies that 27 million km2, 70 % of the global agricultural area is used for animal products. | Accepted, Revised. |
| 5062 | 11 | 28 | 13 | 28 | 13 | there is a ppaer coming out in climatic change about a healthy nowegian diet where fish are substituted so substitution can also be in animal protein categories | Accepted, Not able to find the paper, not clear what should be changed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 11297 | 11 | 28 | 13 | 28 | 15 | Re: comment #6 above the 'exception' here is duly noted, but in much of the developed world non-seasonal, non-local food is not actually exceptional at all. | Accepted, Noted and revised. |
| 11167 | 11 | 28 | 13 | 30 | 3 | Change of diet is very important option, but to avoid misleading, considerations for cultural aspect of variety of food must be reffered. | Accepted, Revised. These aspects are outside the scope of this part and need |
| 16567 | 11 | 28 | 17 | 28 | 22 | This comparison actually makes my point (numbers 47 and 49) about the importance of comparing different kinds of animal-based diets, not just animal vs. plant. Going from the beef-based option to the pork-based one reduces emissions by 3.4 kgCO2eq; going from the pork-based meal to the soy-based one saves another 0.9 kgCO2eq. In other words, changing the kind of animal protein reduces emissions by 79% as much as going from animal to plant entirely. For a review of 16 such studies, see: DeVries, M., and I.J.M. deBoer. 2010. Comparing environmental impacts for livestock products: A review of life cycle assessments. Livestock Science 128(1–3):1–11 | Accepted, Revised; also discussed in other parts of this subsection. |
| 9450 | 11 | 28 | 17 | | 23 | Care should be taken to distinguish between average GHG intensity of food and marginal effects of diet switching. A large literature on this theme exists in LCA including the literature comparing attributional and consequential LCA. This turns out to be a particularly vexing problem for AFOLU. See for example, Lemoine, D., Plevin, R., Cohn, A., Jones, A., Brandt, A., Vergara, S., et al. (2010). The Climate Impacts of Bioenergy Systems Depend on Market and Regulatory Policy Contexts. Environmental Science & Technology, 44(19), 7347-7350.<br><br>Thomassen, M., Dalgaard, R., Heijungs, R., & de Boer, I. (2008). Attributional and consequential LCA of milk production. The International Journal of Life Cycle Assessment, 13(4), 339-349. | Accepted, Revised, reference by Thomassen et al. Added; the other was not related to food. |
| 13530 | 11 | 28 | 22 | 28 | 22+ | It was argued that these are nutritionally comparable meals, but nutrition is not only a matter of calories and proteins. We all are concerned with the world hunger, but it can't mean open the door to the soy business, with all its risks, even from the point of view of GHG emissions. Real problems are complex, and they haven't magic solutions. | Rejected, We are exploring biophysical effects of assumed behavioral changes here, not recommending actions. |
| 15179 | 11 | 28 | 23 | 29 | 1 | what does this mean? Unclear as written | Accepted, Revised |
| 9331 | 11 | 28 | 29 | | | The phrase 'and a quarter respectively half of the wasted food --' is not clear. | Accepted, Revised |
| 5503 | 11 | 28 | 6 | | | Wasted food is a current priority for US EPA and they are likely to have data that would be useful. Jean Schwab-schwab.jean@epa.gov is a contact for this information | Accepted, Jean has been contacted |
| 15178 | 11 | 28 | 8 | 28 | 11 | doesn't make sense | Accepted, Revised |
| 4391 | 11 | 28 | 8 | 28 | 11 | phrase is confusing, especially the part "a quarter... saved" | Accepted, Revised |
| 15610 | 11 | 28 | 13 | 28 | 14 | Consider discussing that the consistent results for lower GHG emissions for most plant-based foods holds true around the globe, e.g. in studies in India, the United States, Italy, and U.K. Pathak H., N. Jain, A. Bhatia, J. Patel, and P.K. Aggarwal (2010). Carbon footprints of Indian food items. Agriculture, Ecosystems and Environment 139, 66-73. Marlow H.J., W.K. Hayes, S. Soret, R.L. Carter, E.R. Schwab, and J. Sabaté (2009). Diet and the environment: does what you eat matter? The American Journal of Clinical Nutrition 89(suppl), 1699S-703S. Weber C.L. and H.S. Matthews (2008). Food-miles and the relative climate impacts of food choices in the United States. Environmental Science & Technology 42(10), 3508-13. Available at: http://pubs.acs.org/doi/pdfplus/10.1021/es702969f. Baroni L., L. Cenci, M. Tettamanti, and M. Berati (2007). Evaluating the environmental impact of various dietary patterns combined with different food production systems. European Journal of Clinical Nutrition 61:279-86. Berners-Lee M., C. Hoolohan, H. Cammack, C.N. Hewitt (2012). The relative greenhouse gas impacts of realistic dietary choices. Energy Policy 43, 184-90. | Accepted, Revised; for reasons of limited space not all additional refs could be included. |
| 16568 | 11 | 29 | 2 | 29 | 4 | This is a good point except for the phrase "if cattle production contributes to deforestation" -- clearly it does. In fact, it is the major driver of deforestation in Latin America. | Accepted, There is no agreement to what extent cattle contributes to deforestation, see comment line 804. |
| 15967 | 11 | 29 | 2 | 29 | 2 | iLUC / dLUC - acronym not explained | Accepted, Revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9451 | 11 | 29 | 2 | | 5 | The Cederberg study has an attribution problem. That is, the authors admit that it is unclear how much land use change to attribute to cattle production. For more see Cohn, A., Bowman, M., Zilberman, D., & O'Neill, K. (2011). The viability of cattle ranching intensification in Brazil as a strategy to spare land and mitigate greenhouse gas emissions. Copenhagen, Denmark: CCAFS. | Accepted, Revised and references added. |
| 15180 | 11 | 29 | 2 | 29 | 2 | iLUC not specified until further down hapter | Accepted, Revised |
| 9084 | 11 | 29 | 20 | 29 | 35 | What concerns me is that the authors stated the changes in diets with a focus on meat. Think about cultural diversities, this demand-side option is no easy task. | Noted, We are exploring scenarios here - not recommending actions. A note on cultural and other aspects has been |
| 9332 | 11 | 29 | 24 | | | Please see if the word 'substited' is actually 'substituted'. | Accepted, Revised |
| 15236 | 11 | 29 | 4 | | | Suggest adding a recent quantified account of consumer-demand mitigation in Europe: For example, a recent analysis of the potential mitigation from various reductions in animal protein consumption including land use change emissions, calculated savings between 2 and 30% of total European emissions from livestock. From Bellarby et al. 2012. Bellarby, J., Tirado, R., Leip, A., Weiss, F., Lesschen, J. P. & Smith, P. 2012. Livestock greenhouse gas emissions and mitigation potential in Europe. Global Change Biology, in press. http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2486.2012.02786.x/abstract | Accepted, Revised, references added. |
| 16569 | 11 | 29 | 6 | 29 | 19 | A quite useful paragraph; it could be improved (and shortened somewhat) by putting the numbers into a Figure. | Accepted, Text was thoroughly revised and shortened, no space for additional |
| 15181 | 11 | 29 | 6 | 29 | 19 | rather detailed for synthesis; tighten paragraph (next paragraph too) | Accepted, Revised. |
| 5818 | 11 | 29 | 6 | 29 | 35 | Please avoid phrasing text like "X wrote …, Y wrote ...". Give the statement and a citation. This way, you save space and the text will be easier to read. | Accepted, Revised. Note, however, that this is less useful when one particular study is discussed in more detail. In that case, this would only result in awkward |
| 13531 | 11 | 29 | 7 | 29 | 35 | However, research must be directed to a joint balanced solution of rich and poor diets, and the GHG emissions, avoiding the temptations to adopt any kind of global or unique answer for these regionally differenced issues. | Rejected, Proposing research strategies is beyond the scope of this section |
| 15968 | 11 | 30 | | | | Table adds little more info, text is already explanatory, could be removed. | Accepted, Table deleted |
| 5819 | 11 | 30 | | | | Table can be deleted, information is already given in the text (page 29). | Accepted, Table deleted |
| 12412 | 11 | 30 | 1 | | | The table should be extended with the information on p 29 line 6-19. An advantage would be to introduce a column for the emissions in 2050 or 2055 for different diet scenarios, if posible including also the CO2-emissions from landuse/landuse change. | Partially Accepted, Table deleted |
| 5063 | 11 | 30 | 1 | 30 | 1 | I think all this discussion about changing diet shopuld be tempered with a little discussion of how hard this is to get done. In the us there is a lot of talk about obesity and unhealthy food but it has proved very hard to change | Accepted, Revised. Implementation issues discussed elsewhere |
| 9486 | 11 | 30 | 10 | 30 | 10 | The reference quote as Christian Lauk et al. (2012) is Lauk Christian ("Laul Christian"in the reference list)? | Accepted, Zotero updated for SOD |
| 12413 | 11 | 30 | 13 | 30 | 20 | Could you please clarify if the buildings energy-demand over the lifetime are included in the analysis of the net CO2 emissions over a 100 year lifetime? | Accepted, Revised |
| 15182 | 11 | 30 | 16 | 30 | 18 | repetitive | Accepted, Deleted |
| 16571 | 11 | 30 | 21 | 30 | 22 | I assume that the "construction of one million flats per year" is using wood, correct? Clarify this. | Accepted, Revised |
| 5505 | 11 | 30 | 21 | 30 | 32 | Are wood structures suitable as multi family dwellings? Energy use in multifamily dwellings is a fraction of that in single occupancy homes- this should be considered in this discussion. One estimate of energy use and LCA costs of home construction is available at:State of Oregon Department of Environmental Quality. A life cycle approach to prioritizing methods of preventing waste from residential construction sector in the state of Oregon: Phase 2 report, version 1.4. Document 10-LQ-022; http://www.deq.state.or.us/lq/pubs/docs/sw/ResidentialBldgLCA.pdf. | Accepted, Revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 7074 | 11 | 30 | 21 | 30 | 32 | This section should also refer to the important meta analysis by Sathre and Oconner - Sathre, R., & O'Connor, J. (2010). A synthesis of research on wood products and greenhouse gas impacts - 2nd Edition. Vancouver BC: FPInnovations. | Accepted, Revised, peer-reviewed paper cited |
| 7076 | 11 | 30 | 21 | 30 | 32 | This section leaves the impression that there is no overarching conclusion to be drawn from these studies. This is incorrect. As a whole, these studies indicate that using wood from sustainably managed forests to displace more GHG-intensive non-wood materials will always yield mitigation benefits, although the timing of benefits will vary depending on the specific situation. It is important that this section include this overall conclusion and that it be reflected in the executive summary of the report as it was in the Fourth Assessment Report (Fourth Assessment Report, WGIII, Chapter 9, Executive Summary). Even the Nassen study reflects the benefits of active forest management and the resulting low GHG-intensity products, althought the results of this study are misrepresented in the current draft (the subject of the next comment). | Accepted, Revised. Note that Sathre and O'Connor (2010) and Werner et al. (2010) also identify cases in which emissions of wood use are higher. Although this is the exception rather than the rule, balanced treatment requires that this is mentioned. |
| 5577 | 11 | 30 | 21 | 30 | 32 | I think that the argument that GHG saving with wood products in place of steel and concrete may be small or zero is false. Wood from existing forest areas (especially under improved management) and areas of abandoned land under tree crops, will not only increase the sequestration of C, but also provides sustainable (and increased) sources of wood. The use of energy for steel and concrete production for building and furniture etc. is much more than for a similar building made of wood products. | Accepted, Revised, but note the caveats in row 825 |
| 11124 | 11 | 30 | 21 | 30 | 32 | When "wood" is discussed, it is often forgotten that wood comes out of forest, and every single harvest reduces or destroys many other goods and services of forests. If this is also considered, then the wood - non-wood equation must be re-evaluated. | Accepted, Revised |
| 5820 | 11 | 30 | 26 | 30 | 32 | The study of Nässén et al. has weaknesses in the C cycle assessment (e.g., using wood for bio-energy only when it could be used in products requires CCS or it would increase emissions compared to fossil fuels, see Schulze, E. D. et al.: Large-scale bioenergy from additional harvest of forest biomass ... , doi:10.1111/j.1757-1707.2012.01169.x, for an - unfortunately also incomplete - overview and general problem discription). The "question whether promotion of wood ... " is also misleading as the situation where both options were equal is based on future options not available for quite some years to come. The weighing today is clear. So please be aware what messages you want to send. | Accepted, Revised |
| 5456 | 11 | 30 | 26 | 30 | 32 | The quotation of (Naessen et al., 2012) is irrelevant and gives wrong message. Their report is based on uncertain assumptions like CCS technologies, carbonation of concrete, and future carbon price. Considering middle term period until 2050, wood construction can reduce more CO2 than concrete construction. Promotion of wood construction is best mitigation measures in the construction sector. | Accepted, Revised, but note the caveats in row 825 |
| 10247 | 11 | 30 | 3 | 30 | 3 | instead of "multiplication with 3.66667" it is better to use "44/12" which is more explicit | Accepted, Revised |
| 3856 | 11 | 30 | 3 | 30 | 3 | Do we really need all these decimal figures? | Accepted, Revised |
| 15969 | 11 | 30 | 31 | 30 | 31 | CCS - not explained | Accepted, This part was deleted |
| 7077 | 11 | 30 | 31 | 30 | 32 | The results of the Nassen et al 2012 study are misrepresented and the study is flawed. First, Nassen et. al. focused on a question that had not been examined previously, i.e. the effect of hypothetical future energy systems on the relative benefits of wood and concrete building systems. The future energy systems included CCS applied to both power production and industrial emissios, including emissions during calcination in the concrete manufacturing process. The study first points out that "Summing up the results from previous studies in this field we find it fairly well-established that, given the current energy system, increasing the share of buildings with wood frames would reduce overall GHG emissions, and a few studies also point out that this could be a cost-effective strategy." Then in the conclusions, the authors state that "Our analysis confirms the results from previous studies that for current conditions wood framed buildings will emit less CO2 during their life cycle than concrete buildings. Built on these earlier results arguments have been put forward that using wood frames in buildings should be stimulated. Still, in an elaborative scenario where CCS technologies are made available in the energy system,...(continued below) | Accepted, Revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 7078 | 11 | 30 | 31 | 30 | 32 | (continued from above)...the better carbon balance for wood frames is dependent on that CCS would also be used for the incineration of the relatively small and scattered streams of wood waste at the end-of-life of the building. Moreover, the carbon balances are sensitive to assumptions on the alternative use of the forest land in the concrete case, for which the land requirements for materials production are smaller than in the wood case." The findings in Nassen et. al., however, appear to have been affected by the study's having ignored the removal of CO2 from the atmoshpere accomplished in the initial growing of wood for construction. (See Table 2 in the study to see the carbon flows considered in the study) Instead, only regrowth is considered. Had carbon uptake by initial forests and the subsequent transfer of this carbon into wood-based construction materials been included for the wood-based system, in accordance with normal LCA practice, the wood-based systems would have shown benefits in both the current and future energy systems. (continued below) | Accepted, Revised |
| 7079 | 11 | 30 | 31 | 30 | 32 | (continued from above) This is because, had proper boundaries been used, it would have revealed that CCS applied to biogenic CO2 has a much larger benefit in reducing atmospheric GHGs (due to its removing carbon that was previsoulsy actively cycling in the atmosphere, so CCS results in a net negative flux of carbon to the atmosphere) compared to the removal of fossil fuel CO2 (which merely removes carbon that was added by fossil fuel burning, resulting in a net zero flux of carbon to the atmosphere). By excluding the initial uptake of carbon from the atmosphere, this difference is missed. We suggest, therefore, that due to limitations of the study, and the fact that its summary of previsou studies merely confirms other references used, this study be removed from the list of those used in the Fifth Assessment Report. | Accepted, Revised |
| 5710 | 11 | 30 | 4 | 30 | 32 | Research to make life of wood products longer is a workable proposition. Proper application of research has the potential of increasing the life of long-lived wood products like, door- window frames, lumber in house construction, and furniture, which will increase carbon sequestered in wood products. Flagging this kind of research here will be relevant. | Accepted, Revised |
| 5575 | 11 | 30 | 4 | 30 | 4 | Demand-side options related to wood and forestry. Should define 'socioeconomic'. I assume it mainly means the stock of carbon in long-lived wood products? | Accepted, Revised |
| 11813 | 11 | 30 | 4 | 30 | 32 | Here you only focus on construction wood.What about wood used for pulp and paper or furniture? | Accepted, The aggregate numbers from Lauk et al. (2012) and Pan et al. (2011) include all uses of forest biomass. No peer-reviewed studies were found on |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12075 | 11 | 30 | 4 | 30 | 32 | It seems that section 11.3 divides, as almost unrelated ,many forest related mitigation actions - increased use of biomass for bioenergy, improved natural forest management (more growth), improved plantation management, forest conservation ("production" measures); decreasing wood consumption, increasing wood consumption to subtitute for other products, and increased storage of carbon in wood products. ("demand side measures). It seems we need a concept for how policies could encouage or support these measures in a coordinated way to get the greatest mitigation offset. It seems a way to do is ito have a discussion about how to use wood (or not use wood and let it accumulate in forests) that is parallel to the discussion about how to changing food diets (pg 28 line 13 to pg 30 line 3). The parallel idea is that we should look to modify our wood product use diet - bioenergy, wood for paper, wood for construction products - in a way that gets the most OVERALL mitigation - over time - from the combination of carbon increase in forests, biomass for energy, (offset of fossil emissions), wood product carbon storage, wood product production for construction products (offset of emissions from displaced construction products). The main point is that for given forest circumstances (forest age, growth, regrowth, current uses for wood ) and current wood use/ wood use opportunities we need to identify what are the most effective combination of CHANGES in uses (or no use or decreased use) to mitigate emissions over time. Second we need to identify the coordinated policies that will support this integrated outcome - not just separate policies for forest management, bioenergy, and wood products use in construction that would likely not recognize the best mix of uses (no use). If this document does not recognize that there is a NEED to analyze our wood use DIET and determine the most effective diet then the question about the policy needed to attain the best diet will likely not be discussed elsewhere (in this document or by policy makers) . Cherubini et al (2012) gives a simplified set of examples comparing the radiative forcing reduction benefit associated with alternate use of roundwood for energy, and various products. Sathre and O'Connor (2010) review of estimated carbon offsets if wood is substituted for nonwood products in a range of cases. Ximenes et al (2012) give a good pair of real world examples comparing no harvest to harvest and use of wood for products and energy. I am not aware of a study that does a good job of comparing no harvest to several levels/uses for harvest for a range of conditions. There are many studies that include payments to add carbon to forests (and sometimes products) but these do not consider a policy that would pay builders to substitute wood for other materials as a way to get substitution benefits. Refs cited --- [Cherubini, F., Guest, G. and Stromman, A. (2012). Application of Probability Distributions to the Modeling of Biogenic CO2 Fluxes in Life cycle Assessment. Global Change Biology Bioenergy, 1 - 15.] [Ximenes et al. 2012. Greenhouse gas balance of native forests in New South Wales, Australia. Forests 2012 (3)653-683. ] [Sathre, R. and J. O'Connor. 2010. Meta-analysis of greenhouse gas displacement factors of wood product substitution. Environmental Science & Policy 13(2010)104-114.] | Accepted, Revised. |
| 9487 | 11 | 30 | 5 | 30 | 10 | The quoted values do not match with the values in literature (10.1 GtC in 2008 vs. 11.5 GtC, 188 MtC/yr in 2007 vs. 247 MtC/yr). | Accepted, Revised (numbers for bitumen and plastics taken out, numbers for products plus landfills added, based on Pan et al. 2011). It was not clear where the numbers quoted by the reviewer come from and whether they |
| 7073 | 11 | 30 | 7 | 30 | 7 | Plastics and bitumen should not be included in estimates of stocks of stored carbon because they do not represent removals of carbon from the atmosphere. Furthermore, a study based on such a definition is not particularly relevant in a section devoted to wood and forestry.<br>For information on carbon stocks and changes in carbon stocks the Fifth Assessment Report should rely on the data in Pan et. al. (i.e. Pan, Y., Birdsey, R., Fang, J., Houghton, R., Kauppi, P., Kurz, W., et al. (2011). A Large and Persistent Carbon Sink in the World's Forests. Science Vol. 333 , 988-993.) | Accepted, Revised. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 5576 | 11 | 30 | 8 | 30 | 10 | "--- increase from 17 MtC/yr in 1900 to a maximum of 188 MtC/yr in 2007". This is nearly a 3 fold per-capita increase, which seems high. Whereas --- to 50-80 MtC/yr (line 10) seems more reasonable. | Accepted, Revised |
| 9452 | 11 | 31 | 1 | | 1 | This section would benefit from a sub-section on the extent to which mitigation effectiveness depends on adoption choices by land users and, relatedly, the design of instruments to induce adoption. | Rejected, Dealt with later in the chapter |
| 5070 | 11 | 31 | 1 | 31 | 1 | in this section you could also mention additionality which is a problem with redd and afforestation and a number of other ag items. The real question is how much of this mitigation activity happened anyhow | Partially accept, Additional paragraph added to end of section introducing additionality; this is described elsewhere |
| 16573 | 11 | 31 | 10 | 31 | 11 | "easy to track visually" is a dubious assertion -- one certainly can't see the below-ground effects, and even if one can see changes if one is present when plowing happens, it is much more difficult to track (let alone quantify) the effects over a large scale by remote sensing. | Accepted, Have reworded and caveated this statement: viz;. "Some activities that reverse carbon sequestration are relatively easy to track visually, such as deforestation and some changes in land-use such as the removal of residues from a ploughed field. Obviously, such an approach cannot assess all carbon pools (e.g. below ground). These techniques, which rely on remote |
| 5578 | 11 | 31 | 10 | 31 | 12 | "Most activities that reverse carbon sequestration are relatively easy to track visually. A ploughed field with residues removed, the removal of trees etc". I would argue that this is not a reversal of C sequestration. Crop residues if not used will rot and/or be eaten by insects etc. and be returned to the atmosphere. If they are used for energy, the may substitute fossil fuels. What could be lost is some minerals (fertility) soil friability etc. The harvesting of wood from a sustainable supply will not affect C loss. Rather it should have a positive effect on C accumulation in wood products or the substitution of wood energy for fossil fuels. | Accepted, Added reference to remote sensing of forests for REDD (Gibbs et al. 2007) |
| 14629 | 11 | 31 | 12 | | | surely it is as much carbon as is usually lost due to LUC or fire in a certain ecosystem type | Accepted, Agreed, however this will depend very much on the carbon stores and nature of disturbance. Not necessarily equivalent. Text added "There are relatively few data on how much carbon is lost when reversals occur and estimates will depend on a range of factors such as the carbon storage within the system and the nature of the disturbance. A first order estimate |
| 13969 | 11 | 31 | 13 | 31 | 15 | this sentence requires a separate paragraph. Permanent removals should be described in the first paragraph of this section, then followed by a discussion of those types of mitigation for which non-permanence is an issue. | Accepted, Agreed and changed |
| 15183 | 11 | 31 | 15 | 31 | 17 | contradictory | Rejected, The statement is not contradictory. Frost damage affects the annual increment but doesn't reverse the |
| 14630 | 11 | 31 | 15 | 31 | 16 | run these two sentences together and delete "The natural events that affect yields" | Accepted, Agreed and changed |
| 14631 | 11 | 31 | 16 | | | add example of fire | Accepted, Agreed and changed |
| 14632 | 11 | 31 | 17 | | | whether it is a reveral or not depends wha thappens after e.g. if there is a fire and the forest not replanted, or if the r is disease and the forest cannot regrow, then it is a reversal. The stored carbon is gone and not rpelaced. | Accepted, Agreed and changed |
| 3857 | 11 | 31 | 20 | 31 | 24 | Check for typo error. | Accepted, Typo not found. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5064 | 11 | 31 | 24 | 31 | 24 | Kim, M-K., B.A. McCarl, and B.C. Murray, "Permanence Discounting for Land-Based Carbon Sequestration", Ecological Economics, vol. 64, issue 4, 763-769, 2008. do some work on permanance and show contract terms and unequal sequestration rates plus saturation and possible maintainence costs lead to value of sequestation being as low as 1/3 of a perfect detruction of methane on a co2eq basis | Accepted, Text inserted to cover this: " estimated the impact of differences in permanence on the value of carbon offsets using examples from cropland |
| 14633 | 11 | 31 | 25 | 26 | | change order of sentence and give example what you mean (e.g. afforestation) and (e.g. fossil fuel substitution with bioenergy). Culd be owrth noting at end of this paragraph that peatlands sinks may not saturate, but C uptake very slow. | Accepted, Agreed. |
| 5711 | 11 | 31 | 25 | 31 | 30 | Can some idea/figures about saturation limit of carbon in different types of soils, say in %, or t ha-1, be given? This could give an idea about the capability of a particular soil to assimilate carbon in future. | Rejected, No - too much detail and too variable |
| 5065 | 11 | 31 | 25 | 31 | 25 | post and six have a climatic change article on saturation in 2007. also there is an uncertainty question here as to what is the rate and Kim, M-K., and B.A. McCarl, "Uncertainty Discounting for Land-Based Carbon Sequestration", Journal of Agricultural and Applied Economics, 41, 1(April 2009), 1-11, 2009. deal with it theoretically and empirically | Accepted, Agreed and two papers cited. |
| 5579 | 11 | 31 | 25 | 31 | 30 | Saturation. I agree that there are saturation points for carbon stored in biomass and soils. However, in most systems, the C content is well below the saturation point. Also, even if the saturation point can be achieved, the removal of annual growth provides carbon that can be used in wood products for building etc. and as a sustainable energy source to substitute for fossil fuels. | Rejected, No support for the statement that "in most systems, the C content is well below the saturation point" |
| 5821 | 11 | 31 | 25 | 31 | 30 | It is currently debated whether the equilibrium hypothesis is correct or not. Studies from old-growth forests for example show that they can continue to sequester C in soil and dead organic matter even if net living biomass increment is near zero (see, for example, Luyssaert, S., E. D. Schulze, A. Borner, A. Knohl, D. Hessenmoller, B. E. Law, P. Ciais and J. Grace (2008). "Old-growth forests as global carbon sinks." Nature 455(7210): 213-215). The debate is ongoing, but I suggest to keep the paragraph in subjunctive as far as an equilibrium is concerned. | Accepted, Agreed and added |
| 9132 | 11 | 31 | 29 | | | "Smith, 2005" is not cited. | Accepted, Fixed |
| 16572 | 11 | 31 | 3 | 31 | 4 | The assertion that "soil and vegetation carbon sequestration forms a large proportion of the mitigation potential in the AFOLU sector" is surprising -- particularly since the previous section has just shown the large mitigation potential of demand-side changes. Is it still "a large proportion" if these demand-side options are included? What is that proportion? At minimum, this assertion needs to be quantified and supported by citations. | Accepted, Changed to significant component. This is value is covered in earlier sections. |
| 13325 | 11 | 31 | 3 | 31 | 3 | a large, not a lage | Accepted, Agreed. |
| 14634 | 11 | 31 | 31 | | | This paragraphs confuses natural drivers with indirect human drivers. Ie . A direct human driver is an intentional activity that affects C balance such as LUC. A Natural driver of GHG flux would be cliamte variability, fires, wind throw disease. If a natural driver is changing, e.g. due to human induced claimte change or pollution , then this would be an indirect humn induced change. So see line 25, future changes in clumate are not natural changes, they are indirect human induced drivers of hange in flux. | Accepted, Changed |
| 9133 | 11 | 31 | 32 | | | "Smith, 2005" is not cited. | Accepted, Changed |
| 15184 | 11 | 31 | 35 | 31 | 36 | delete sentence | Accepted, Retained. Linking sentence in |
| 9134 | 11 | 31 | 36 | | | insert "changes" after "indirect human-induced". | Accepted, Changed |
| 15970 | 11 | 31 | 40 | 31 | 40 | Displacement/leakage - it seems this is key to many sink/emission statements, this could be elaborated more, one can assume that previous text takes this into account, and many studies would build on this. Leakage/displacement seems to be one of the more important factors to take into account, as a basis for all other mitigation effectiveness studies, this could be discussed first | Accepted, Rearranged |
| 5066 | 11 | 31 | 40 | 31 | 40 | the statement "If reducing emissions in one place leads to increased emissions elsewhere, 40 the emissions no net resuction in emissions occurs" is rather rediculous as it assumes a one to one corespondance. A more realistic view is in Murray, B.C., B.A. McCarl, and H-C. Lee, "Estimating Leakage From Forest Carbon Sequestration Programs", Land Economics, 80(1), 109-124, 2004. where the percentage offset is computed | Accepted, Done |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7191 | 11 | 31 | 40 | | | o Leakage. Now only displacement leakage is mentioned. Also ecological leakage should be discussed when it comes to rewetting of peat soils as a mitigation measure. If in the area where the rewetting activity takes place is not hydrologically 'intact', then ecological leakage shall be considered (expressed in amounts of carbon). | Noted. Text augmented. |
| 10248 | 11 | 31 | 41 | 31 | 41 | rewrite | Accepted. Text revised. |
| 14635 | 11 | 31 | 41 | | | delete "the emissions | Accepted. Text revised. |
| 14636 | 11 | 31 | 41 | | | the net reduction might not be zero, it might be lower than one is aiming for, or it might even be negative (ie reduction elsewhere is greater than gain by activity) this would be perverse mitigation. I would suggest to say, net reduction in emissions would be lwoer than that of the planned activity alone | Noted. Text revised. |
| 11065 | 11 | 31 | 41 | 31 | 41 | typo needs correction in following wording "…the emissions no net resuction in emissions occurs…." | Accepted. Text revised. |
| 9453 | 11 | 31 | 44 | | 45 | Trade statistics are not necessarily a proxy for emissions displacement. | Rejected. The text does not assume this for all trade statistics. |
| 14637 | 11 | 31 | 46 | | | ther are many publciations not on this patter of which Serchinger is at one extreme. In fact the jury is still very much out on quantifying iLUC. Needs some more thoughtful and in depth discussion as this is a critical point for this chapter. | Accepted. Text augmented. |
| 5506 | 11 | 31 | 6 | 33 | 3 | Excellent clear discussion | Noted. |
| 6829 | 11 | 31 | 6 | | 24 | There is some confusion cause by apparent interchangeability between 'sink' and 'stock' - the former is a process and the latter is a reservoir - and the addition of 'storage', which could be sink or stock. Avoided emissions are accounting issues not sinks and hence have different impacts on the atmosphere. Avoided emissions cannot be re-emitted (reversed) becasue there is nothing to reverse! | Accepted. We've added sentences explaining 'sink' and 'stock'. Use of the term 'storage' will be checked. |
| 14627 | 11 | 31 | 6 | | | this section needs some work, it is disjointed and a little confusing | Noted, section revised. |
| 14628 | 11 | 31 | 8 | | | other types of what? | Accepted. Other types of carbon sinks. |
| 13968 | 11 | 31 | 8 | 31 | 10 | this phrase confuses real mitigation, where gases are prevented from entering the atmosphere or are removed from the atmosphere, with market fixes. Buffer pools and insurance have nothing to do with mitigation. You can't take out insurance on reversals as a means to keep CO2 out of the atmosphere. with regard to the global GHG concentration increases, buffer pools are irrelevant. this sentence should be struck. | Accepted. Text revised. |
| 4392 | 11 | 31 | | 31 | | I find this section very small in regard to its importance, although some aspects of non-permanance appear in other sections. E.g. tree die back, pests, increased drought | Noted. Section has been augmented within limits of page allocation. |
| 13967 | 11 | 31 | | | | Essential section, but the findings are not adequately incorporated into the analysis of technical and economic potential. If there are serious uncertainties with regard to both amount of carbon sequestered and permanence of carbon sequestered (particularly as temperatures increase), there is little likelihood that this carbon can be commodified in a market. Other references to be added include R.P. Philipps et al. 2012. Roots and fungi accelerate carbon and nitrogen cycling in forests exposed to elevated CO2. ecology letters doi: 10.1111/j.1461-0248.2012.01827.x; F.M. Hopkins et al. 2012. Warming accelerates decomposition of decades-old carbon in forest soils. PNAS doi:10.1073/pnas.1120603109; A. Knohl and E. Veldcamp. 2011. Indirect feedbacks to rising CO2, Nature 475: 177-178;K.J. vanGroenigen et al. 2011. Increased soil emissions of potent greenhouse gases under increased atmospheric CO2. Nature 475: 214-216. | Noted. Section (now 11.3.2) has been revised and two of the three references added. |
| 14436 | 11 | 31 | | | | Relatively little discussion space is allotted to the important topic of mitigation effectiveness, relative to the page-length of the black carbon and biofuels section. Given the interest in policies that offer land managers payments for C sequestration, it is important for readers to understand the risk regarding C sequestration permanence. | Noted. Section has been augmented within limits of page allocation. |
| 11206 | 11 | 32 | | | | The treatment here on 'competition for land' is overly truncated and could be expanded upon and this feeds back to my earlier comments about the need for specific actions to control unregulated land grabbing and strengthen communal tenure rights for customary land owners. At line 32: Why call these benefits 'cultural services'? | Accepted, Competition for land is discussed in an entire subsection (was 11.4.2); text regarding cultural services revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16221 | 11 | 32 | | | | figure is missing conservation as one of the competing uses of land (it has biofuels and food/fiber); it leaves out water/biodiversity | Accepted, Figure was deleted for reasons of scarce space, and following the suggestion by another reviewer. |
| 15971 | 11 | 32 | 1 | 41 | 43 | Chapter is well written and clear, useful information is presented in a format which gives a nice overview. Displacement could be discussed more | Partially Accepted, Revised, but leakage is discussed elsewhere in more detail, |
| 5067 | 11 | 32 | 1 | 32 | 29 | I find this section redundant to coverage above and would delete it or move a little of it to earlier section on land use | Rejected, Most reviewers wish to see the section expanded |
| 3858 | 11 | 32 | 11 | 32 | 18 | It will be useful to provide figures at this point. What about quoting increase in agricultural area in the last 50 years, compared with population growth and society revenue (Global National Income)? I am surprised with the many references provided supporting the view of food versus fuel competition when agricultural land expansion has been many times lower than population and wealth growth. Be fairer by adding literature sources with different view. | Accepted, Two sentences with numbers and citations added |
| 11298 | 11 | 32 | 14 | 32 | 16 | Interesting indeed, but the 'points in space in time when this currently trajectories [sic] may be more easily influenced' already seem quite clear: cities. In particular, the fastest-growing cities in the developing world that are looking to expand and upgrade their infrastructure will have massive implications for resource use and efficiency; if their growth trajectories are directed appropriately they can have a great and positive impact on sustainability. However, neither the term 'cities' nor 'urban' appears even once in this entire chapter. | Accepted, Revised, text and references added |
| 13326 | 11 | 32 | 16 | 32 | 16 | Global resource, not .in global | Accepted, Revised |
| 3859 | 11 | 32 | 16 | 32 | 17 | Check wording | Accepted, Revised |
| 5822 | 11 | 32 | 20 | | | The information shown in this figure is already given in the text, so the figure can be deleted. Its presentation does not result in more information or better understanding. | Accepted, Figure deleted. |
| 11205 | 11 | 32 | 3 | 32 | 18 | The use of the term 'wild' here is inappropriate and outdated. Most scientific studies demonstrate that almost every corner of terrestrial ecosystems are used and occupied by peoples, the point is that in 'remote' areas the usage tends to be very low intensity and infrequent, yet nonetheless this land is under use, it just tends to be 'invisible' to western planners and decision-makers. This is especially case for indigenous gatherer hunter groups and shifting cultivators who combine hunting and gathering land use in very distant forest areas with swidden farming in forests closer to home. In some cases areas of 'remote' land are specifically set aside as no-go areas by indigenous peoples for spiritual *and* ecological reasons e.g. game breeding areas, water sources BUT they form part of an integrated customary system of land use and management. See, for example: Jane M. Read, Jose. V. Fragoso, Kirsten M. Silvius, Jeffrey Luzar, Han Overman, Anthony Cummings, Sean T. Giery, L. Flamarion de Oliveira (2010), Space, Place, and Hunting Patterns among Indigenous Peoples of the Guyanese Rupununi Region Journal of Latin American Geography Volume 9, Number 3, 2010 pp. 213-243. | Accepted, Revised, reference added. |
| 11987 | 11 | 32 | 30 | | 30 | Need to add here that ecosystem services are underpinned by biodiversity, e.g. "ecosystem services, which are underpinned by biodiversity". | Partially Accepted, Agreed, but the text was considerably shortened so the proposed formulation did no longer fit in. |
| 15185 | 11 | 32 | 33 | 32 | 33 | cite MEA. | Accepted, Done |
| 11299 | 11 | 32 | 34 | 32 | 38 | Agriculture (and indeed forestry) are increasingly important for urban livelihoods and employment too, though urban and peri-urban agriculture is never mentioned in this chapter. Urban and peri-urban agriculture can also help alleviate competition for scarce land resources by working within dense urban areas (and the innovative land use changes like green roofs, walls and redeveloped brownfields it often involves) and allowing larger green areas to remain intact. | Accepted, Urban and settlements are now better covered |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5580 | 11 | 32 | 7 | 32 | 9 | "Approximate ¼ of --- NPP is appropriated by humans either forgone due to land-use related loss in NPP or harvested for human purposes". (H. Haberl et. Al 2007). The NPP for terrestrial plants is an estimated 53 GtC. One quarter of this is therefore 13 GtC. The annual gross rate of deforestation, according to FAO is 15.2 million ha/yr. The annual loss in NPP from this area is between 75 MtC and 115 MtC. However, according to FAO, there has been an annual planting of an estimated 8.8 million ha. This should sequester between 44 MtC and 66 MtC, thus the net NPP loss will be between 31 MtC and 49 MtC. The annual use of wood products is an estimated 1765 MtC, (but if this is not used it will decay etc. and finish up as atmospheric CO2 and the annual NPP for wood is over 9 GtC). Food consumption for 7 billion people at 2750 kcal day (page 8, line 24), consumption is about 790 MtC. Allowing for waste, residues and losses via animal consumption, the annual consumption of NPP may be of the order of 1.6 GtC. (However, some NPP, e.g. grass would rot if not eaten). Thus gross the 'socioeconomic' loss of NPP is an estimated 3.5GtC/yr. This is less than 7% of NPP not 25%! Also fish from the sea etc. should be excluded from terrestrial food consumption. Thus Haberl estimates are much too high. | Partially Accepted, Numbers were cross-checked but matched the numbers reported in the peer-reviewed literature; additional reference added. Note that, as explained in detail in the paper by Haberl et al., 2007, this hinges on the definition of HANPP applied; the formulations used here are based on definitions widely used in the scientific literature, see e.g. the special issue edited by Erb et al. (2009) in Ecological Economics, 69(2), 250-334; in particular the editorial gives an in-depth discussion of definitional issues related to HANPP. |
| 15612 | 11 | 32 | 25 | 32 | 29 | Feedbacks should also include animal welfare. People around the world care about the welfare of animals raised for food. World Society for the Protection of Animals (2007). WSPA International Farm Animal Survey (China & Brazil), Dec. 14; Zogby International (2003). Nationwide views on the treatment of farm animals. Poll for the Animal Welfare Trust; Lusk J.L., F. B. Norwood, and R.W. Prickett (2007). Consumer preferences for farm animal welfare: results of a nationwide telephone survey. Available at http://asp.okstate.edu/baileynorwood/AW2/InitialReporttoAFB.pdf; and Penn, Schoen & Berland Associates (2005). Poll for the Humane Society of the United States, Washington, DC. (Illustrating consumer concern for farm animal welfare in the United States of America.)<br>Industrial systems now produce approximately two-thirds of the world's poultry meat and eggs, and more than half of all pork. Food and Agriculture Organization of the United Nations (2009). The state of food and agriculture: livestock in the balance (Rome, Italy: FAO, p. 27). Available at: http://www.fao.org/docrep/012/i0680e/i0680e.pdf. The breadth of scientific evidence demonstrating that intensively confined animals are frustrated, distressed, and suffering under modern production schemes is extensive, conclusively substantiating that battery cages for egg-laying hens and crates for pregnant sows and calves are simply not appropriate environments. Duncan I.J.H. (1970). Frustration in the fowl. In: Freeman B.M. and Gordon R.F. (eds.), Aspects of Poultry Behaviour (Edinburgh, Scotland: British Poultry Science Ltd., pp. 15-31). Špinka M. (2006). How important is natural behaviour in animal farming systems. Applied Animal Behaviour Science 100(1-2),117-28. Baxter M. (1994). The welfare problems of laying hens in battery cages. The Veterinary Record 134(24), 614-9. Dawkins M.S. (1990). From an animal's point of view: motivation, fitness, and animal welfare. Behavioral and Brain Sciences 13, 1-61. Vestergaard K. (1984). An evaluation of ethological criteria and methods in the assessment of well-being in sows. Annales de Recherches Vétérinaires (Annals of Veterinary Research) 15(2), 227-36. Broom D.M., Mendl M.T., and Zanella A.J. (1995). A comparison of the welfare of sows in different housing conditions. Animal Science 61, 369-85. European Commission, Scientific Veterinary Committee, Animal Welfare Section. 1995. Report on the welfare of calves. Adopted November 9. Available at: http://ec.europa.eu/food/fs/sc/oldcomm4/out35_en.pdf. | Partially Accepted, Revised - introduced a sentence in the subsection on demand-side measures. It fitted better than here due to length concerns. |
| 15186 | 11 | 33 | 11 | 33 | 13 | delete sentence | Accepted, Deleted |
| 15187 | 11 | 33 | 11 | 33 | 24 | is it trade offs that you want to minimize or negative effects? (tradeoffs can work, yes?) | Accepted, Revised |
| 5823 | 11 | 33 | 18 | 33 | 19 | "Leakage must be avoided" is only correct if the term "leakage" in used in the sense that emissions occur elsewhere and are therefore not considered in the assessment. This must be avoided. If emissions are assessed without regard to the location or timing of emission, than "leakage" is no problem. | Accepted, Revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5581 | 11 | 33 | 20 | 33 | 22 | Exploiting fully the NPP of the land should positively affect the livelihoods of the poor, especially if the are given control of say natural forests, paid for protecting them and provided with simple management techniques and opened up new markets for the products. | Rejected, Policy prescriptive and not sufficiently supported by peer-reviewed literature |
| 13327 | 11 | 33 | 21 | 33 | 21 | I believe it should say livlihoods of populations, not only poor populations. How do you define poor? | Accepted, Revised |
| 8931 | 11 | 33 | 21 | | | "poor" seems inappropriate better "rural population" | Accepted, Revised |
| 5072 | 11 | 33 | 29 | 33 | 29 | I have seen discussion of "Competition for land and water" before in this chapter | Accepted, Revised |
| 11207 | 11 | 33 | 30 | 33 | 46 | The section at 11.4.2 on 'competition for land and water' might be an ideal place to insert stronger and more robust text and references on the need to control unjust land acquisition and take measures to ensure forest tenure reforms to recognise the collective property rights of indigenous peoples and forest dependent communities. | Accepted, Noted - but not in a policy prescriptive way |
| 16576 | 11 | 33 | 30 | 33 | 38 | This section is important. However its first paragraph is fairly general and reads more like an introduction to the whole chapter than to this section specifically. Some of the sentences could be moved to the start of the chapter. | Accepted, Revised |
| 5582 | 11 | 33 | 35 | 33 | 37 | “Competition for --- resources is expected to intensify”. This could be mitigated by increasing agricultural productivity, increasing the use of NPP, changing the diet and tempering population increase etc. | Rejected, Policy prescriptive |
| 5507 | 11 | 33 | 39 | | | Is there a potential to include in this list multi purpose use of lands? So for example earlier on in the chapter combination forest and production agriculture were mentioned- integrating coffee growing into forest lands is one case, another way to describe this would be to maximize ecological functions of land. This seems to be an important consideration- not clear where it would best fit into the discussion- just got up to pg 37 ln 43- thank you | Accepted, Revised, sentence and references included. |
| 5071 | 11 | 33 | 39 | 33 | 39 | the section about "Mitigation activities in the AFOLU sector can reduce climate forcing in different ways" has appeared twice before and does not fit under land and water | Accepted, Deleted |
| 7197 | 11 | 33 | 39 | | | Mitigation activities. Missing: reducing fire frequency, reducing peat oxidation. Maybe it’s also good to think a bit further: choice of land for agricultural expansion (e.g. no-go-areas. Avoiding high carbon, high biodiversity land). | Partially Accepted, Agreed, but this part was deleted due to required shortening, so the proposed text cannot be added |
| 5069 | 11 | 33 | 4 | 33 | 28 | I again think this was covered before and would eliminate some and rearrange | Accepted, Revised |
| 5068 | 11 | 33 | 4 | 33 | 4 | adaptaion also comoets plus future demands need to be considered | Rejected, Do not understand the |
| 7192 | 11 | 33 | 4 | | | o Successful implementation. This section illustrates the constraints and difficulties, and it describes ‘what is needed’, however, its very abstract and at the end I still do not know what the ‘key’ is to successful implementation. You could think of describe more concrete ‘what is known already’, including references, and takes parts from section 11.10. E.g important points regarding successful implementation: | Accepted, Revised |
| 13328 | 11 | 33 | 43 | 33 | 46 | This bullet could be taken to suggest that fertilization could lead to a net sequestration of carbon (removal of N,P deficiencies). This is not a statement that has a high degree of certainty and may in fact be false considering the energy required to produce fertilizer as well as N2O emissions. | Accepted, Revised (this part was deleted due to shortening) |
| 2133 | 11 | 33 | 44 | 33 | 44 | write "…to reduced till cropping" as it is not yet clear that no-till cropping, measured over the whole soil horizon does increase soil carbon (e.g. Ogle, S.M., A. Swan, and K. Paustian. 2012. No-till management impacts on crop productivity,carbon input and soil carbon sequestration. Agriculture, Ecosystems and Environment 149: 37-49 | Accepted, Revised (this part was deleted due to shortening) |
| 5583 | 11 | 33 | 46 | 33 | 46 | Reducing deforestation is tied mainly to population increase and the increased demand for food and energy (increase in wealth), not from the use of forest product. | Accepted, Revised (this part was deleted due to shortening) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15613 | 11 | 33 | 10 | 33 | 10 | The "social values (e.g. equity of participation)" should also include animal welfare. People around the world care about the welfare of animals raised for food. World Society for the Protection of Animals (2007). WSPA International Farm Animal Survey (China & Brazil), Dec. 14; Zogby International (2003). Nationwide views on the treatment of farm animals. Poll for the Animal Welfare Trust; Lusk J.L., F. B. Norwood, and R.W. Prickett (2007). Consumer preferences for farm animal welfare: results of a nationwide telephone survey. Available at http://asp.okstate.edu/baileynorwood/AW2/InitialReporttoAFB.pdf; and Penn, Schoen & Berland Associates (2005). Poll for the Humane Society of the United States, Washington, DC. (Illustrating consumer concern for farm animal welfare in the United States of America.) | Accepted, Revised - introduced a sentence in the subsection on demand-side measures. It fitted better than here due to length concerns. |
| 5378 | 11 | 33 | 23 | 33 | 35 | The last bullet in this paragraph seems like a platitude. Can the authours shed light on how this would be dealt with in practice as that would be very helpful. Otherwise this sentence seems to say this is a complex issue which is abundantly clear from all the material in Chapter 11. Luckow, P., et al., Large-scale utilization of biomass energy and carbon dioxide capture and storage in the transport and electricity sectors under stringent CO2 concentration limit scenarios. International Journal of Greenhouse Gas Control, 2010. 4(5): p. 865-877. Hamelinck, C.N., R.A.A. Suurs, and A.P.C. Faaij, International bioenergy transport costs and energy balance. Biomass and Bioenergy, 2005. 29(2): p. 114-134. | Accepted, Revised |
| 5377 | 11 | 33 | 4 | 33 | 6 | The first sentence of this paragraph seems like a platitude. Can the authours shed light on how this would be dealt with in practice as that would be very helpful. Otherwise this sentence seems to say this is a complex issue which is abundantly clear from all the material in Chapter 11. | Accepted, Revised |
| 15188 | 11 | 33 | | | | interesting text, but it's NOT about land and water competition; it also repeats earlier sections. | Accepted, Revised |
| 11815 | 11 | 33 | | | | I had the feeling that the titel of this section (competition…) does not fully reflect the content of this section (climate forcings of Mitigation etc…) | Accepted, Revised |
| 10249 | 11 | 33 | 29 | 35 | 38 | Change the title of this section "competition for land and water"…thus this section do not deal will water! | Accepted, Revised |
| 5824 | 11 | 34 | | | | This figure does not add significant information, could be deleted. | Partially Accepted, Figure revised and |
| 8932 | 11 | 34 | | | | The figure does not show that consumed materials from forestry are frequently used to process bio-energy (cascade use) | Accepted, Figure revised and improved |
| 8933 | 11 | 34 | | | | Trade should stand between the pillars Livestock, Processing and Consumption not about | Partially Accepted, Figure revised and improved; proposed changes could not be entirely solved graphically. The current solution makes clear that product |
| 5712 | 11 | 34 | 1 | 34 | 3 | Research to find possibility of increasing the capacity of soil to store more carbon also needs to be flagged here. | Partially Accepted, Added in knowledge gaps section instead |
| 2134 | 11 | 34 | 1 | 34 | 3 | may also mention the potential of certain agricultural practices to increase soil carbon, not only referring to forests: i.e. add "…or through soil carbon increasing agricultural practices such as legume leys in crop rotations or use of organic fertilizers" | Accepted, Revised (this part was deleted due to shortening) |
| 5584 | 11 | 34 | 1 | 34 | 6 | One principal bullet that has been excluded is: | Noted, Not a comment |
| 5585 | 11 | 34 | 1 | 34 | 6 | · Using more fully the NPP in the existing biomass stock, especially wood. | Accepted, Revised (this part was |
| 15189 | 11 | 34 | 10 | 34 | 11 | delete (and replace with lines 16-17) | Accepted, Revised |
| 11301 | 11 | 34 | 12 | | | Actually the term 'urban' does appear in this figure, but it is deliberately excluded from the landuse flows that this diagramme depicts. Urban and peri-urban agriculture calls this into question. | Accepted, Figure revised and improved |
| 5073 | 11 | 34 | 13 | 34 | 13 | don't like "Figure 11.6" very much it really does not stand alone and the discussion is just as effective as the figure | Accepted, Figure revised and improved |
| 14731 | 11 | 34 | 16 | | | Figure 11.6 demonstrates..." my suggestion is Figure 11.6 establishes… | Accepted, Figure revised and improved, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5586 | 11 | 34 | 19 | 34 | 20 | Again the use of the existing NPP has been excluded. | Rejected, This claim is not correct. First, the chapter discusses increased use of "existing NPP", e.g. through increased use of wood in long-lived products. Second, the literature reviewed there also shows that "use of existing NPP" does not reduce GHG emissions under all circumstances, see Werner et al., 2010, Environmental Science & Policy 13, 72–85, Holtsmark 2011, Climatic Change, Schulze et al. 2012, GBC |
| 3860 | 11 | 34 | 21 | 34 | 21 | I don't agree that organic agriculture, in general, involves adoption of less intensive cultivation technologies. Since the yield is lower than for traditional agriculture we need larger areas to fulfill food and feed demand. Larger areas are associated with higher GHG emissions from LUC and iLUC. | Accepted, Revised |
| 13329 | 11 | 34 | 7 | 34 | 11 | Her we are talking about production side vs. Consumption side activities, yet the terminology is not consistent with previous sections. Assure throughout chapter 11 that consisten terminology is used for consisten concepts. | Accepted, Revised |
| 11300 | 11 | 34 | 7 | 34 | 8 | AFOLU mitigation is not only about land management and technology, but also about planning and (sustainable) configuration (e.g. AFOLU configured to work with watersheds, avoid critical biodiversity hotspots and remain located close to markets). | Noted, We agree but there is not sufficient space to discuss this in detail. To some extent this issue is covered in the discussion of local food (diet change |
| 11208 | 11 | 34 | 9 | | | first mention of governance. This needs expansion here and throughout the text | Partially Accepted, Revised - governance is discussed in another |

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| 15614 | 11 | 34 | 16 | 35 | 5 | The environmental, health, and animal welfare benefits of diet changes are vast, as listed in my comment 2. I suggest citing and discussing some of the following additional studies, as well as including animal welfare. Mekonnen M.M. and A.Y. Hoekstra (2012). A global assessment of the water footprint of farm animal products. Ecosystems 15, 401-15. Available at: http://doc.utwente.nl/80897/1/Mekonnen-Hoekstra-2012-WaterFootprintFarmAnimalProducts.pdf. Eshel G. and P. Martin (2009). Geophysics and nutritional science: toward a novel, unified paradigm. The American Journal of Clinical Nutrition 89(suppl), 1710S-16S. McMichael A.J., J.W. Powles, C.D. Butler, and R. Uauy (2007). Food, livestock production, energy, climate change, and health. The Lancet 370, 1253-63. Marlow H.J., W.K. Hayes, S. Soret, R.L. Carter, E.R. Schwab, and J. Sabaté (2009). Diet and the environment: does what you eat matter? The American Journal of Clinical Nutrition 89(suppl), 1699S-703S. Donner S.D. (2007). Surf or turf: a shift from feed to food cultivation could reduce nutrient flux to the Gulf of Mexico. Global Environmental Change 17, 105-13. Industrial systems now produce approximately two-thirds of the world's poultry meat and eggs, and more than half of all pork. Food and Agriculture Organization of the United Nations (2009). The state of food and agriculture: livestock in the balance (Rome, Italy: FAO, p. 27). Available at: http://www.fao.org/docrep/012/i0680e/i0680e.pdf. The breadth of scientific evidence demonstrating that intensively confined animals are frustrated, distressed, and suffering under modern production schemes is extensive, conclusively substantiating that battery cages for egg-laying hens and crates for pregnant sows and calves are simply not appropriate environments. Duncan I.J.H. (1970). Frustration in the fowl. In: Freeman B.M. and Gordon R.F. (eds.), Aspects of Poultry Behaviour (Edinburgh, Scotland: British Poultry Science Ltd., pp. 15-31). Špinka M. (2006). How important is natural behaviour in animal farming systems. Applied Animal Behaviour Science 100(1-2),117-28. Baxter M. (1994). The welfare problems of laying hens in battery cages. The Veterinary Record 134(24), 614-9. Dawkins M.S. (1990). From an animal's point of view: motivation, fitness, and animal welfare. Behavioral and Brain Sciences 13, 1-61. Vestergaard K. (1984). An evaluation of ethological criteria and methods in the assessment of well-being in sows. Annales de Recherches Vétérinaires (Annals of Veterinary Research) 15(2), 227-36. Broom D.M., Mendl M.T., and Zanella A.J. (1995). A comparison of the welfare of sows in different housing conditions. Animal Science 61, 369-85. European Commission, Scientific Veterinary Committee, Animal Welfare Section. 1995. Report on the welfare of calves. Adopted November 9. Available at: http://ec.europa.eu/food/fs/sc/oldcomm4/out35_en.pdf. | Accepted, Revised - introduced a sentence and a reference in the subsection on demand-side measures. It fitted better than here due to length concerns. However, not all those references could be incorporated due to length restrictions. |
| 12414 | 11 | 35 | 1 | 35 | 1 | The expression "healthier diets" used here and a number of other places in chapter 11 could be replaced with "diets with a lower share of animal products". This is more informative and neutral. In developed countries lower consume of animal products will be healthier for most people, but in developing countries, more protein also from animal products will for many people improve their health. | Accepted, Revised and clarified. Because demand-side issues were moved from section 11.3 to section 11.4, this part was integrated in the |
| 5075 | 11 | 35 | 1 | 35 | 1 | in the sentence "A critical factor is the 'displacement factor', i.e. the fraction of the 20 energy crop plantation area that is replaced by crop production somewhere else (RJ Plevin et al., 21 2010)." you introduce yet another term for leakage and indirect land use which i would not. also this was covered twice above why again? | Accepted, Deleted - refers to p 36, line 20 |

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| 5076 | 11 | 35 | 1 | 35 | 1 | thare are some empirical papers on this these include Baker, J.S., B.A. McCarl, B.C. Murray, and R.B. Jackson, "Assessing Domestic Land Use Change under Simultaneous Bioenergy and Climate Mitigation Incentives", Presented at the World Congress on Resource Economics, Toronto, 2010. Mosnier, A., P. Havlk, H. Valin, J.S. Baker, B.C. Murray, S.J. Feng, M. Obersteiner, B.A. McCarl, S.K. Rose, and U.A. Schneider, "Alternative U.S. Biofuel Mandates and Global GHG emissions: The Role of Land Use Change, Crop Management and Yield Growth", Energy Economics, second review, 2012. Baker, J.S., B.A. McCarl, B.C. Murray, S.K. Rose, R.J. Alig, D.M. Adams, G.S. Latta, R.H. Beach, and A. Daigneault, "Net Farm Income and Land Use under a U.S. Greenhouse Gas Cap-and-Trade", AAEA Policy Issues, Issue 7: April 2010 (http://www. aaea. org/publications/policy-issues/PI7. pdf), 2010. | Partially Accepted, detail now in the bioenergy annex |
| 5077 | 11 | 35 | 1 | 35 | 1 | technology is a pretty big factor in mitigation Mosnier, A., P. Havlk, H. Valin, J.S. Baker, B.C. Murray, S.J. Feng, M. Obersteiner, B.A. McCarl, S.K. Rose, and U.A. Schneider, "Alternative U.S. Biofuel Mandates and Global GHG Baker, J.S., B.C. Murray, B.A. McCarl, S.J. Feng, and R. Johansson, "Implications of Alternative Agricultural Productivity Growth Assumptions on Land Management, Greenhouse Gas Emissions, and Mitigation Potential", American Journal of Agricultural Economics, forthcoming, 2012. Mosnier, A., P. Havlk, H. Valin, J.S. Baker, B.C. Murray, S.J. Feng, M. Obersteiner, B.A. McCarl, S.K. Rose, and U.A. Schneider, "Alternative U.S. Biofuel Mandates and Global GHG emissions: The Role of Land Use Change, Crop Management and Yield Growth", Energy Economics, second review, 2012. | Partially Accepted, detail now in the bioenergy annex |
| 5074 | 11 | 35 | 1 | 35 | 38 | lots of redundancy to above and another opportunity to shorten | Accepted, Revised |
| 2628 | 11 | 35 | 1 |  | 5 | The diet discussions have been interesting to read even though it doesn't show up again when much of the information is summarized. My only point on this is that it is an individual decision and behavioral change which will be more difficult to achieve so the benefits are less achievable. Other practices are government and organization controlled so there is an institutional change in behavior that is possible, i.e., more likely a broad impact and behavioral change. Is it worth including some discussion on this point? | Accepted, Yes - added for the SOD |
| 2135 | 11 | 35 | 14 | 35 | 14 | may also add the following reference that directly addressess this trade-off: Muller, A. (2009). Sustainable Agriculture and the Production of Biomass for Energy Use, Climatic Change 94(3-4): 319-331 | Accepted, Reference added |
| 16578 | 11 | 35 | 15 | 35 | 22 | This paragraph assumes that land sparing will result from yield increases, but a later section (p. 69 lines 1-12) indicates, and cites evidence, to show that this assumption is questionable. The chapter needs to be consistent on this controversial question; the treatment on p. 69 is better since it takes into account at least some of the literature that questions land sparing (see also papers by Angelsen, Minang, Perfecto and Vandermeer). | Accepted, Revised |
| 15237 | 11 | 35 | 15 |  |  | "land sparing" might also have rebound effects at the farm level. As yields increase, economic benefit per piece of land increase, and there is higher pressure to expand farmlands. Ref: Matson, P. A. & Vitousek, P. M. 2006. Agricultural Intensification: Will Land Spared from Farming be Land Spared for Nature? Conservation Biology, 20: 709-710. | Accepted, Revised, reference added. |
| 15190 | 11 | 35 | 2 | 35 | 3 | repeats earlier sections | Accepted, Deleted here, integrated in demand-side section (11.4.3.) |
| 14437 | 11 | 35 | 20 | 35 | 22 | This is an important point, that observation suggests that yield improvements have not lead to land-sparing, rather to increase in consumption. As currently written this sentence does not integrate well into the other points made in this paragraph. | Accepted, Revised, reference added. |
| 11988 | 11 | 35 | 21 |  | 21 | "rebound effects" need to expand what these might be, e.g. increased deforestation for crop land. | Accepted, Revised, reference added. |
| 7080 | 11 | 35 | 23 | 35 | 32 | The benefits of higher forest productivity in increasing the potential for the land should also be mentioned. A good reference is Fox, T. E. (2004). The Evolution of Pine Plantation Silviculture in the Southern United States. In H. M. Rauscher, & K. e. Johnsen, Southern forest science: past, present, and future: Gen. Tech. Rep. SRS-75 (p. 394). U.S. Department of Agriculture, Forest Service, Southern Research Station. | Rejected, Not peer reviewed and pre-2007 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3861 | 11 | 35 | 23 | 35 | 32 | The amount of land required for biofuel production can be very modest as shown in Pacca and Moreira, 2011. Thus, it may be useful to reconsider the view that large scale biofuels production is a serious competitor for land use - Pacca, S. and J. R. Moreira, 2011. A Biorefinery for Mobility? Environ Sci Technol. 2011 Nov 15;45(22):9498-505. | Accepted, Revised; mostly moved to bioenergy annex |
| 5589 | 11 | 35 | 33 | 35 | 35 | If much more use is made of existing NPP, then the competing uses of biomass may be greatly reduced, especially if marginal land and waste land is taken into more productive use. | Partially Accepted, Use of marginal land for bioenergy has now been moved to |
| 13532 | 11 | 35 | 34 | 35 | 34 | ...may also (or may not) | Accepted, Revised |
| 9454 | 11 | 35 | 36 | | 38 | True, but how? This chapter would benefit from discussion specific to AFOLU of how mitigation strategies can be implemented. | Partially Accepted, These issues are discussed in section 11.7 and 11.10 |
| 13533 | 11 | 35 | 38 | 35 | 38 | (OPRE, MEM-ADC, 2001; EEP, MST-MEM, 1994) | Rejected, Not clear what is meant by |
| 15191 | 11 | 35 | 40 | 25 | 48 | could cut whole paragraph (it's already been covered | Accepted, Whole paragraph has been |
| 3862 | 11 | 35 | 40 | 35 | 42 | This is a point where the conclusion from Pacca and Moreira, 2011 can be commented. - Pacca, S. and J. R. Moreira, 2011. A Biorefinery for Mobility? Environ Sci Technol. 2011 Nov 15;45(22):9498-505. | Accepted, Whole paragraph has been excluded. But paper is now cited in the |
| 5591 | 11 | 35 | 40 | 35 | 48 | . In my opinion, the upper limit for bioenergy crops of 9900 Mha is unrealistic. Much increased bioenergy could come from a much better use of existing NPP. | Rejected, Which would not then increase the area |
| 10610 | 11 | 35 | 40 | | | Update from 2004 | Accepted, Update to 2010: HH: I only found numbers for 2007. I hope others |
| 12415 | 11 | 35 | 41 | 35 | 43 | The sentence states "In 2050, energy crops might occupy 1.3-9.9 Mkm2(9-65 % of current cropland which amounts to 15.2million km2) if ambitious bioenenergy strategies are pursued." 9-65 % is a very wide interval. Could it be explained which different assumptions are covered by "ambitious bioenergy strategies"?. To move from the existing 1 % (2004) to 65 % of crop area to bioenergy in 2050 is quite more ambitious than to 9%. | Accepted, Whole paragraph has been excluded; issues are now discussed (in revised form) in the bioenergy annex |
| 10611 | 11 | 35 | 41 | | | IEA, 2006 not listed in refs | Accepted, Zotero updated for SOD |
| 5590 | 11 | 35 | 42 | 35 | 42 | 15.2 mio km2 should read 15.2 M km2 (1520 M ha.) | Accepted, Whole paragraph has been |
| 14732 | 11 | 35 | 43 | | | (Coelho et al., 2012), (H. Haberl et al., 2010)…should be changed to (Haberl et al., 2010; Coelho et al., 2012). | Accepted, Zotero updated for SOD |
| 16579 | 11 | 35 | 45 | 35 | 45 | Here, and in several other places, the phrase "avoided deforestation" is used as if it were comparable to afforestation, bioenergy or other new activities that reduce available land. It is not; deforestation is the land use change, and "avoided deforestation" is no change. Including it with these other activities effectively makes deforestation the default assumption; I doubt if the authors of the chapter wish to introduce such a bias in favor of one kind of land use change, but against others. (You certainly wouldn't refer to "avoided conversion of cattle pastures", for example!) | Accepted, Terminology has been improved. |
| 14733 | 11 | 35 | 46 | | | the same as above in chronological order, (Wackernagel et al., 1999; Murtaugh and Schlax, 2009 and Dietrich, et al., 2011). | Accepted, Zotero updated for SOD |
| 11168 | 11 | 35 | 6 | | | In this secton, it is enphasized that options in the AFOLU sector often cause competition or trade-off. However, it is mainly happen in the energy crops and not common in forestry sector. | Rejected, This is in the AFOLU sector |
| 5587 | 11 | 35 | 8 | 35 | 8 | Again I stress that the fist bullet should be: | Rejected, Not a comment |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5588 | 11 | 35 | 8 | 35 | 8 | · Much more use of the existing NPP, especially from wood. | Noted, Increased use of wood is discussed in the demand-side section (11.4.3). The literature very clearly shows that increasing wood use does not always reduce GHG emissions (Werner et al., 2010, Environmental Science & Policy 13, 72–85). Increasing wood harvest in forests results in a C debt because trees are felled that would otherwise store C and would also continue to grow. Simple (e.g. various papers by Holtsmark and Cherubini) as well as complex models (e.g. Boettcher et al. 2012, GCB Bioenergy, vol 4(6), 773-783) show that this results in complex changes in flows and stocks of C in forests as well as socioeconomic |
| 8837 | 11 | 35 | | | | I would appreciate a more elaborated explanation on iLUC, on the mechanism, the available estimation methods (models) and their assumptions. How is the displacement factor estimated and which land use type is targeted in this displacement and in which geographical region. | Accepted, No space to give detailed explanation in ILUC and LUC treatment in the models. Methodology can be |
| 14438 | 11 | 35 | | 37 | | This section repeats land-pressure issues discussed earlier (11.3.2, 11.4.2) such as water scarcity and the impact of a changing diet. There may be opportunities for reducing text length by editing these sections. | Accepted, Revised. |
| 3863 | 11 | 36 | 10 | 36 | 11 | First generation energy crops can build up carbon stocks while delivering bioenergy, as is the case of sugar cane in Brazil (EPA, 2010). Combining with CCS, the result is negative emission (see Pacca and Moreira, 2009). EPA, 2010 - EPA (Environmental Protection Agency). Renewable Fuel Standard Program (RFS2), Regulatory Impact Analysis. Assessment and Standards Division, Office of Transportation and Air Quality. EPA-420-R-10-006, February (2010). Pacca, S. and J. R. Moreira, 2009. Historical carbon budget of the brazilian ethanol program, Energy Policy, 2009, vol. 37, issue 11, pages 4863-4873 | Accepted, Changed from 2nd generation to perennial crops (now includes sugarcane). |
| 2629 | 11 | 36 | 11 | | | Lands that used to be for food crops and no longer are used for this purpose are typically less productive. Therefore growing energy crops will need considerable amount of fossil inputs as fertilizers, pesticides, etc. | Rejected, The logic is flawed. Some crops grow well on less fertile land. |
| 10109 | 11 | 36 | 16 | 36 | 17 | The price calculations I assume do not take into account the potential to reduce demans throug less waste and less meat (esp beef) dicussed above in theis chapter. | Noted, Correct - they do not |
| 3864 | 11 | 36 | 18 | 36 | 20 | Why not quote EPA, 2010 presents a much smaller figure? Why not quote Chapter 2 - Biomass from Special Report on Renewables that concludes that iLUC effects evaluation are decreasing as most fresh literature calculates with improving resolution soil uses? EPA, 2010. EPA (Environmental Protection Agency). Renewable Fuel Standard Program (RFS2), Regulatory Impact Analysis. Assessment and Standards Division, Office of Transportation and Air Quality. EPA-420-R-10-006, February (2010). | Accepted, Strongly revised and moved to bioenergy annex |
| 5593 | 11 | 36 | 23 | 36 | 24 | What is meant by 100g CO2 eq/MJ? 100 g CO2 contains 27 g C, which has an energy value of about 1 MJ. Why would LUC emissions increase under such crops? In fact the opposite may occur. | Accepted, This paragraph has been excluded due to length restrictions |
| 2630 | 11 | 36 | 24 | | 30 | Not all bioenergy production needs to deforest. This only happens when converting forests to ag production, e.g., palm oil. | Accepted, Revised. |
| 7081 | 11 | 36 | 27 | 36 | 30 | It is more than just the avoidance of deforestation - it is also, as clearly noted in the Fourth Assessment Report, the need for sustainable forest management to maintain or increase carbon stocks while producing a continued output of product. (Forth Assessment Report, WGIII, Ch. 9, Executive summary) | Accepted, This paragraph has been excluded due to length restrictions |
| 5594 | 11 | 36 | 28 | 36 | 29 | As stated above, the avoidance of deforestation could occur through a more fully use of NPP, increasing agricultural productivity, changing diet and tempering population increase. | Accepted, This paragraph has been excluded due to length restrictions |
| 16580 | 11 | 36 | 31 | 36 | 31 | Another place where "avoided deforestation" is combined with land use changing activities, making deforestation the default. | Accepted, Terminology has been improved. |

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| 5078 | 11 | 36 | 31 | 36 | 31 | the statement "However, restrictions of agricultural expansion resulting from avoided deforestation, expansion of 31 energy crop areas, afforestation and reforestation are expected to increase food and feed prices and 32 costs of agricultural production. Integrated assessments of land use based mitigation options 33 indicate that conserving natural" could be stronger. see the discussion in Abbott, Philip; Hurt, Christopher; and Tyner, Wallace E. What's Driving Food Prices? Farm Foundation Issue Report, July 2008. www.farmfoundation.org. there is a 2012 update | Noted, This paragraph has been excluded due to length restrictions |
| 5595 | 11 | 36 | 31 | 36 | 41 | This paragraph states that one outcome of LUC may be an increase in food prices. But this will most likely change food eating habits to more grain eating rather than meat consumption. This is what you have previously argued, so should it not be encouraged? | Rejected, This paragraph has been excluded due to length restrictions |
| 16581 | 11 | 36 | 34 | 36 | 36 | The Wise et al. paper on which these comparisons are based assumes a world-wide carbon tax on fossil fuels. This unlikely assumption is critical to its prediction of increased food prices. Thus I suggest you drop this first sentence. | Accepted, This paragraph has been excluded due to length restrictions |
| 15192 | 11 | 36 | 4 | 36 | 30 | repetitive of bioenergy ection | Accepted, This paragraph has been excluded due to length restrictions |
| 5592 | 11 | 36 | 4 | 36 | 30 | This whole paragraph assumes that the will be no increased use of NPP and that energy crops will be grown on converted forests and woodlands. This is highly unlikely. Even when natural forests are converted to eucalyptus plantations, the annual growth of eucalyptus is at least 50% more and with the use of the wood for charcoal production, which is then used for steel manufacture in place of fossil fuels gives a positive GHG balance after about 15 years and thereafter. | Accepted, This paragraph has been excluded due to length restrictions |
| 13534 | 11 | 36 | 41 | 36 | 41+ | Indeed, it's more relevant and useful develop trade agreements and finance controls that could reduce or avoid the artificial rise of food prices, which have doubled and tripled, well before the end of the century. | Accepted, Revised by including text on trade as an adaptation option.. |
| 16582 | 11 | 36 | 42 | 36 | 45 | This sentence understates the point. Forest conservation will tend to incentivize increase yields, by reducing the supply of cheap land for agricultural expansion. Limiting expansion on the extensive frontier will lead to more expansion on the intensive frontier. Thus forest conservation is not simply something that can be compensated by increased yields, but also will tend to stimulate them. | Accepted, This paragraph has been excluded due to length restrictions |
| 5079 | 11 | 36 | 42 | 36 | 42 | the study by Mosnier, A., P. Havlk, H. Valin, J.S. Baker, B.C. Murray, S.J. Feng, M. Obersteiner, B.A. McCarl, S.K. Rose, and U.A. Schneider, "Alternative U.S. Biofuel Mandates and Global GHG emissions: The Role of Land Use Change, Crop Management and Yield Growth", Energy Economics, second review, 2012. looks at global issues with bioenergy and yield growth | Noted, This paragraph has been excluded. Publication could also not be found. |
| 2631 | 11 | 36 | 47 | | 49 | The list includes most of the factors that one would assume is soil degradation. Remove soil degradation from the list but introduce it. | Rejected, Unclear comment of the reviewer. |
| 10110 | 11 | 36 | 48 | 36 | 48 | This argumentation forgets that it means also increased income for farmers, we are taking about agricultural investments not costs, the investments can have high/or acceptable returns, often there is a time lag before the increased productivity will be realised, but since we are at the same time talking about economic development and poverty reduction, the investments are bot economically, socially and environmentally justified. Further it is assumed that it is not possible to increase productivety or intensify without negative environmental impacts, we have a lot of evidence of farming practices and especially systems where productivity (per land area) can be increased sustainably. the issue is very much about research politics and what kind of technical solutions are promoted. | Noted, This paragraph has been excluded due to length restrictions |
| 11816 | 11 | 36 | 5 | | | LUC is here introduced the first time as an abbreviation but has been used already earlier in the document. | Accepted, Revised |
| 5379 | 11 | 36 | 11 | 36 | 16 | Suggest adding a citation to Rooney et al (2012) as this speaks directly to the point being made in this passage Rooney, R.C., S.E. Bayley, and D.W. Schindler, Oil sands mining and reclamation cause massive loss of peatland and stored carbon. Proceedings of the National Academy of Sciences, 2012. 10.1073/pnas.1117693108 | Accepted, This paragraph has been excluded. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14676 | 11 | 36 | 33 | 36 | 36 | Production of bioenergy can keep energy prices down. If energy prices rise, food prices will rise. With biofuels in the mix the relationship between energy prices and food prices becomes more complicated. | Noted, Considered, but no peer-reviewed literature could be found to support the complex hypothesized |
| 15615 | 11 | 36 | 45 | 36 | 49 | As listed in IAASTD, 2009 (section 7.3.2.4, pp. 471-72), animal welfare is important. The possible negative effects of intensification on animal welfare should be added. And, as mentioned above, the breadth of scientific evidence demonstrating that intensively confined animals are frustrated, distressed, and suffering under modern production schemes is extensive, conclusively substantiating that battery cages for egg-laying hens and crates for pregnant sows and calves are simply not appropriate environments. Duncan I.J.H. (1970). Frustration in the fowl. In: Freeman B.M. and Gordon R.F. (eds.), Aspects of Poultry Behaviour (Edinburgh, Scotland: British Poultry Science Ltd., pp. 15-31). Špinka M. (2006). How important is natural behaviour in animal farming systems. Applied Animal Behaviour Science 100(1-2),117-28. Baxter M. (1994). The welfare problems of laying hens in battery cages. The Veterinary Record 134(24), 614-9. Dawkins M.S. (1990). From an animal's point of view: motivation, fitness, and animal welfare. Behavioral and Brain Sciences 13, 1-61. Vestergaard K. (1984). An evaluation of ethological criteria and methods in the assessment of well-being in sows. Annales de Recherches Vétérinaires (Annals of Veterinary Research) 15(2), 227-36. Broom D.M., Mendl M.T., and Zanella A.J. (1995). A comparison of the welfare of sows in different housing conditions. Animal Science 61, 369-85. European Commission, Scientific Veterinary Committee, Animal Welfare Section. 1995. Report on the welfare of calves. Adopted November 9. Available at: http://ec.europa.eu/food/fs/sc/oldcomm4/out35_en.pdf. | Accepted, Revised as suggested. |
| 5596 | 11 | 37 | 1 | 37 | 50 | This page is a mainly negative take on bioenergy production, except line 43 which talks about the multifunctional use of land | Rejected, Statement - not a comment. |
| 16583 | 11 | 37 | 10 | 37 | 10 | Clarify whether by "freshwater use" you mean withdrawal or consumption. | Accepted, Revised |
| 5825 | 11 | 37 | 12 | 37 | 15 | Please correct sentence, it is not understandable. | Accepted, Revised |
| 10111 | 11 | 37 | 13 | 37 | 14 | It has to be remembered that reforestation of watershed aread can actually be an important way to improve the water availablility for agriculture downstream | Rejected, Statement - not a comment |
| 13330 | 11 | 37 | 18 | 37 | 21 | This sentence is not clear. The term shadow prices requires some explanation as well. | Accepted, Revised |
| 13535 | 11 | 37 | 26 | 37 | 26+ | It would be useful, look into the links between prices, shadow prices, real costs, so as different water management practical water management solutions applied by local communities, based on needs, use value, and the importance of supposed "externalities" (Kumar, A., Huici C.,J.,1996; Postel, S., 1989; Rogers, P., et al., 2001). | Rejected, Unclear comment of the reviewer, reference could not be found. |
| 5826 | 11 | 37 | 27 | 37 | 34 | Please re-order paragraph, can be shortened by 2 - 3 lines. | Accepted, Revised |
| 15351 | 11 | 37 | 27 | 37 | 28 | http://www.maweb.org/en/index.aspx | Rejected, Unclear comment of the |
| 15352 | 11 | 37 | 28 | 37 | 31 | Sajwaj, T et al (2008) The Eliasch Review: Forest management impacts on ecosystem services, AEA http://www.ibcperu.org/doc/isis/11528.pdf | Rejected, Unclear comment of the reviewer. |
| 5080 | 11 | 37 | 32 | 37 | 32 | I think the statement "Biodiversity conservation is therefore a necessity," is an unsubstantited conclusion and should be toned down, perhaps use highly desirable. This is not your subject | Accepted, Revised |
| 10250 | 11 | 37 | 35 | 37 | 42 | Already said p.30 | Accepted, Revised |
| 5082 | 11 | 37 | 35 | 37 | 35 | food demand yet again. Somne serious reorganization is needed. (Yes I know it was glued together although this is the fod not the zod and it has a lot of redundancies) | Accepted, Revised |
| 16584 | 11 | 37 | 36 | 37 | 38 | Same point as numbers 47, 49 and 50 -- need to distinguish beef from other animal products, for which the land requirements are much less. | Accepted, This paragraph has been excluded due to length restrictions |
| 13536 | 11 | 37 | 40 | 37 | 40 | if to be concerned only about GHG emissions, also show | Rejected, Unclear comment of the |
| 5508 | 11 | 37 | 43 | | | A diagram to illustrate multi purpose land use and associated benefits would be helpful | Accepted, See completely newly written section 11.1., including a figure making |
| 10112 | 11 | 37 | 43 | 37 | 50 | This is a central insight and the basis for landscape level land management, should not be bureid at a bottom of the bioenergyargumentation only | Accepted, Revised; bioenergy issues have mostly been moved to the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2136 | 11 | 37 | 6 | 37 | 6 | Add the waste-aspect as a third point to land use and yields, e.g. by adding the following "Hereby, the 30-40% of global food wastage (*add a cross reference*) should not be neglected, as reducing this wastage would also lower pressure to increase yields and further intensify production in the context of fewer land availability for crop production." | Partially Accepted, This paragraph had to be excluded due to length restrictions. |
| 15193 | 11 | 37 | 7 | 37 | 26 | THIS is the land/water tension | Accepted, Revised; most material was moved to the Bioenergy Annex |
| 3867 | 11 | 37 | 7 | 37 | 14 | It is worthwhile noting that sugar cane in Brazil usually doesn't require artificial irrigation. How much land will be used in order to achieve 70% increase in water price in Latin America? | Partially Accepted, This paragraph had to be excluded due to length restrictions (parts of the material are now in the |
| 3866 | 11 | 37 | 7 | 37 | 8 | Why not comment AR4, Chapter 2 - Bioenergy main conclusion here. Bioenergy production can be performed in the right and in the wrong way. When using the right way there are significant benefits. | Partially Accepted, This paragraph had to be excluded due to length restrictions (parts of the material are now in the |
| 14677 | 11 | 37 | 21 | 37 | 22 | C4 plants generally have a higher water use efficiency than C3 plants. If a C4 plant replaces C3 plants transpiration may go down. | Partially Accepted, This paragraph had to be excluded due to length restrictions (parts of the material are now in the |
| 5380 | 11 | 37 | 27 | 37 | 34 | What is said here is certainly true. However this seems a little too black and white. If we do not reduce GHG emissions that will certainly have a negative impact on biodiversity. Biodiversity and GHG mitigation will have to be balanced. The text here reads as if it is obvious that protection of biodiversity is the more worthy goal. The point that climate change is bad for biodiversity is made a few pages down in Chapter 11. Perhaps a pointer could be provided here to this later text so the reader understands the authors of chapter 11 see this as a nuanced balancing of goals. | Accepted, Revised; mostly moved to bioenergy annex |
| 11209 | 11 | 38 | | | | Table 11.6: The section on "Institutional arrangements" should make mention of free, prior and informed consent (FPIC) and could make specific reference to legal recognition of communal tenure regimes of indigenous peoples. | Partially Accepted, The content of this table has been moved. Consideration to FCIP as one option has been included. Land tenure and use rights for |
| 15972 | 11 | 38 | | | | good figure, readability should be improved and discussed. | Accepted, Design improved |
| 5827 | 11 | 38 | | | | Where do you subsume e. g. trade relations and the question of production for subsistence economy or cash crops? | Accepted, Trade and subsistence economy (also informal sector) included |
| 5829 | 11 | 38 | | | | Conditions can also be prohibitive, not only enabling. The figure could also be deleted because it offers no additional information then contained in the text. | Rejected, There are other comments highlighting the usefulness of the graphic. The term "enabling conditions" is well known as such. Of course in absence of such conditions the planning, |
| 11169 | 11 | 38 | | | | The intention of this figure is not clear. This figure must be improved. | Partially Accepted, We got positive and negative comments about this graph. |
| 5597 | 11 | 38 | 12 | 38 | 13 | I entirely agree with Herold (2009) | Noted, |
| 5828 | 11 | 38 | 12 | 38 | 13 | This example is not clear. Besides, deforestation monitoring does not require national or even local capacities: it can be done by remote sensing. | Rejected, Detailed monitoring can not be done only with remote sensing, as the quality and readability of the imagines is not always as high as required. This is especially the case in tropical countries. Additionally, local capacities are also needed for using remote sensing in developing countries. Herold et al 2009 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5598 | 11 | 38 | 15 | 38 | 15 | "--- for example promoting agroforestry plantations". I would use the word systems rather than plantations. In Asia they have the taungya system to grow teak with farmers growing crops for 2 to 3 years, while weeding under the trees and in East Africa they have the shamba system with a similar outcome, but most agro-forestry systems are based on short-rotation trees scattered in the fields or in lines, mainly to improve the soil fertility or to enhance soil fertility while providing brows. Some 'trees' may be on a 1-year rotation, but generally 3-5 years. The trees are not replanted as they coppice. | Accepted, Term improved in the SOD |
| 10168 | 11 | 38 | 15 | 38 | 16 | I lack a specific explanation on how agroforestry improves food security | Accepted, Many agroforestry systems mix wood species with crops and/or with trees producing food. These systems sequester C from the atmosphere and also produce food. A good example are the agroforestry gardens used by farmers in Africa, Asia and Latin America. References are cited in the text. Further references can be found under the publications of ICRAF, including its annual report 2007 - 2008 or Pye-Smith C. 2008. Farming Trees |
| 14439 | 11 | 38 | 17 | 38 | 20 | Text can more strongly state that development must consider the benefits of mitigation strategies with respect to food security. Focusing on mitigation at the expense of creating viable cropping systems which promote local access to nutritious food should not be a possible outcome. We should not endanger nutrition in developing countries to offset the high energy use of developed countries. | Accepted, We agree with the comment. It has been noted repeatedly in the chapter. |
| 11302 | 11 | 38 | 21 | | | This figure may not be necessary. The graphic effects obscure the message which the text alone may explain better anyhow. | Partially Accepted, We got positive and negative comments about this graph. |
| 5083 | 11 | 38 | 3 | 38 | 3 | the statement "as well as in chapter 4 of the AR5" is odd. Ar5 is not out yet what are you referring to? | Rejected, It is a cross reference within |
| 7616 | 11 | 38 | 5 | 38 | 5 | "sustanable future" is incomprehensible term for citizen. This trem would be improved. | Partially Accepted, Sentence improved |
| 15616 | 11 | 38 | 8 | 38 | 10 | The social and human framework in Table 11.6 should include animal welfare. See, e.g. studies including animal welfare in sustainability analyses: Stern S., U. Sonesson, S. Gunnarsson, I. Öborn, K.-I. Kumm, and T. Nybrant (2005). Sustainable development of food production: a case study on scenarios for pig production. Ambio 34(4), 402-407. Mollenhorst H., P.B.M. Berentsen, and I.J.M. De Boer (2006). On-farm quantification of sustainability indicators: an application to egg production systems. British Poultry Science 47(4), 405-417. Additionally, people around the world care about the welfare of animals raised for food. World Society for the Protection of Animals (2007). WSPA International Farm Animal Survey (China & Brazil), Dec. 14; Zogby International (2003). Nationwide views on the treatment of farm animals. Poll for the Animal Welfare Trust; Lusk J.L., F. B. Norwood, and R.W. Prickett (2007). Consumer preferences for farm animal welfare: results of a nationwide telephone survey. Available at http://asp.okstate.edu/baileynorwood/AW2/InitialReporttoAFB.pdf; and Penn, Schoen & Berland Associates (2005). Poll for the Humane Society of the United States, Washington, DC. (Illustrating consumer concern for farm animal welfare in the United States of America.) | Noted, Thanks for the references. Animal welfare can be included in social issues. Why? Because the definition of animal welfare is based on cultural values |
| 10251 | 11 | 38 | 1 | 41 | 49 | This section can be improved with recent papesr that showed/illustrated possibilities of synergy between development and mitigation in AFOLU (e.g. Branca et al. 2013. (available on line) Capturing synergies between rural development and agricultural mitigation in Brazil. Land Use Policy, 30,1 507-518. Also International agencies involved in development activities in the AFOLU sector (FAO, World Bank, GEF, IFAD,...) started to incorporate the "mitigation" (and also "adaptation") aspect, by developing indicators or tools to maximise synergies (see for instance the UNEP Year Book, 2012; The GEF Carbon Benefits project; the Ex-ante carbon balance Tool developed by FAO: http://www.fao.org/tc/exact). | Accepted, Thanks for the references. Were considered when drafting the SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7617 | 11 | 39 | | | | Replace "Sustainable manegement of plantations" with "Sustainable manegement of planted forest" as "Plantation" meams short rotation forestry. | Accepted, Term changed |
| 5599 | 11 | 39 | | | | P39 Table 11.7 Natural assets - Forestry. The statement GHG emissions from forests for rural energy (firewood) are highly relevant in developing countries is wrong. Firewood and wood for charcoal accounts for an estimated 2036 MT dry wood out of a total wood consumption of 2422 Mt dry wood. The annual growth of accessible wood is an estimated 10328 Mt dry wood, (K, Openshaw 2011 –ref above). When burnt, the wood gives off CO2 and some products of incomplete combustion, but if not burnt it will rot giving of CO2 etc. or be eaten by termites etc, which also give off CO2 and CH4 etc. – the carbon cycle. You use it or you lose it! | Partially Accepted, GHG emissions from forest for rural energy are relevant not only because of the carbon balance but because of its importance for the livelihood. Mitigation activities related to firewood will therefore have an impact not only on GHG balance but also on the whole livelihood |
| 5600 | 11 | 39 | | | | Natural assets – Bioenergy. Under natural assets, the stated points are mainly negative. First and foremost the use of NPP should be emphasized. While monoculture has its negative aspects, the most successful natural forests are mainly monoculture –northern temperate forests. The statement about potential increases in GHG emissions should be qualified. Again under livestock, silvopatoral activities have a positive impact when replacing degraded grasslands | Accepted, The whole table has been moved to 11.7 and redrafted |
| 13970 | 11 | 39 | | | | under livestock and manure, a differentiated treatment of manure issues in different management systems is required. The GHG contributions of intensive feedlot manure lagoons are different than the contributions of manure from dispersed pastoralism. | Accepted, The whole table has been moved to 11.7 and redrafted |
| 13971 | 11 | 39 | | | | under cropland management, the claim that increasing productivity has an impact on areas required for food security cannot be made uncritically. Food security is complex, and the effects of increased productivity on who eats is not straightforward, let alone, as mentioned earlier, the impacts that may or may not have on other land uses. | Accepted, The whole table has been moved to 11.7 and redrafted. We agree with the reviewer on the challenges for attributing co-benefits and risks, |
| 13972 | 11 | 39 | | | | under cropland managements, add the word negative in the sentence on large scale monocultures | Accepted, The whole table has been moved to 11.7 and redrafted |
| 13973 | 11 | 39 | | | | under livestock and manure, add the word positive in the sentence on silvopastoral activities | Accepted, The whole table has been moved to 11.7 and redrafted |
| 14440 | 11 | 39 | | 40 | | Tabulating concepts is a very helpful format for concisely presenting the complex interactions discussed. The table should be reviewed for formatting and can be made more concise to improve readability. | Accepted, The whole table has been moved to 11.7 and redrafted |
| 12416 | 11 | 39 | 1 | | | Comment on column on forestry and/or bioenergy, and the row on natural assets: Cutting of boreal forest (and other slow growing forests) may give higher short term emissions of GHG compared to not cutting. The time lag lasts for several decades before the released amount of CO2 is on the same level as if the forest continued growing. Repeated cutting magnifies this time lag. This aspect is important for policy makers to be aware of. | Rejected, Time frame in the context of AFOLU mitigation options is discussed in p. 41 line 25 ff |
| 9455 | 11 | 39 | 1 | | 1 | This table is valuable, but seems mischaracterized. It should be labeled "Factors Affecting Mitigation Activities and Mitigation Outcomes." | Accepted, The whole table has been moved to 11.7 and redrafted |
| 11303 | 11 | 39 | 1 | | | There is too much text in this table for it to be useful as a graphic. It would be much easier to read as listed bullets. | Accepted, The whole table has been moved to 11.7 and redrafted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15617 | 11 | 39 | 1 | 40 | 2 | Table 11.7 should build on the AR4 WGIII Chapter 8, Table 8.8, which at least included qualitative analysis of the effects (+, -, or ?), and explanation in the notes. Table 11.7 here should be made more clear for whether impacts are positive, negative, or unknown. Additionally, the section on "Livestock and manure" (for the "Social and human Framework" and "Natural Assets") should include animal welfare to the extent that AFOLU mitigation options may include intensification that leads to more intensive confinement or other welfare-depriving practices. The breadth of scientific evidence demonstrating that intensively confined animals are frustrated, distressed, and suffering under modern production schemes is extensive, conclusively substantiating that battery cages for egg-laying hens and crates for pregnant sows and calves are simply not appropriate environments. Duncan I.J.H. (1970). Frustration in the fowl. In: Freeman B.M. and Gordon R.F. (eds.), Aspects of Poultry Behaviour (Edinburgh, Scotland: British Poultry Science Ltd., pp. 15-31). Špinka M. (2006). How important is natural behaviour in animal farming systems. Applied Animal Behaviour Science 100(1-2),117-28. Baxter M. (1994). The welfare problems of laying hens in battery cages. The Veterinary Record 134(24), 614-9. Dawkins M.S. (1990). From an animal's point of view: motivation, fitness, and animal welfare. Behavioral and Brain Sciences 13, 1-61. Vestergaard K. (1984). An evaluation of ethological criteria and methods in the assessment of well-being in sows. Annales de Recherches Vétérinaires (Annals of Veterinary Research) 15(2), 227-36. Broom D.M., Mendl M.T., and Zanella A.J. (1995). A comparison of the welfare of sows in different housing conditions. Animal Science 61, 369-85. European Commission, Scientific Veterinary Committee, Animal Welfare Section. 1995. Report on the welfare of calves. Adopted November 9. Available at: http://ec.europa.eu/food/fs/sc/oldcomm4/out35_en.pdf. Additionally, the Table 11.7 section on "Economic Factors" under "Livestock and manure" could include negative impacts on small-holders, to the extent that AFOLU mitigation options indicate industrial farm animal production (IFAP) practices. Mirle C. (2012). The industrialization of animal agriculture: implications for small farmers, rural communities, the environment, and animals in the developing world. The 10th European International Farming Systems Association Symposium in Aarhus, Denmark, July 1-4. Workshop 1.3: Understanding agricultural structural changes and their impacts, to support inclusive policy dialogue and formulation. Available at: http://www.ifsa2012.dk/downloads/WS1_3/ChetanaMirle.pdf. | Accepted, We checked the references. Many of them are either too old for this assessment report (which focuses in new scientific outputs after the AR4) or non-scientific literature. We then looked for recent references that consider the issues highlighted by the reviewer. |
| 7337 | 11 | 39 | | | | under box Natural Assets/Forestry: 'Vulnerability of forest ecosystem to climate change needs to be better understood." Of course it needs to be better understood (doesn't everything in this report?), but we do know quite a bit about this, and as expected, there is a wide variation on vulnerability, depending on species and location. My group has been working on this topic for 17 years, so I include a couple of citations. I would rather see you put something like "Certain forest ecosystems are highly vulnerable to climate change, others not so much". Citations: 1) Iverson L., Matthews S., Prasad A., Peters M. and Yohe G. 2012. Development of risk matrices for evaluating climatic change responses of forested habitats. Climatic Change 114: 231-243. 2) Iverson L.R., Prasad A.M., Matthews S.N. and Peters M. 2008. Estimating potential habitat for 134 eastern US tree species under six climate scenarios. Forest Ecology and Management 254: 390-406. 3) Swanston C., Janowiak M., Iverson L., Parker L., Mladenoff D., Brandt L., Butler P., St. Pierre M., Prasad A.M., Matthews S., Peters M. and Higgins D. 2011. Ecosystem vulnerability assessment and synthesis: a report from the Climate Change Response Framework Project in northern Wisconsin. U.S. Department of Agriculture, Forest Service, Northern Research Station, Newtown Square, PA. p. 142. | Accepted, The whole table has been moved to 11.7 and redrafted. Further, the discussion on vulnerability and adaptation is located in section 11.5. References checked. Some were too local, we were looking for meta-analysis for validating results |
| 15974 | 11 | 4 | 1 | 5 | 26 | The executive summary can be improved to better summarize the remainder of the chapter | Accepted, Revised for SOD |
| 14551 | 11 | 4 | 1 | 5 | 26 | Exec summary general comment: obviously it is hard to write this until all the numbers are in. I would like to see sub headings for difference AFOLU sectiors (e.g. REDD, Aff/ref, agric, livestock,bioenergy. Numbers in each sector. | Accepted, Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2591 | 11 | 4 | 1 | 5 | 26 | The text focuses a lot on the multi-functionality and underestimate the role of the creation of intergrated agricultural activities, which gives priority to food and fibre production. But, at the same time, it does exploit the opportunities to produce bioenergy. There a lot to do in terms of R&D to find adequate solutions in terms of finding species and varieties that adapt to arid zone. | Rejected, Statement - not a comment |
| 9183 | 11 | 4 | 1 | 5 | 26 | You can cut emissions drastically by shrinking agriculture and changing food consumption pattern from meat to vegitable - isn't it an issue in this chapter? | Noted, Sure - all of 11.4 deals with this |
| 14410 | 11 | 4 | 10 | | | Inconsistent. 1.1-1.3 GtC per year is far less than 1/3 of emissions. (Total emissions of CO2 in 2007 were 8 GtC.) Please clarify whether the absolute figure or the 1/3 share is correct. | Accepted, Checked numbers and revised for SOD |
| 14554 | 11 | 4 | 10 | | | this is not the range of ucnertainty, see comments on that section later | Accepted, Gave uncertainty range where |
| 14420 | 11 | 4 | 10 | | | What does 11.2 refer to? A section? Table? | Accepted, Revised for SOD |
| 16523 | 11 | 4 | 11 | 4 | 13 | The recent reductions in estimates of emissions from deforestation, as well as increases in fossil fuel emissions, make the "about one-third" estimate out of date. And in fact it is misleading to use the words "is responsible for" to describe calculations based on estimates for the 1980s and 1990s. For a report coming out in 2013, those decades clearly should be described with "was", not "is". I urge you to calculate the proportion based on the most recent estimates, for the decades of the 2000s, and for all GHGs (not just CO2) in both numerator and denominator, so as to give a reasonable estimate of the role of AFOLU in the overall climate change problem. | Accepted, Updated for 2010 |
| 12359 | 11 | 4 | 11 | 4 | 12 | Please consider to include "fire" in this sentence, since it is one of the main contributors from AFOLU according to Figure 11.1 a) | Accepted, Revised for SOD |
| 6820 | 11 | 4 | 11 | | | It would be helpful to recognise that in terms of the atmosphere forestry is a sink or reservoir and agriculture is a source, with the conversion of forest to agriculture (accounted as) a source. Deforestation causes a rapid carbon stock loss, but the emission (UNFCCC source) may occur at another time/place due to processes such as combustion (eg bioenergy) and decay (eg landfill of wood products).<br>The key point to make is what is the optimal outcome for land use in relation to GHG, before other factors are taken into account. for example this would include high on-site stocks of carbon, regenerative site management (mantaining/enhancing soil carbon, fertility etc), low external inputs (fertilisers, pesticides etc), low fossil fuel energy inputs, and sustainable harvest levels. the quantified GHG impacts are highly dependent on the accounting system adopted ie boundaries (as shown for forestry in AR4) and baselines. | Accepted, Revised for SOD |
| 12866 | 11 | 4 | 11 | 4 | 11 | Change this to read "for one-fourth of anthorpogenic greenhouse pas emissions" because WGIII, Chapter 5, page 4 says 23%. | Partially Accepted, Updated for 2010 |
| 11290 | 11 | 4 | 11 | 4 | 13 | An important point -- and excellent justification for the integrated nature of this chapter -- which is clearly explained in Muller 2010 (Muller, Adrian, Julia Jawtusch and Andreas Gattinger 2011: 'Mitigating Greenhouse Gases in Agriculture'. Stuttgart: Diakonisches Werk der EKD. Original source Bellarby, J et al 2008: 'Cool Farming: Climate impacts of agriculture and mitigation potential'. Amsterdam: Greenpeace International.). The authors may wish to reference these articles in this chapter. | Accepted, Added reference to Bellarby et al. and Mueller et al. |
| 5026 | 11 | 4 | 12 | 4 | 12 | is rice "soil and nutrient" I might stick in the word rice | Accepted, Revised for SOD |
| 16524 | 11 | 4 | 13 | 4 | 13 | The phrase "biomass burning….also" implies that emissions from fires are separable from, and additional to, emissions from deforestation and forest degradation. If the authors have in fact separated out a biomass burning component of emissions it should be explained further on in the chapter; if not, this phrase should be deleted. | Accepted, Revised by Jo House |
| 14555 | 11 | 4 | 13 | 4 | 14 | biomass burning often little net emission as carbon taken up during growth (apart from land clearing fires and peatland fires).land clearing firest in forets already covered by deforestation. Need to be careful about different types of fire in the main text, see comments there. But if you are going to have smaller additional contributions then there are others. E.g could add in land use change other than deforestation here such as expansion of agricultural land into grasslands and peatlands... | Accepted, Revised by Jo House |
| 10578 | 11 | 4 | 13 | | | Add …agricultural "residue" burning | Accepted, Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13950 | 11 | 4 | 13 | | | While I recognize that production of fertilizers is accounted for in another IPCC category, the emissions from production are inextricably linked to their use in agriculture and should be mentioned/referenced here. | Accepted, Revised for SOD |
| 14421 | 11 | 4 | 15 | | | What does 11.3 refer to? A section? Table? | Accepted, Revised for SOD |
| 14556 | 11 | 4 | 16 | 4 | 19 | I find the separation by demand and supply side measures a bit odd and prefer just to see sectorial. E.g. some of reducing losses of waste in food seems to be production rather than demand. It is not clear where bioenergy and Aff/ref fit as they are produced in response to a demand for mitigation. REDD is reducing demand and relocationg production. i would prefer just to see by option without this separation. howevr ican see a lot of work has gone into this thinking so also happy to live with it as long as it is better explained , eg, mention here that REDD aff/def and nioenergy are considered as production side options. | Partially Accepted, Terminonology changed (supply side and demand side) but discussed together |
| 7531 | 11 | 4 | 16 | 4 | 17 | Dividing mitigation options into production-side and demand-side is not good idea. Even AR4 deals with both side options in Chapter 9. All options are linked tightly each other. All options should be summerized in a table. Categorization by sectors and common options (i.e. Agricilture, Forestry, other land uses , land use change and bioenergy) is enough. | Rejected, See other comments giving the opposite view. In AR4 the agriculture chapter did not consider demand side options at all, so this is a |
| 9438 | 11 | 4 | 17 | | 17 | Normalizng across land units presumes that land units are fungible. They are not fungible economically or biophysically. Land area is poor normalization technique for AFOLU interventions. | Rejected, I don't think it assumes fungibility |
| 5534 | 11 | 4 | 18 | 4 | 18 | As stated above, wood consumption could be increased considerably without affecting the growing stock of wood. | Rejected, Do not know of evidence to support the reviewers statement |
| 13951 | 11 | 4 | 18 | | | changes in diet, including with regard to consumption of animal products -- should be specifically mentioned here. | Accepted, Revised for SOD |
| 6821 | 11 | 4 | 19 | | | Displacement of fossil fuels with bioenergy is important under the current accounting system, but this does not reflect the atmospheric impact. Burning carbohydrate emits more C per unit of energy than burning hydrocarbon. | Rejected, Bioenergy can substitute for fossil fuel, thereby reducing emissions in the energy sector |
| 7532 | 11 | 4 | 19 | 4 | 19 | Replace "displacement " with "substitution" which is used in AR4. | Accepted, Reworded throughout |
| 7533 | 11 | 4 | 19 | 4 | 19 | Not only bioenergy. " ... the substitution of fossil fuels through bioenergy and use of wood products .." is better. | Accepted, Revised for SOD |
| 7052 | 11 | 4 | 19 | 4 | 19 | The mitigation benefits of forest-based products go far beyond "bioenergy" and include the indirect displacement of fossil fuels via production and use of biomass based products that can substitute for more GHG-instnsive products", especially when done in a "cascading" framework, as described in Dornburg, V. and A. Faaij, "COst and CO2-emissions reduction of biomass cascading: methodological aspects and case study of SRF poplar", in Climatic Change (2005) ,71: 373–408. | Accepted, Revised for SOD |
| 5390 | 11 | 4 | 2 | 5 | 26 | The Executive Summary need to be shorten to one page or less | Rejected, This is not the guidance we |
| 6819 | 11 | 4 | 2 | | 8 | The unique feature of AFOLU related to GHG is its ability to perform as a sink, source or reservoir. Furthermore it has perhaps the greatest potential for both mitigation and adaptation impacts. | Accepted, Revised for SOD |
| 2260 | 11 | 4 | 2 | 93 | 26 | This entire Chapetr fails to understand that the entire agricultural and forestry industry has as its prime objective the removal of carbon dioxide from the atmosphere. Any increase in either agriculture or forestry should therefore have the benefit of mitigation credits. At present, only forestry is considered to qualify for such benefits. This is completely unfair to the agricultural industry which finds itself penalised for its relatively minor emissions of methane, whch have no effect on the climate, since the atmospheric concentrations are not rising, but gets no credit for its much greater contribution to sequestering carbon dioxide. | Rejected, The statement is untrue. Many activities in the AFOLU sector emit more GHG to the atmosphere than is gained in C sinks. The statement about CH4 having no climate impact is also incorrect. An ill informed comment. |
| 7530 | 11 | 4 | 2 | 4 | 3 | The first sentence "since it has a central role in providing food security, water and livelihoods, and supporting sustainable development" is not appropriate as the first message for AFORU. It is good only for Agriculture. AFOLU is unique because it contributes mitigation by both emission reduction and removal from the sight of climate change mitigations. And it should be stressed that land use change / deforestation is one of key issues at the beginning. | Accepted, Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11111 | 11 | 4 | 2 | | | "Agriculture" has several definitions. Of all definitions, one is related to the LULUCF context where agriculture is limited to animals, and specific aspects of land use, whereas LULUCF includes the rest. In this respect, I suggest that the definition of AFOLU is repeated here (or there is a link to the IPCC 2006 Guidelines). This is important to link all emission and removal data to the correct definition of agriculture. See e.g. Figure 1.3 (Chapter 1) where "Animal husbandry" and "Agriculture" are treated separately - what is then "Agriculture"? | Accepted, Figure 1 in Chapter 1 needs to be revised. Agriculture includes animal husbandry, if the latter means raising livestock for food |
| 2608 | 11 | 4 | 2 | 5 | 26 | The Executive summary does not reflect the key points made in the chapter. The distinction between forest and agriculture land use, especially as related to bioenergy, needs to be clarified. The inclusion of fertilizers is not applied to forests except on industrial lands and that is a small percent of our forests. | Partially Accepted, Revised for SOD |
| 5027 | 11 | 4 | 20 | 4 | 20 | you say "changes in diet can have a significant impact" but getting that implemented may be very hard and I would qualify that some | Accepted, Qualified the statement to recognize it is hard |
| 14557 | 11 | 4 | 21 | 4 | 22 | sentence doesn't tell us much unless more information given. Also this is just true for the different options regardless of semand or suplly side. "May" is a weak term, trade offs are inevitable, synergies exist and will be ciritcal to exploit | Accepted, Revised for SOD |
| 13952 | 11 | 4 | 23 | | | "the nature of the sector" is too vague to be useful in an executive summary | Accepted, Revised for SOD |
| 5704 | 11 | 4 | 25 | | | Replace 'sounding' with word "surrounding". | Accepted, Revised for SOD |
| 15142 | 11 | 4 | 26 | 4 | 26 | replace "between" with 'among" | Accepted, Revised for SOD |
| 5028 | 11 | 4 | 26 | 4 | 26 | limited available resources are also an item forcing tradeoffs (investment capital, land, wate, human capitalr) | Accepted, Revised for SOD |
| 14558 | 11 | 4 | 28 | 4 | 30 | does this sentence need a confidence qualification. | Accepted, Yes |
| 14266 | 11 | 4 | 3 | 4 | 4 | Reption of Reference "Godfray et. al 2010" may be corrected | Accepted, Deleted |
| 15141 | 11 | 4 | 3 | 4 | 4 | duplicated reference | Accepted, Deleted |
| 14552 | 11 | 4 | 3 | 4 | 4 | I don't think you make the right case for it being a unique case, after all energy has a central role in providing energy security. It is rather that use of land for cliamte mitigation comeptes with other uses or priorities of land such as food production and natural capital | Accepted, Reworded |
| 5024 | 11 | 4 | 3 | 4 | 3 | agriculture is also taking on an increasing role in energy | Accepted, Revised for SOD |
| 5025 | 11 | 4 | 3 | 4 | 3 | you might isert fiber or building materials or forest products to encompass forest | Accepted, Revised for SOD |
| 5023 | 11 | 4 | 3 | 4 | 4 | agriculture has a central role in providing … water? Really? Words must be missing | Accepted, Revised for SOD |
| 11974 | 11 | 4 | 30 | | 31 | "Sustainable management of agriculture, forests...". Excellent statement. Completely agree. | Noted, Thank you |
| 11801 | 11 | 4 | 30 | 4 | 31 | This sentence as formulated here is so general and unspecific that it does not convey much information. | Accepted, Removed in edit |
| 13953 | 11 | 4 | 30 | 4 | 31 | I would add here the need for increased research and diffusion of research. | Rejected, Do scientists not always say |
| 7053 | 11 | 4 | 31 | 4 | 31 | To accurately reflect the literature and give adequate attention to the critical role of sustainable forest management, the following conclusion (originally in the fourth assessment report) should be repeated here. i.e. "In the long term, sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual yield of timber, fibre, or energy from the forest, will generate the largest sustained mitigation benefit". (Fourth Assessment Report, WGIII, Chapter 9, Executive Summary) This finding remains true in spite of the recent fondness for focusing on "carbon debt". The carbon debt research does not contradict the important finding in the Fourth Assessment Report. Instead, it highlights the fact that various systems where forest carbon stocks are reduced to produce biomass require differing times to reach the point where the long-term benefits of using the biomass are realized. The fact remains, however, that "In the long term, sustainable forest management strategy aimed at maintaining or increasing forest carbon stocks, while producing an annual yield of timber, fibre, or energy from the forest, will generate the largest sustained mitigation benefit". | Accepted, Has been reflected here - with similar wording |
| 9439 | 11 | 4 | 32 | | 32 | Will the terms top-down and bottom up be defined elsewhere in WG3? If not, I think that they should be defined here | Accepted, Replaced with more explicitly descriptive terms |
| 13954 | 11 | 4 | 35 | 4 | 36 | moreover an overriding concern for food security will require careful evaluation of mitigation options in context-specific manner | Accepted, Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5698 | 11 | 4 | 36 | 4 | 40 | Cost of mitigation per tCO2eq is mentioned for agriculture sector. However, for forestry mitigation potential, the same is not mentioned. It will be advisable to add this figure. | Accepted, Revised for SOD |
| 15955 | 11 | 4 | 37 | 4 | 37 | A range should be given for agriculture, with a lower limit, as is done for forestry | Accepted, Revised for SOD |
| 15143 | 11 | 4 | 37 | 4 | 39 | with falling carbon price, should take care in what kind of estimates and price are highlighted | Noted, Revisit what basis on which to quote economic potentials |
| 11058 | 11 | 4 | 37 | 4 | 39 | Should CO2 eq. also be used in the numerator of the unit as well as the denominator? | Rejected, No - the form of the carbon |
| 5535 | 11 | 4 | 38 | 4 | 39 | There is a surplus of annual growth of an estimated 9 Gt C or 34 Gt CO2 equivalent. This is not taken into account when considering forest mitigation options (1.3 to 4.2 GtCO2/yr). Thus, the potential for 'forest' mitigation is much larger. | Rejected, Please provide a reference for this. What does surplus annual growth mean? |
| 9324 | 11 | 4 | 4 | | | Please delete '(Godfray et al., 2010)'; it appears twice. | Accepted, Deleted |
| 8597 | 11 | 4 | 4 | 4 | 4 | There is only one work of Godfray et al. (2010) in the References section. Thus, it should be cited once in this line. | Accepted, Deleted |
| 11059 | 11 | 4 | 40 | 4 | 44 | Mitigation potential for the agricultural sector will vary at much smaller scales than considered in these sentences - see comment below regarding Section 11.8.3. | Rejected, Cannot see what the reviewer is referring to |
| 14559 | 11 | 4 | 41 | 4 | 42 | suggest delete as unecesary: "for instance, between….rdeveloping regions" | Accepted, Deleted |
| 5029 | 11 | 4 | 42 | 4 | 42 | sentence "In developing countries, agriculture is often central to the livelihoods of many social groups and a significant share of the GDP." is fairly irrelevant and could be dropped | Rejected, Retained, but qualified as suggested in comment on row 1109 |
| 14560 | 11 | 4 | 43 | 4 | 44 | true but link to rest of text e.g by saying at end "COMPARED TO DEVELOPED REGIONS" | Accepted, Revised for SOD |
| 14561 | 11 | 4 | 45 | | | "..is difficult TO ESTIAMTE..."" | Rejected, Removed as below comment |
| 11060 | 11 | 4 | 45 | 4 | 45 | Awkward wording, suggest edit "…difficult to estimate accurately.." | Accepted, Revised for SOD |
| 13955 | 11 | 4 | 48 | | | and the overriding food security priorities/demands at national and subnational levels | Accepted, Revised for SOD |
| 12361 | 11 | 4 | 49 | 4 | 49 | Please consider to add "soils" so the sentence states; "climate change impacts on carbon stocks in forests, soils and future land use…..". Significant C-stocks are found in peat lands and other soils and these are also vulnerable to climate change. | Accepted, Revised for SOD |
| 14562 | 11 | 4 | 49 | | | suggest: "…cliamte change impacts on LAND COVER, carbon stocks in PLANT BIOMASS AND SOILS, and future HUMAN land use.." because climate change could lead to e.g. forest dieback or expansion, as well as loss of soil carbon, etc in natural vegetation as well as deliberate activity changing land use in the future | Rejected, Adopted wording suggested in comment on row 1113 |
| 14553 | 11 | 4 | 7 | | | suggest add: as well as the OTHER COMPETING ecosystem services | Rejected, They do not all compete |
| 12360 | 11 | 4 | 9 | 4 | 10 | Please consider to rephrase, as this sentence is difficult to understand | Accepted, Revised for SOD |
| 9437 | 11 | 4 | 9 | | 9 | Why report global C and not GWP? | Accepted, I think you mean total GHG impact (not the same as GWP) - but we |
| 13304 | 11 | 4 | 9 | 10 | 4 | The link between the introductory sentence is not clear. This paragraph could be reorganised. Is the objective of the paragraphs is to clearly state that there is a great deal of uncertainty in AFOLU estimate methodology? If not it should be clearly stated. | Accepted, Revised for SOD |
| 7051 | 11 | 4 | 9 | 4 | 10 | Cited range does not include atmospheric removals of carbon attributible to forest growth and expansion as documented by Pan, Y., Birdsey, R., Fang, J., Houghton, R., Kauppi, P., Kurz, W., et al. (2011). A Large and Persistent Carbon Sink in the World's Forests. Science Vol. 333 , 988-993. While part of this removal of carbon from the atmosphere may be due to anthropogenic nitrogen fertilization and elevated termperature, Pan et. al. indicate that much of it is clearly attributable to expansion of forestland, regrowth of forest land, and forest management. It is simply wrong to ignore this important flux. | Accepted, Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15602 | 11 | 4 | 11 | 4 | 13 | As mentioned later, the farm animal production sector deserves particular consideration. Steinfeld H., P. Gerber, T. Wassenaar, V. Castel, M. Rosales, and C. de Haan (2006). Livestock's long shadow: environmental issues and options. Food and Agriculture Organization of the United Nations. Available at: ftp://ftp.fao.org/docrep/fao/010/a0701e/a0701e.pdf. Pelletier N. and P. Tyedmers (2010). Forecasting potential global environmental costs of livestock production 2000-2050. Proceedings of the National Academy of Sciences of the United States of America 107(43), 18371-74. Available at: http://www.pnas.org/content/early/2010/09/27/1004659107.full.pdf+html. | Accepted, Revised for SOD |
| 15603 | 11 | 4 | 19 | 4 | 21 | As mentioned later, dietary changes can also positively impact health, non-climate environmental indicators, as well as animal welfare. Mekonnen M.M. and A.Y. Hoekstra (2012). A global assessment of the water footprint of farm animal products. Ecosystems 15, 401-15. Available at: http://doc.utwente.nl/80897/1/Mekonnen-Hoekstra-2012-WaterFootprintFarmAnimalProducts.pdf. Stehfest E., L. Bouwman, D.P. van Vuuren, M.G.J. den Elzen, B. Eickhout, and P. Kabat (2009). Climate benefits of changing diet. Climatic Change 95, 83-102. Eshel G. and P. Martin (2009). Geophysics and nutritional science: toward a novel, unified paradigm. The American Journal of Clinical Nutrition 89(suppl), 1710S-16S. McMichael A.J., J.W. Powles, C.D. Butler, and R. Uauy (2007). Food, livestock production, energy, climate change, and health. The Lancet 370, 1253-63. Marlow H.J., W.K. Hayes, S. Soret, R.L. Carter, E.R. Schwab, and J. Sabaté (2009). Diet and the environment: does what you eat matter? The American Journal of Clinical Nutrition 89(suppl), 1699S-703S. Donner S.D. (2007). Surf or turf: a shift from feed to food cultivation could reduce nutrient flux to the Gulf of Mexico. Global Environmental Change 17, 105-13. Regarding animal welfare, less animals consumed would likely result in less animals being raised and therefore improve animal welfare. Additionally, industrial systems now produce approximately two-thirds of the world's poultry meat and eggs, and more than half of all pork. Food and Agriculture Organization of the United Nations (2009). The state of food and agriculture: livestock in the balance (Rome, Italy: FAO, p. 27). Available at: http://www.fao.org/docrep/012/i0680e/i0680e.pdf. The breadth of scientific evidence demonstrating that intensively confined animals are frustrated, distressed, and suffering under modern production schemes is extensive, conclusively substantiating that battery cages for egg-laying hens and crates for pregnant sows and calves are simply not appropriate environments. Duncan I.J.H. (1970). Frustration in the fowl. In: Freeman B.M. and Gordon R.F. (eds.), Aspects of Poultry Behaviour (Edinburgh, Scotland: British Poultry Science Ltd., pp. 15-31). Špinka M. (2006). How important is natural behaviour in animal farming systems. Applied Animal Behaviour Science 100(1-2),117-28. Baxter M. (1994). The welfare problems of laying hens in battery cages. The Veterinary Record 134(24), 614-9. Dawkins M.S. (1990). From an animal's point of view: motivation, fitness, and animal welfare. Behavioral and Brain Sciences 13, 1-61. Vestergaard K. (1984). An evaluation of ethological criteria and methods in the assessment of well-being in sows. Annales de Recherches Vétérinaires (Annals of Veterinary Research) 15(2), 227-36. Broom D.M., Mendl M.T., and Zanella A.J. (1995). A comparison of the welfare of sows in different housing conditions. Animal Science 61, 369-85. European Commission, Scientific Veterinary Committee, Animal Welfare Section. 1995. Report on the welfare of calves. Adopted November 9. Available at: http://ec.europa.eu/food/fs/sc/oldcomm4/out35_en.pdf. | Rejected, This is dealt with later - does not belong here in such detail |
| 14671 | 11 | 4 | 4 | 4 | 4 | Unless this is done elsewhere in the document it might be useful to indicate what exactly is meant by sustainable development. This is a word that has been appropriated by many over the last few decades and its meaning has been stretched in a wide range of directions. | Rejected, Hopefully done in another chapter - should not be defined here |
| 11210 | 11 | 40 | | | | Table 11.7: Again -- would be useful to include explicit language here on the need to take measures to recognise and secure the land rights of indigenous peoples in left hand column on 'forestry' | Accepted, explicit language to land rights of indigenous peoples can be |
| 11211 | 11 | 40 | | | | Table 11.7: On left column at 'state of infrastructure...'; there is indirect mention of prior agreement: why not insert FPIC here? | Rejected, Because it doesn't belong to infrastructure, but to institutional |
| 11212 | 11 | 40 | | | | Table 11.7: On left column at 'Institutional arrangements' - you could insert here the word 'and recognition' after 'clarification' | Accepted, The whole table has been moved to 11.7 and redrafted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3868 | 11 | 40 | | | | 1st. Row, 3rd. Column. Are you sure that bioenergy production in countries with insufficient political stability can reduce or prevent investment? Look the example of oil and NG investments in some very political unstable countries. | Rejected, 1st Row 3rd column in page 40 discusses availability of infrastructure in cropland management. |
| 5601 | 11 | 40 | | | | Under Forestry –economic factors. I would add --- or with better land management and fuller use of NPP. | Partially Accepted, The whole table has been moved to 11.7 and redrafted |
| 11817 | 11 | 40 | | | | The references should be linked to the content of the table, otherwise they are not so useful | Accepted, The whole table has been moved to 11.7 and redrafted |
| 5830 | 11 | 40 | | | | Notes: There is only one note, so "-s" and "a)" can be deleted. The last sentence is highly speculative and should be deleted. One could also assume that these options are supposedly little researched. | Partially Accepted, The whole table has been moved to 11.7 and redrafted |
| 13974 | 11 | 40 | | | | under the caption. Many developing countries have little to no mitigation burden to bear. Their per capita emissions are below 1 ton and many LDCs have a per capita emission below .1 ton. Equity and responsibility issues also have a very significant bearing on the adoption of agricultural mitigation strategies in countries where actually they might need to increase emissions from agriculture for food production and food security reasons. following on the comment earlier on about who bears the cost of migitation, vs. who is responsible for emissions and thereby derives most of the benefits, excessive costs for assuming someone else's mitigaiton burden might actually go a long way to explaining why there is little experience with agricultural mitigation in developing countries. the lens of the carbon market is really not appropriate for these countries. see for example P. Tschakert. 2004. Carbon for farmers: assessing the potential for soil carbon sequestration in the old peanut basin of senegal. climatic change 67: 273-290. | Rejected, The chapter discusses the opportunities of AFOLU mitigation options, but not the responsibility issue. This is mainly discussed within the UNFCCC, which is a more proper place for this discussion |
| 13975 | 11 | 40 | | | | some differentiated analysis of where responsibilities and mitigtion potential lie, particularly with regard to ch4 and n2o is absolutely essential, as is a breakout of per capita emissions among countries. | Rejected, ibid |
| 11785 | 11 | 40 | | | | Deleate or transfer to WG2 to save the voulme.Climate change impact should be described in WG2. | Accepted, The whole table has been moved to 11.7 and redrafted |
| 5602 | 11 | 41 | 1 | 41 | 39 | This page needs a good edit. | Accepted, Section re -drafted |
| 11304 | 11 | 41 | 13 | 41 | 16 | As both a social and scalar phenomenon, 'city' is missing from the social scale-line. As it is, the sudden jump from 'village' to 'province' makes little sense, and in any case agriculture most likely originated as a result of cities (see Soja, Edward 2000: 'Postmetropolis: Critical Studies of Cities and Regions'. Oxford: Blackwell: 20-27.) | Partially Accepted, City was included in tthe SOD. |
| 14441 | 11 | 41 | 16 | 41 | 17 | Unclear sentence. The topic of this paragraph - mitigation scenarios having potentially negative impacts on regional socio-ecological systems is an important point to emphasize. | Accepted, The whole table has been moved to 11.7 and redrafted |
| 5603 | 11 | 41 | 18 | 41 | 21 | Bio-fuel plantations can also have positive impacts for villagers. The could provide work, sell fuelwood, charcoal and poles etc. | Accepted, Section re -drafted |
| 13331 | 11 | 41 | 27 | 41 | 29 | This sentence is not clear. | Accepted, Section re -drafted |
| 5604 | 11 | 41 | 31 | 41 | 31 | Population growth is a key input and should be mentioned sooner. | Accepted, Section re -drafted |
| 17146 | 11 | 41 | 32 | | | Suggest a more indepth inclusion of Indigenous Peoples and Sustainable Development specifically as it relates to behaviour | Rejected, "indigenous peoples" is indicated in the text as the first example. Indigenous peoples are not the only social group potentially affected; colonos (settlers) or farmers need also to be considered. The awareness of different social groups is key for getting the potential of AFOLU realized as well as |
| 3869 | 11 | 41 | 40 | 41 | 41 | Sustainable management of bioenergy crops is also possible (see AR4, Chapter 2 - Bioenergy),. You should add this to make the text a little less biased against bioenergy. | Accepted, Section re -drafted |
| 5605 | 11 | 41 | 40 | 41 | 49 | . I am in full agreement with this paragraph, as I am with the first paragraph on page 42. | Noted, thanks |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11170 | 11 | 41 | 40 | | | The description "Sustainable management of agriculture, forests, and other land uses –either natural or man-made, such as plantations- is essential to achieving sustainable development." is not clear. Any land management, including agriculture, forestry and other land uses are human-induced activities even if there are some difference of intensity. This sentence should be changed into "Sustainable land management is essential to achieving sustainable development." | Accepted, Section re -drafted |
| 13976 | 11 | 41 | 42 | | | a blanket statement that synergies need to be maximized, including maximization of the mitigation efect, cannot be made. It depends on what country you are in and what your food security demands/needs are. | Partially Accepted, Section re -drafted |
| 3870 | 11 | 41 | 43 | 41 | 44 | Should read "Adequately implemented forestry and agriculture, including bioenergy, mitigation options provide". | Partially Accepted, Section re -drafted |
| 7200 | 11 | 41 | 43 | 41 | 43 | What is adequately implemented? Ideas? Systems? Global? National? See earlier comments. | Partially Accepted, This paragraph has |
| 13977 | 11 | 41 | 43 | 41 | 47 | it is inappropriate to use the 2007 forestry chapter and its conclusions and then conclude that they are also appropriate for the agriculture sector, particularly a claim that mitigation options are an effective means to reduce poverty. There is no empirical evidence for this claim and it should be eliminated. | Accepted, Some of the management options included for AFOLU measures in agriculture have been used in developing countries (although without being used as mitigation options). This experience |
| 2137 | 11 | 41 | 47 | 41 | 47 | may add a reference to the potential of "systemic" approaches to agricultural production, e.g. between "...(Nabuurs et al., 2007)." and "Additional costs…": e.g. the following. "Thereby, it should be accounted for the potential of systemic approaches to agricultural prouction, such as pursued in agro-ecology or organic agriculture (e.g. (El-Hage Scialabba, N., Müller-Lindenlauf, M., 2010. Organic agriculture and climate change. Renewable Agriculture and Food Systems 25, 11.))." | Accepted, Reference assessed |
| 14735 | 11 | 41 | 47 | | | The phase: “Additional costs and human…” is confusing, needs rewriting. | Accepted, Section re -drafted |
| 11818 | 11 | 41 | 9 | 41 | 49 | this text part could be shortened | Partially Accepted, Section re -drafted |
| 5606 | 11 | 42 | 12 | 42 | 12 | What is meant by natural resource space? | Accepted, Text modified |
| 12873 | 11 | 42 | 19 | 42 | 19 | It would be good here to add a key example of the connection between adaptation and mitigation with forest management and forest carbon: "Field trials in western U.S. forests indicate that prescribed burning, mechanical thinning, and retention of large trees can help forest ecosystems adapt to climate change (Stephens et al. 2009) and mitigate greenhouse gas emissions because long-term storage of carbon in large trees outweighs short-term emissions from prescribed burning (Hurteau and Brooks 2011)." Stephens, S.L., J.J. Moghaddas, C. Edminster, C.E. Fiedler, S. Haase, M. Harrington, J.E. Keeley, E.E. Knapp, J.D. McIver, K. Metlen, C.N. Skinner, and A. Youngblood. 2009. Fire treatment effects on vegetation structure, fuels, and potential fire severity in western U.S. forests. Ecological Applications 19: 305-320. Hurteau, M.D. and M.L. Brooks. 2011. Short- and long-term effects of fire on carbon in US dry temperate forest systems. BioScience 61: 139-146. | Accepted, Text Modified |
| 11819 | 11 | 42 | 21 | 42 | 48 | This text part could be cross-referenced to WG2 and then shortened | Accepted, Section restructured, referring |
| 2632 | 11 | 42 | 21 | | 38 | It would be worth clarifying the material a bit. There is a CO2 fertilizer effect if the plant is able to adjust its water use efficiency and nutrient use efficiency. It is unable to adjust its physiological activities, there will be no fertilizer effect. Part of the CO2 fertilizer effect is the increased efficiency of water uptake which could be valuable if the environment becomes more dry. | Accepted, Section restructured, referring to WGII |
| 10113 | 11 | 42 | 24 | 42 | 24 | Scale works also the other way, integrated food-energy systems at farm/communitylevel can mitigate while brininging substantial development benefits (energyavailability, cost savings, additional income source,energy for agricultural production i.e. irrigation pumps, reduced forest degradation etc.) | Accepted, Section restructured, referring to WGII |
| 7338 | 11 | 42 | 25 | 42 | 34 | need citations for the CO2 fertilization effect, and the report that carbon storage would decline with warming. Also the Wamelink study needs more info, including the modeled time frame. And the Metsaranta study -4.5 to +4.5! - needs some indicator as to what key variables matter the most and what business as usual might look like. | Accepted, Section restructured and shortened due to page limitation |
| 5084 | 11 | 42 | 25 | 42 | 25 | I believe brent sohngen has some results that are very different from the those inculded in this paragraph. | Accepted, Section restructured |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5085 | 11 | 42 | 25 | 42 | 25 | you might also talk about the face experiements as they seem to show that forest growth may be somewhat lower than what people project. | Accepted, Section restructured |
| 5086 | 11 | 42 | 25 | 42 | 25 | this first section is somewhat unbalanced. One should also discuss croplands and grasslands. | Accepted, Section restructured |
| 15194 | 11 | 42 | 3 | 42 | 19 | doesn't add much | Accepted, Section restructured and shortened due to page limitation |
| 4277 | 11 | 42 | 30 | 42 | 32 | As worded leaves impression Metsaranta et al worked on European Forest; their work was in British Columbia. Also, listing of growth rates, decay rates, and area burned by wildfire leaves out insect and disease disturbances which are a very large component of forst disturbance in British Columbia and boreal forests more generally. | Accepted, Text modified |
| 5831 | 11 | 42 | 30 | 42 | 38 | Please rephrase this paragraph. Do not put the weight on persons but on the findings. It is also not very polite to refer to G.B. Bonan as "it" as your wording in lines 34 - 36 does. | Accepted, Text modified |
| 13978 | 11 | 42 | 30 | 42 | 36 | how does this data then translate into carbon storage in fields, and what is the relation between increase in T and altered precipitation regimes and carbon storage in fields? | Rejected, These are trees- they are not grown in fields. Misplaced comment? |
| 12417 | 11 | 42 | 34 | 42 | 38 | The lines state that "... carbon cycle feedbacks are projected to increase atmospheric CO2 at the end of the 21. century by 4-44 % equivalent to 20-224 ppm". Could it be clearified, compared to which model scenario this increase will take place? And whether the big interval is caused by uncertainty or by different emission scenarios. | Accepted, Text modified |
| 13332 | 11 | 42 | 36 | | | Remove extra "to" | Accepted, Text modified |
| 7339 | 11 | 42 | 41 | 42 | 43 | Reader needs to know how deforestation in mid-high latitudes may cool the Earth, and by altering what biophysical processes. This is potentially a really important statement in that, if true and taken at face value, why would I not want to go out and harvest the entire boreal forest??? | Accepted, Text based on reference |
| 2633 | 11 | 42 | 41 | | 46 | Shift to deciduous will be more challenging. Deciduous species need higher nutrient contents and even growing season rainfall. If these do not exist, they will not begin to dominate. Most coniferous sites are nutrient poor and have low rainfall during the summer growing season. | Rejected, Projections are for an increase |
| 5832 | 11 | 42 | 43 | 42 | 48 | Please rephrase in a more concise way. I suggest: "Several studies show that there will be an expansion of deciduous woodlands (Edwards et al., 2005; Peros et al., 2008). This can have a positive feedback on regional climate change by creating a positive feedback through albedo and transpiration, and produce a strong warming if they act in combination with sea-ice processes (Swann et al., 2010)." | Noted, Text based on references and is already concise |
| 12418 | 11 | 42 | 47 | 42 | 48 | It would have been useful if it could be clearified whether the combination of positive feedback through albedo and transpiration and sea-ice processes will produce a "strong warming" proportional with the sum of these phenomena or if these will reinforce each other even more and in that case why. | Partially Accepted, We only cover the albedo here |
| 2140 | 11 | 42 | 6 | 42 | 6 | add reference to Smith P., D. Martino, Z. Cai, D. Gwary, H. Janzen, P. Kumar, B. McCarl, S. Ogle, F. O'Mara, C. Rice, and others (2008). Greenhouse gas mitigation in agriculture. Philosophical Transactions of the Royal Society B: Biological Sciences 363, 789–813. Available at: http://rstb.royalsocietypublishing.org/content/363/1492/789.short. | Accepted, Text deleted |
| 2141 | 11 | 42 | 9 | 42 | 9 | Locatelli et al: add further references emphasizing the potential of systemic approaches, e.g. El-Hage Scialabba, N., Müller-Lindenlauf, M., 2010. Organic agriculture and climate change. Renewable Agriculture and Food Systems 25, 11 or Muller, A., Olesen, J., Smith, L., Davis, J., Dytrtova, K., Gattinger, A., Lampkin, N. and Niggli, U., 2012, Reducing Global Warming: The Potential of Organic Agriculture, Scandinavian Working Papers in Economics 526 / FiBL Working Paper or Muller, A. and Aubert, C., forthcoming, The potential of organic agriculture to mitigate the impact of agriculture on global warming - a review, in: Penvern, S., Bellon, S. and Savini, I. (eds), Organic Farming, prototype for sustainable agricultures? Springer | Accepted, Issue adequately addressed |
| 11125 | 11 | 42 | | | | If mitigation=emission reduction + sink increase + feedbacks, it would be nice to develop one table where all effects could be combined, at least by AFOLU categories, to highlight the complexity of the entire system and the limits of our knowledge. | Noted, I think this would require multiple scenarios - will do in systemic perspectives chapter |
| 8011 | 11 | 42 | 20 | | | Some descriptions are required for climate feed-backs of not only forests but also agricultural land and other land use. | Accepted, Referred to WGI and a generic sentence added from WGI |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6931 | 11 | 42 | 20 | | | Please coordinate and ensure consistency with WGI, Chapter 6 on the land use change - climate feedbacks. Suggest to refer to WGI AR5 Chapter 6 here whenever appropriate. Many parts of this section stray into the WGI area of expertise and will overlap with the assessment provided by Chapter 6. This should be avoided to avoid duplication and/or inconsistencies. | Accepted, Consistency with WGI ensured |
| 12874 | 11 | 43 | 10 | 43 | 10 | Because biome shifts comprise a major climate change impact that also alters greenhouse gas emissions and removals, add here: "Field measurements from boreal, temperate, and tropical ecosystems around the world have detected numerous latitudinal and elevational biome shifts (Gonzalez et al. 2010) that alter ecosystem function and greenhouse gas emissions and removals." Gonzalez, P., R.P. Neilson, J.M. Lenihan, and R.J. Drapek. 2010. Global patterns in the vulnerability of ecosystems to vegetation shifts due to climate change. Global Ecology and Biogeography 19: 755-768. | Accepted, Section restructured and shortened |
| 7340 | 11 | 43 | 12 | | | it seems 'fires in tropical forest ecosystems' should be 'fires in all forest ecosystems'. Why restrict to tropical? | Accepted, Section restructured and |
| 5607 | 11 | 43 | 13 | 43 | 13 | Give examples of invasive species. | Accepted, Section restructured and |
| 9333 | 11 | 43 | 14 | | | The word 'are' is suggested to be replaced with 'is'. | Accepted, Section restructured and |
| 11821 | 11 | 43 | 15 | | | Are you refering to natural adaptation of anthropogenic adaptation measures? | Accepted, Section restructured and |
| 7341 | 11 | 43 | 16 | | | Zhu et al 2011 paper not cited | Accepted, Zotero updated for SOD |
| 7342 | 11 | 43 | 16 | | | suggest adding at end of sentence "nor is the pace of migration likely to keep up with the pace of climate change (Iverson et al. 2004). " Citation: Iverson L.R., Schwartz M.W. and Prasad A. 2004. How fast and far might tree species migrate under climate change in the eastern United States? Global Ecology and Biogeography 13: 209-219. | Rejected, Need to find more up-to-date reference |
| 13333 | 11 | 43 | 17 | 43 | 27 | Opportunity in this section to treat the question of active N in the biosphere. The impact on NH3 deposition from fertilizer application and impacts on natural ecosystems. | Accepted, Section restructured and shortened |
| 5087 | 11 | 43 | 2 | 43 | 2 | I sure think the statement below is totally obviou abd hardly in need of stating or referenceing what els could the sensitivity be "In general, how forests, agriculture or other land-use systems will respond to climate change 2 depends on the exposure to climatic changes as well as the sensitivity of the ecosystem to these 3 changes" | Accepted, Section restructured and shortened |
| 5088 | 11 | 43 | 2 | 43 | 2 | to me this whole section is a very partial treatment and would be best eliminated and cross referenced to wgii past and present materials. So many issues are ignored that the coverage is misleading at best. | Accepted, Section restructured and shortened |
| 10114 | 11 | 43 | 2 | 43 | 16 | Corresponding discussion on vulnerabilites in agricultural production systems is missing, also should be mentioned, that optimal adaptation of agricultural production systems is a prerequisite to maximize mitigation co-benefits, through maximised system productivity | Accepted, Section restructured and shortened |
| 9135 | 11 | 43 | 22 | | | Add an important literature in the citation "Matyssek R. et al 2010" after "Allen et al., 2010".<br>Matyssek R., G. Wieser, R. Ceulemans, H. Rennenberg, H. Pretzsch, K Haberer, M. Löw, A.J. Nunn, H. Werner, P. Wipfler, W. Oßwald, P. Nikolova, D.E. Hanke, H. Kraigher, M. Tausz, G. Bahnweg, M. Kitao, J. Dieler, H. Sandermann, K. Herbinger, T. Grebenc, M. Blumenröther, G. Deckmyn, T.E.E. Grams, C. Heerdt, M. Leuchner, P. Fabian, K.-H. Häberle (2010). Enhanced ozone strongly reduces carbon sink strength of adult beech (Fagus sylvatica)– Resume from the free-air fumigation study at Kranzberg Forest. Environmental Pollution 158, 2527-2532. | Accepted, Section restructured and shortened |
| 9136 | 11 | 43 | 26 | | | "Strassburger 2008, Leadley et al 2010" are not cited. | Accepted, Zotero updated for SOD |
| 6779 | 11 | 43 | 28 | 43 | 47 | Ecological thresholds about climate change or other global change drivers is uncertains,some ecosystems carbon sink may increase,for example grass ecosystems change into shurb or forest ecosystems following climate change. | Rejected, Statement - not a comment |
| 9334 | 11 | 43 | 30 | | | The word 'been' is suggested to be added between 'has' and 'exposed'. | Accepted, Section restructured and |
| 5089 | 11 | 43 | 32 | 43 | 32 | I wonder why you are devoting pages to this as it is covered in wgii and is not so well done here | Accepted, Section restructured and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11989 | 11 | 43 | 36 | | 37 | Please add something to the effect of: For the Amazon at least, Intact forest is more resilient to climate change than fragmented forest. Malhi, Y., Aragão, L.E.O.C., Galbraith, D., Huntingford, C., Fisher, R., Zelazowski, P., Sitch, S., McSweeney, C. & Meir, P. 2009. Exploring the likelihood and mechanism of a climate-change-induced dieback of the Amazon rainforest. Proceedings of the National Academy of Sciences 106: 20610-20615. | Accepted, Section restructured and shortened |
| 11990 | 11 | 43 | 36 | | 37 | Please add something to the effect of: Fragmentation increases susceptibility to drought-induced forest fire, leading to a descructive positive feedback loop between fragmentation, forest fire and drought. Nepstad, D.C., Stickler, C.M.,Soares, B.& Merry, F. 2008. Interactions among Amazon land use, forests and climate: Prospects for a near-term forest tipping point. Philosophical Transactions of the Royal Society B 363:1737–1746. Ray, D.; Nepstad, D. C. & Mourinho, P. 2005. Micrometeorological and canopy controls of fire susceptibility in mature and disturbed forests of an east-central Amazon landscape. Ecological Applications 15: 1664-1678. Laurance, W.F. 2004. Forest-climate interactions in fragmented tropical landscapes. Philosphical Transactions of the Royal Society. 359: 345-352 | Accepted, Section restructured and shortened |
| 16589 | 11 | 43 | 45 | 43 | 47 | There are a number of recent papers on Amazon dieback (and a World Bank review of the literature) with different conclusions; you shouldn't consider only one of them. | Accepted, Section restructured and shortened |
| 14736 | 11 | 43 | 6 | | | (Allen et al., 2010) suggest…should be Allen et al. (2010) suggest… | Accepted, Zotero updated for SOD |
| 15195 | 11 | 43 | | | | FACE sites contribute here? | Accepted, Section restructured and |
| 11820 | 11 | 43 | | | | I miss here adaptive capacity as an important element of vulnerability | Accepted, Section restructured and |
| 6932 | 11 | 43 | 28 | | | Suggest to refer here to the WGI and WGII AR5 reports in relation to climate change and ecological tipping points. Make sure this assessment is consistent with the other two AR5 WG reports. | Accepted, Section restructured and shortened |
| 4278 | 11 | 44 | 11 | 44 | 13 | FRA 2010 (page 75: Table 4.7) notes 0.7 % of forests burned each year, not 1.0%. The difference is significant: it reflects a difference between a 100 yr fire cycle (not credible) and a 143 yr fire cyle (much more plausible). Comparing Table 4.7 in FRA 2010 with Table 4.3 shows that insects and disease disturb nearly twice as much forest area each year as fire. | Accepted, Value Modified |
| 5090 | 11 | 44 | 14 | 44 | 14 | in this section I might talk carbon and fires and carbon and pests like mountain pine beetle | Accepted, Text modified |
| 9137 | 11 | 44 | 26 | | | “mainly due to CO2 fertilization effects" is not understandable. | Noted, Text based on reference |
| 9138 | 11 | 44 | 28 | | | “primarily due to CO2 fertilization" is not understandable. | Noted, Text based on reference |
| 5609 | 11 | 44 | 31 | 44 | 31 | --- ‘tree die-back’ not ‘die off’ is the common phrase. | Accepted, Corrected |
| 5610 | 11 | 44 | 34 | 44 | 34 | Change ‘sampling’ to ‘sample’ | Accepted, Corrected |
| 15196 | 11 | 44 | 37 | 44 | 40 | anentire range of outcomes is in the figure; doesn't make sense to highlight "some"; neither text nor figure really contribute much | Accepted, Text restructured and shortened |
| 16590 | 11 | 44 | 38 | 44 | 40 | Need to say how many of the 11 models predict this. Although it's not clear from Figure 11.8, it appears that it is only a few of them, not the majority. | Accepted, Figure deleted |
| 5608 | 11 | 44 | 5 | 44 | 8 | There are 12 references. Cut some out. Chang OL Phillips et al to Phillips et al. | Accepted, Text modified |
| 11822 | 11 | 44 | | | | also here cross-references to WG2 would be good | Accepted, Referred to WGI and many references from WGII added |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 10633 | 11 | 44 | 1 | 44 | 10 | As for implication of climate change on forest carbon sink, climate influences on GHG fluxes in forest soils. The following sentence would be appropriate in this section.<br><br>Hashimoto et. al. (2011) showed climate-driven changes in soil GHG fluxes (CO2 emission, CH4 uptake, and N2O emission) in Japanese forests from 1980 to 2009, which were estimated using a regional soil GHG model that is data-oriented. It revealed that the soil GHG fluxes in Japanese forests have been increasing over the past 30 years.<br><br>Shoji Hashimoto, Tomoaki Morishita, Tadashi Sakata and Shigehiro Ishizuka<br>Increasing trends of soil greenhouse gas fluxes in Japanese forests from 1980 to 2009<br>Scientific Report 2011; 1: 116. Published online 2011 October 13. doi: 10.1038/srep00116 | Accepted, New sentence added quoting Sitch et al, 2008 and Bowman et al., 2009 which covers forest biomass and soil carbon |
| 6933 | 11 | 44 | 1 | | | Please coordinate and ensure consistency with WGI, Chapter 6 on climate change and forest carbon. Suggest to refer to WGI AR5 Chapter 6 here whenever appropriate. Please avoid duplication of assessment. | Accepted, Cross reference to WGI, Ch6 is provided |
| 4274 | 11 | 44 | 37 | | 40 | Because some models showed different trends (Fig. 11.8,) should be good to know some of the key assumptions of Heimann and Reichstein, 2008 to allow better undertansding of those modeled results | Accepted, Figure 8 deleted |
| 6935 | 11 | 44 | 39 | 44 | 40 | Better: Components of "the terrestrial carbon cycle become a substantial source of atmospheric CO2 [...]". | Accepted, Text modified and shortened |
| 6934 | 11 | 44 | 4 | 44 | 9 | Suggest to refer here to the WGI and WGII AR5 reports in relation to climate change and forest carbon. Make sure this assessment is consistent with the other two AR5 WG reports. | Accepted, Cross reference better to WGI, Ch6 provided in the paragraph |
| 12927 | 11 | 44 | 1 | 46 | 11 | Section 5.2 and 5.3 should be combined. Pragraph in Line37-40 in Page may good for the introduction in this section. Implication of climate change on forest C sinks and soil C in three land use should be discussed in different sub-sections, I think. | Rejected, Section 11.5.3 retained to provide focus for peatlands, grasslands and rangelands |
| 7618 | 11 | 45 | | | | Need explanatory notes in this figure. | Accepted, Figure deleted |
| 5833 | 11 | 45 | | | | The figure has no legend. Besides, it has little informational value beyond the text and can be deleted. If you want to retain it please add information to the text: under what circumstances can the terrestrial C cycle become a source? | Accepted, Figure deleted |
| 11171 | 11 | 45 | | | | A legend or some explanations for the lines are needed to understand the figure. | Accepted, Figure deleted |
| 14442 | 11 | 45 | 1 | | | Is there a legend? | Accepted, Figure deleted |
| 9085 | 11 | 45 | 18 | 45 | 29 | Besides CO2, CH4 and N2O are also important GHG and are emitted from peatland, easpecially after disturbances. | Accepted, Text added |
| 15197 | 11 | 45 | 24 | 45 | 25 | delete sentence | Accepted, Text modified |
| 12420 | 11 | 45 | 30 | 46 | 2 | Could an estimate for the carbon stock in the soil of Grasslands, Pastures and Rangelands be given as it is done for forest soils and peatlands? | Noted, Carbon stock values provided for peatlands due to the magnitude involved. Due to lack of space, C-stock |
| 12875 | 11 | 45 | 30 | 45 | 31 | The 2006 IPCC National Greenhouse Gas Inventory Guidelines have superceded the older good practice guidance. So, say instead "...used in the IPCC National Greenhouse Gas Inventory Guidelines (IPCC 2006)..." Intergovernmental Panel on Climate Change. 2006. Agriculture, Forestry, and Other Land Use. National Greenhouse Gas Inventory Guidelines. Institute for Global Environmental Strategies, Hayama, Japan.) | Accepted, Text deleted |
| 12419 | 11 | 45 | 4 | 45 | 5 | In connection to chapter 11.5.3, it would be useful to include a table which illustrate the total estimated content of carbon in different types of soil, adding up to 100%. | Rejected, No - too detailed |
| 5611 | 11 | 45 | 4 | 45 | 4 | 11.5.3 Soil carbon. Insert soil carbon estimates by land use types as given in general comments on page 2 above. This could be in place of or addition to Figure 11.8. | Rejected, What would the purpose be? |
| 16222 | 11 | 45 | 8 | | 18 | Inconsistency here: FAO has 363 GT C for forest soil carbon; then below, for peatlands only, estimate is 350-550 GTC (the entire amount) and they say: 'this is 20-25% of the soils stocks globablly'--they must mean non-forest as well? And nevermind that it seems to represent 100% of the above referenced soil carbon? | Rejected, Not all forests are on peatlands- no inconsistency here |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5612 | 11 | 45 | 8 | 45 | 8 | The figure of 363 GtC for forests seems low. | Accepted, Values deleted since available in FAO reports and WGI and lack of |
| 4393 | 11 | 45 | | 45 | | indication of emission scenarios used would be useful | Rejected, Where? |
| 10612 | 11 | 45 | | | | Could merge with section 11.2 and delete from here - much overlap | Accepted, Substantial text deleted from |
| 12189 | 11 | 45 | 18 | 45 | 19 | Firstly the estimated carbon in peatlands seems too high and if it consists 20-25% carbon of the world's soil organic carbon, the estimated value of the world's soil carbon should be mentioned. | Rejected, No - this is consistent with global soil C estimates |
| 4279 | 11 | 45 | 4 | | | There is good literature on peatland carbon (CO2 and CH4) emissions, but this section does not seem to clearly summarize it. Peatlands are extremely sensitive to climate, and store vast amounts of carbon (see Yu, Z, Vitt, D.H., Campbell, I.D>, & Apps, M.J. 2003. Understanding Holocene peat accumulation pattern of continental fens in western Canada. Can. J. Bot. 81: 267-282; Yu, Z., Campbell, I.D., Campbell, C., Vitt, D.H., Bond, G.C. and Apps, M.J. 2003. Carbon sequestration in western Canadian peat highly sensitive to Holocene wet-dry climate cycles at millenial timescales. The Holocene 13: 801-808)- that point is made - but there is a need to further discuss CH4 and CO2 separately, along with net carbon fluxes. | Accepted, Text modified and shortened and since WGI covers these issues, not addressed here |
| 6936 | 11 | 45 | 4 | | | Please coordinate and ensure consistency with WGI, Chapter 6 on climate change and soil carbon. Suggest to refer to WGI AR5 Chapter 6 here whenever appropriate. Please avoid duplication of assessment. | Accepted, Cross reference to WGI, Ch6 provided |
| 10172 | 11 | 45 | 6 | 45 | 29 | Structure could be improved for increased understanding, e.g. 1. peatlands globally, 2. regionally, i.e. permafrost | Accepted, Section modified; due to limited space available, detailed |
| 12188 | 11 | 45 | 8 | 45 | 8 | As per FRA 2010 of FAO the Carbon in soil is 292 billion tonnes or 44 % of the total carbon in the forest ecosystem then where from 363 Gt C has come? | Accepted, Text modified |
| 18233 | 11 | 46 | | 46 | | • In section 11.5.4 (Potential adaptation measures to minimize the impact of climate change on 12 carbon stocks in forests); page 46. This section shows in a positive way and in perspective, the need to assume different adaptation strategies related with forests; aspects considered relevant in the forest policy of the country, by the fact that adaptation measures will allow to take the future risks of the climate change, risks that would produce a number of environmental, economic, and human costs, among others. In Venezuela are initiating the application of adaptation measures by implementing a new model for forests management. | Rejected, Interesting - but this is a statement, not a comment. What can we do with it? |
| 6777 | 11 | 46 | | 47 | | add the "potential adaptation measures to minimize the impact of climate change on carbon stocks in grasslands or other lands ",because climate change will influence the carbon stocks or non-CO2 emission,some potential adaptation measures will minimize the impact of climate change on carbon stocks or non-CO2 emission in grasslands or other lands type. | Accepted, Section includes forest and agriculture land only. Grassland and other land categories not included due to lack of references. Have been explored |
| 8603 | 11 | 46 | 1 | 46 | 11 | Please, consider contributions on tropical savannas such as Grace, J., San José, J., Meir, P., Miranda, H. & Montes, R. 2006. Productivity and carbon fluxes of tropical savannas. J. Biogeogr. 33:387-400 and San José, J. & Montes, R. 2007. Resource apportionment and net primary production outcome across the Orinoco savanna-woodland continuum. Acta Oecol. 32:243-253. | Rejected, Ideally, we should use post-2007 reviews and meta-analyse and not older single studies |
| 12421 | 11 | 46 | 12 | 46 | 43 | The measures in this paragraph seem not to comprise forest soils, even though forest soils represent huge stocks of C as mentioned on p 45 line 8. Does that mean that such measures don't exist? | Accepted, Forest soils not included due to lack of references. If found, will be |
| 16592 | 11 | 46 | 26 | 46 | 34 | These are important points. I suggest that they be made into a Box to highlight them. | These are important points. I suggest that they be made into a Box to highlight |
| 15198 | 11 | 46 | 3 | 46 | 11 | section is supposedly about SOC, but all effects on grassland mentioned here | Accepted, Section title modified; Mitigation aspects of peatland SOC |
| 5091 | 11 | 46 | 3 | 46 | 3 | the statement "The potential impacts of climate change on pastures would be declines in pasture/grass productivity, 3 reduced forage quality, livestock heat stress, greater problems with some pests and weeds, more 4 frequent droughts and intense rainfall events, and greater risks of soil erosion (Hennessy et al. 5 2007). " is a lttle too harsh as i think there are grasslands in northern areas that will have increased productivity. | Accepted, Text modified and sentence deleted |
| 5092 | 11 | 46 | 3 | 46 | 3 | also again you are doing things that overlap with wgii | Accepted, Text modified and sentence |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5613 | 11 | 46 | 33 | 46 | 33 | Energy efficient cooking devices will improve the health of the cook and family if used indoors. They may not reduce the pressure on forests etc. if there is a surplus of wood. | Noted, Energy efficient cookstoves will reduce fuelwood use and there is a shortage of fuelwood in large parts of |
| 13335 | 11 | 46 | 37 | 46 | 42 | There is mounting evidence that C loss due to tillage only occurs in dry agricultural production areas (see Angers, D.A., Bolinder, M.A., Carter, M.R., Gregorich, E.G., Drury, C.F., Liang, B.C., Voroney, R.P., Simard, R.R., Donald, R.G., Beyaert, R.P., Martel, J., 1997. Impact of tillage practices on organic carbon and nitrogen storage in cool, humid soils of eastern Canada. Soil & Tillage Res. 41, 191-201.). The authors should be more specific and qualify this statement. | Accepted, Qualified statement |
| 10115 | 11 | 46 | 37 | 46 | 37 | Other for mitigiaotn important adaptation measures are more efficient water management and use, which will allove for maximum biomass produciton with availble water, and reduction of production risks through diversification securing for example feed prodcution for animals, and thus more efficient livestock production | Accepted, Drastically reduced here and cross referenced to WGII |
| 13334 | 11 | 46 | 38 | | | NPP has already been defined for net primary production, use NPP. | Accepted, Revised for SOD |
| 10252 | 11 | 46 | 40 | 46 | 42 | The sentence "The main cause of SOC…is due to disturbance of soils with tillage" is only supported by a non peer-reviewed scientific reference which concerns pasture! Moreover, tillage level is not the only neither the main cause of SOC loss (as it is clearly stated in the sentence before: quantity and quality of inputs might be more important. The authors should avoid this kind of sentence | Accepted, Qualified statement |
| 2143 | 11 | 46 | 42 | 46 | 42 | May add the following: "There are also indications from many cases that the use of synthetic N fertilizers decreases soil organic carbon stocks (Mulvaney, R., Khan, S. and Ellsworth, T., 2009. Synthetic Nitrogen Fertilizers Deplete Soil Nitrogen: A Global Dilemma for Sustainable Cereal Production. Journal of Environmental Quality 38: 2295–2314; Khan, S., Mulvaney, R., Ellsworth, T. and Boast, C., 2007. The Myth of Nitrogen Fertilization for Soil Carbon Sequestra-tion. Journal of Environmental Quality 36: 1821–1832): Generalisation of these findings are however discussed controversially (Ladha, J., Reddy, C. K., Padre, A. and van Kessel, C., 2011. Role of Nitrogen Fertilization in Sustaining Organic Matter in Cultivated Soils. Journal of Environmental Quality 40: 1756-1766). | Accepted, Added debate to feedback and uncertainty section |
| 15199 | 11 | 46 | 43 | 46 | 47 | delete | Accepted, Deleted |
| 5614 | 11 | 46 | 43 | 46 | 43 | What were P Smith's findings? Are they given in Figure 11.9? If so it should be stated in the text. | Noted, Big table - not shown here - they |
| 11823 | 11 | 46 | 46 | | | "migration" should be "mitigation" | Accepted, Text modified |
| 11066 | 11 | 46 | 46 | 46 | 46 | Is "climate migration" the wording that is intended here? Also "future" is misspelled. | Accepted, Text modified |
| 6937 | 11 | 46 | 3 | 46 | 6 | Please revise and avoid generalized statements about drought/rainfall changes since they are regionally dependent and connected to high uncertainties (especially regarding rainfall). | Accepted, Text modified and shortened due to page limitation |
| 14678 | 11 | 46 | 9 | 46 | 9 | If C4 plants replace C3 plants this will generally diminsh forage quality as C4 plants generally have less leaf protein. | Noted, This section is about mitigation and not about forage quality |
| 6938 | 11 | 46 | 9 | 46 | 11 | Please make sure to use the latest available literature on that topic, i.e., post AR4. Suggest to add References to AR5 (Chapter 12) and/or SREX Chapters 3/4. | Accepted, Text modified |
| 8012 | 11 | 46 | 35 | | | Before discussing the potential adaptation measures to minimize the impacts of climate change on carbon stocks in agricultural soils, an overview for the impacts is necessary. | Noted, Due to page limitation, not included here. Further WGII covers |
| 14679 | 11 | 46 | 43 | 46 | 47 | This paragraph needs to indicate the important findings of the two studies it mentions. | Accepted, Text shortened and modified. Smith and Olesen quoted. |
| 10634 | 11 | 46 | 46 | 46 | 47 | fufutre climate change' may be 'future climate change' ? | Accepted, Modified |
| 10253 | 11 | 46 | 35 | 46 | 47 | In its present state, this section do not really concerns ADAPTATION….rather only mitigation. Please be more precise on the practices, and why they can help to adapt to climate change (e.g. irrigation which reduce vulnerability to water availability...) | Noted, Text shortened and modified |
| 12928 | 11 | 46 | 12 | 47 | 21 | Same as previous comments, these two chapter may be better to be combined. | Accepted, Sections combined |
| 6778 | 11 | 47 | | | | Suggest add the effects of Nitrogen deposition or other air pollution on the carbon stocks or non-CO2 emission | Noted, This section is about Mitigation-adaptation synergy and not about the |
| 16593 | 11 | 47 | 16 | 47 | 21 | Another set of important recommendations that should be highlighted. They can be part of the same Box recommended in my point 75, or a separate one. | Rejected, Cannot locate this comment |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13336 | 11 | 47 | 17 | 47 | 17 | Why are reduce fertilizer and increase crop diversification included as one soil management practice. | Accepted, Text modified |
| 13337 | 11 | 47 | 17 | 47 | 21 | There should be a qualifying statement that these practices should be undertaken in such a way as to not affect crop yields. | Accepted, Text modified |
| 11824 | 11 | 47 | 2 | 47 | 3 | the mitigation potential of a land use systems itself…' is more clear | Accepted, Text deleted to avoid generic |
| 5834 | 11 | 47 | 2 | 47 | 16 | Please make sure you do not consider C stocks only. SFM with high annual increment, high annual harvest and a high share of timber flow to HWP with a high replacement factor (substitution factor) can contribute much better to mitigation than forest reserves or simply raising C stocks. | Noted, Text provides only illustrative examples; all potential examples cannot be covered due to page limitation. |
| 13979 | 11 | 47 | 2 | | | add the phrase "may at times be" prior to the word "complementary." these measures may not necessarily be undertaken by the same person at the same time. | Accepted, Sentence deleted |
| 5093 | 11 | 47 | 3 | 47 | 3 | this was all said earlier in the document | Accepted, Text deleted |
| 13338 | 11 | 47 | 31 | 47 | 35 | Sentence is confusing, rephrase. | Accepted, Revised for SOD |
| 13981 | 11 | 47 | 31 | 47 | 34 | this section must include discussion of the fact that there is no functioning carbon market for AFOLU and that the current CDM market is crashing. To discuss market potential in the absence of a functioning market is highly misleading. | Noted, The section deals with economic potentials and not market potentials. The market potentials are mentioned as a concept and only to distinguish these |
| 13980 | 11 | 47 | 35 | 47 | 36 | does technical mitigation potential completely incorporate the biogeophysical uncertainties about carbon sequestration potentials under changing climates? | Accepted, No - it is the unconstrained maximum - see figure 11.9 |
| 5615 | 11 | 47 | 38 | 47 | 38 | Mt of GHG mitigation --- MtC or MtCO2? | Accepted, CO2-eq. |
| 5094 | 11 | 47 | 41 | 47 | 41 | I think the section puts all the gaps at the foot of barriers but I think incentives are a huge part as are resource competiton. mccarl and schneider shows big gaps depending on resources and altered shares depending on prices McCarl, B.A., and U.A. Schneider, "Greenhouse Gas Mitigation in US Agriculture and Forestry", Science, Volume 294 (21 Dec), 2481-2482, 2001. | Accepted, Revised in SOD (can be more specific pending the outcome of the costs and potentials cross-cut) |
| 5095 | 11 | 47 | 41 | 47 | 41 | not sure what leakage means in the sentence "Providing consolidated estimates of economic potentials for GHG mitigation within the AFOLU sector 19 as a whole is further complicated because of potential 'leakages' stemming from competing 20 demands on land for various agricultural and forestry activities as well as for the provision of many 21 ecosystem services" but i think it is being used wrong | Accepted, Revised in SOD (can be more specific pending the outcome of the costs and potentials cross-cut) |
| 11825 | 11 | 47 | | | | there are no trade-offs mentionned here, such as decreasing rotation length to adapt to pest and storm risks in forestry | Accepted, Added for SOD if appropriate |
| 13063 | 11 | 47 | 22 | 54 | 6 | On the Costs & Potentials issues it is difficult for the reader to access the bigger picture of the cost & potential information. Each sector has its own approach to costs and potentials, which is appropriate as each sector has its own unique qualities and considerations. Nonetheless, the information that will be most relevant to take-away for policy-makers is overarching cost information that brings these different pieces together. To help policy-makers access this information, it should be important to highlighting market realization, but also the policy aspects of cost (by policy it is meant institutional frameworks and/or market frameworks and/or capacity building arrangements, etc...). In both developing and developed countries policy can have a strong impact on cost. Simply looking across the costs & potentials sections of the sector chapters, the reader could miss this message, although the information on policies and measures is there in the chapter. Therefore it could be important to make sure that these informations are put in perspective appropriately. | Accepted, (Peter, my understanding is that these issues will be picked up in the synthesis report) |
| 10254 | 11 | 47 | 23 | 54 | 6 | I am not an econimist, but I think this section need to include somewhere the economic dimension of the REDD debate. | Accepted, Addressed in SOD |

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| 5509 | 11 | 47 | 16 | 11 | 47 | Use of organic soil amendments as a source of fertility as well as soil conditioners should be mentioned here. Depending on how one considers carbon storage accouting- multiple studies have shown persistant soil carbon increases following the use of organic soil amendments. These amendments also increase soil nitrogen reserves, decrease bulk density and improve soil water holding capacity, and can increase NPP- all important factors for mitigation and resiliance See Khaleel, R.; Reddy, K. R.; Overcash., M. R. Changes in soil physical properties due to organic waste applications: A review. J. Environ. Qual. 1981, 10, 133–141., Albaladejo, J.; Lobez, J.; Boix-Fayos, C.; Barbera, G. G.; Martinez-Mena, M. Long-term effect of a single application of organic refuse on carbon sequestration and soil physical properties. J. Environ. Qual. 2008, 37, 2093–2099. Spargo, J. T.; Alley, M. M.; Follett, R. F.; Wallace, J. V. Soil carbon sequestration with continuous no-till management of grain cropping systems in the Virginia coastal plain. Soil Tillage Res. 2008,100, 133–140. Tian, G.; Granato, T. C.; Cox, A. E.; Pietz, R. I.; Carlson, C. R., Jr.; Abedin, Z. Soil carbon sequestration resulting from long-term application of biosolids for land reclamation. J. Environ. Qual. 2009,38:61-74, Life Cycle Inventory and Life Cycle Assessment for Windrow Composting Systems; Recycled Organics Unit, The Univ. of New South Wales: Sydney, Australia, 2006; www.recycledorganics.com/publications/ reports/lca/lca.htm., Brown, S., K. Kurtz, A. Bary, and C. Cogger. 2011. Long-term effects of organic amendments on soil carbon storage and physical properties. Environ. Sci. & Tech. dx.doi.org/10.1021/es2010418 | Accepted, Added in revision |
| 10624 | 11 | 48 | | | | Please consider Lubowski et al. (2006) and in general the papers that use econometric estimations of reveled preferences of the landowner to estimate reforestation economic potentials and costs. Reference: Lubowski, R.N., A.J. Plantinga, and R.N. Stavins (2006), 'Land-use change and carbon sinks: econometric estimation of the carbon sequestration supply function', Journal of Environmental Economics and Management 51: 135–152. | Rejected, Prefer more up to date literature (post-2007) |
| 5616 | 11 | 48 | 15 | 48 | 15 | Change acreage to hectarage or area? | Accepted, In SOD used 'area' |
| 5617 | 11 | 48 | 19 | 48 | 19 | The word sectoral is used here and subsequently. I think the correct word is sector. | Accepted, Revised in SOD: sector- |
| 9456 | 11 | 48 | 21 | | 21 | Is a mitigation "response" the same as a mitigation "option?' | Accepted, Clarified in SOD (can be more specific pending the outcome of |
| 16594 | 11 | 48 | 32 | 49 | 13 | This point seems too subtle (and only conceptual) to be appropriate in this chapter. | Accepted, Revised to contextualize the 'sectoral implications of transformation |
| 15976 | 11 | 48 | 34 | 48 | 34 | the concept of carbon prices could be briefly explained or refered to | Accepted, Carbon prices explained |
| 10173 | 11 | 48 | 3 | 49 | 32 | Especially p. 48, l. 32 - p. 49, l. 13 : could be illustrated with theoretical graphs for easier understanding | Accepted, Revised to contextualize the 'sectoral implications of transformation |
| 18235 | 11 | 49 | | | | "…deforestation is the most important source of greenhouse gas emissions, with a net loss of forest area estimated in 5.2 million hectares each year, between 2000 and 2010 (FAO 2012)" From this sentence is relevant for countries reaffirm the common but differentiated responsibilities, and deepen binding measures of countries, annex 1; preserved forests will be insufficient as carbon sinks to mitigate the capture of CO2 gases. On the other hand, countries with large forest areas and those adopting REDD measures, will have to account effectiveness of the sink in a carbon markets context. | Rejected, This is a statement - not a comment |
| 18234 | 11 | 49 | | 53 | | • In section 11.6.2 (Forestry), pages 49-53, comment extensively on the economic potential of carbon mitigation, mainly by the forest sector, including reducing deforestation, forestation and agroforestry, which differ largely by activity and by regions, therefore, said options are assessed. At short-term, is expected that economic potentials for carbon mitigation by reduction of deforestation, be higher than economic potentials for forestation (forests management: forestry, forests management, others). This is probably since deforestation is the greatest source of greenhouse gas emissions. | Rejected, This is a statement - not a comment |
| 9457 | 11 | 49 | 1 | | 13 | Important point, but should be re-written for clarity. | Accepted, Revised to contextualize the 'sectoral implications of transformation |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16595 | 11 | 49 | 22 | 49 | 22 | It's quite strange to be citing a 2013 reference, and it's not clear from the literature cited whether it even has been submitted. Given the danger of criticism for citing unpublished work, this should be dropped. | Accepted, it will be in press before SOD |
| 13340 | 11 | 49 | 25 | 51 | 5 | Confusing and repetitive, rephrase. | Accepted, Revised in SOD (can be more specific pending the outcome of the |
| 5618 | 11 | 49 | 37 | 49 | 37 | Reduced deforestation depends on increased agricultural productivity (and tempering population increase) not on cutting down on wood consumption. This could be increased substantially up to the point of NPP of wood! | Rejected, Point made many times elsewhere - does not fit here |
| 7204 | 11 | 49 | 38 | | 39 | That is because deforestation is the single most important source for GHG emission….'. Within the 'forestry' yes, within AFOLU no. Over a 100 years time period, conserving or restoring a peat will produce >50% more carbon credits than the conservation or restoration of a forest on the same area of land. Suggestion: show somewhere in the document a figure on economic potentials of all mitigation measures within AFOLU: 'Forest', 'Croplands', 'grasslands' and 'wetlands'. Fig. 11.12 illustrates this partly, but it's all about management (excludes avoided degradation of forest and peat) and excludes forest. | Accepted, Revised in SOD (can be more specific pending the outcome of the costs and potentials cross-cut) |
| 12423 | 11 | 49 | 40 | 49 | 43 | Could you please clarify if the emissions from biomass-burning are included in the estimated mitigation potential? | Accepted, Clarified in SOD |
| 5619 | 11 | 49 | 40 | 49 | 40 | . Biomass from trees not forestry can contribute up to 340 EJ from NPP alone of which up to 300 EJ are potentially available for energy. The figure of 12-74 EJ is much too low. The current IEA consumption figure for biomass energy is 74 EJ/yr. Likewise the mitigation potential of 0.4 to 4.4 GtCO2/yr (0.11 to 1.2 Gt C) is much too low for power plants. There can be many more wood-fired 'local' plants with conventional boilers and larger wood gasified plants. | Rejected, These numbers seem very optimistic |
| 7669 | 11 | 49 | 41 | 49 | 43 | The above mentioned literature shows that you cannot talk about annual mitigation potentials of bioenergy from forests as a fixed number. Generally increased harvest will lead to increased accumulation of co2 in the atmosphere for a long period (from decades to centuries) before one could hope for a mitigation. | Rejected, Surely not - if that wood is used to substitute fossil fuels, less fossil C will end up in the atmosphere and forest regrowth will take up the C |
| 3760 | 11 | 49 | 44 | 51 | 17 | Three relevant references on economic potential for carbon mitigation from forestry are: 1) Coren, Streck, Myers-Madeira. Estimating supply of RED credits 2011-2035. Climate Policy doi:10.3763/cpoi.2010.0181; 2) Busch, J., Lubowski, R., Godoy, F., Steininger, M., Yusuf, A., Austin, K., Hewson, J., Juhn, D., Farid, M., Boltz, F. (2012). "Structuring economic incentives to reduce emissions from deforestation within Indonesia." Proceedings of the National Academy of Sciences of the United States of America 109(4):1062-1067.; and 3) Merger, Held, Tennigkeit, Blomley. A bottom-up approach to estimating cost elements of REDD+ pilot projects in Tanzania, Carbon Balance and Management 2012, 7:9 doi:10.1186/1750-0680-7-9 | Accepted, Added these references in SOD |
| 12424 | 11 | 49 | 47 | 49 | 47 | Does economically viable mitigation potential mean that effects on biodiversity is not included? If no, what would the mitigation potential be if biodiversity constraints were taken into account? | Rejected, No - and don't know the answer. We can only review what is |
| 12422 | 11 | 49 | 34 | | | This section could be improved to make it more undestandable.Texts should be placed more in connection with the figure they explain. Table 11.9 is hard to understand. Why is the difference between global integrated assesment models and Global forest sector models so much - 700 respectively 13 755 Mt CO2. | Accepted, Revised in SOD (can be more specific pending the outcome of the costs and potentials cross-cut) |
| 13957 | 11 | 5 | | | | some reference to competition of residues for bioenergy with residues needed for fertility (composts) and sequestration. This is a major potential conflict that must be put in the foreground | Accepted, Agreed - has been noted |
| 14563 | 11 | 5 | 1 | | | should this be ADAPTIVE CAPACITY | Accepted, Revised for SOD |
| 2609 | 11 | 5 | 11 | 5 | 12 | bioenergy expansion 'of agricultural plantations into forests' can ….TOO MANY THOUGHTS ARE INCLUDED IN THIS PARAGRAPH WITHOUT HAVING A TRANSITION BETWEEN SENTENCES - MAKES IT DIFFICULT TO FOLLOW | Accepted, Revised for SOD |
| 14565 | 11 | 5 | 13 | 5 | 14 | "will likely increase" increase from what? I would say its more than likely. Use of land for bioenergy and sequestration does comepte with other land uses. Of course the parger the scale the greater the competition. (this is aprtly also covered in paragraph above. Could say this stronger and earlier. | Accepted, Revised for SOD |
| 7535 | 11 | 5 | 13 | 5 | 18 | Forest management and sustainable forest management is important options in this discussion. | Accepted, Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2610 | 11 | 5 | 13 | 5 | 18 | Is the large scale bioenergy from agriculture or is this referring to forests since afforestation and reforestation is mentioned in the same sentence? The comment on harvesting residues does not factor in that most residues have someone that is already using it, e.g., mill owners or small industries colocated with a facility. Therefore residues are a competitive resource. Linking food security with forest energy becomes confusing. Bioenergy from forests or plantations is minor compared to land conversion to agricultural or oil crops. | Accepted, Both |
| 12363 | 11 | 5 | 17 | 5 | 18 | "Multifunctional systems" is at term which is very general an may not be too meaningful for the reader. May be the authors could give a short definition of what is meant by a "multifunctional system" in the body of the text? | Accepted, There is one in the glossary, but we have now explained it on first use |
| 5033 | 11 | 5 | 17 | 5 | 17 | "consider competition for land" I might add and water | Accepted, Revised for SOD |
| 8920 | 11 | 5 | 17 | 5 | 18 | multifunctional system in practice are not yet developed to the point that they could substantially contribute to a considerable decrease of the food-energy competition; a more cautious formulation is recommended | Accepted, Revised for SOD |
| 2126 | 11 | 5 | 18 | 5 | 18 | harnessing agricultural residues for bioenergy may also cause conflicts, due to the utilization of this biomass as fertilizer in a range of sustainable agricultural production systems (e.g. organic; cf. e.g. Muller, A. (2009). Sustainable Agriculture and the Production of Biomass for Energy Use, Climatic Change 94(3-4): 319-331). Another issue is the role of organic fertilizers for soil carbon sequestration which may conflict with using this biomass for energy use. | Accepted, Revised for SOD |
| 2611 | 11 | 5 | 19 | | 23 | Comment - forest conservation is not the only issue that needs to be addressed since half of the world is still dependent on forests for food (wildlife), energy and water. They don't use the forest materials efficiently and mainly burn woodfuel. They also do not convert forests to energy crops. | Accepted, Revised for SOD |
| 2612 | 11 | 5 | 2 | | | Comment - how is this a social benefit if the lands are conserved and forest dependent communities are not provided any alternatives? | Accepted, Revised for SOD |
| 14566 | 11 | 5 | 20 | 5 | 23 | REDD should have its own paragraph. The sentence above is general to all mitigation and not specific to REDD | Accepted, Revised for SOD |
| 5034 | 11 | 5 | 20 | 5 | 20 | the redd statement is a little strong. How we implement this is a major issue. You can spend a lot of money on redd projects that would never have been defforested (additionality isse) plus you can just move development elsewhere (leakage problem) | Accepted, Revised for SOD |
| 13958 | 11 | 5 | 20 | 5 | 22 | the evidence base for a revenue stream forthcoming for substantial numbers of REDD projects is severely lacking. A much more critical, nuanced, and contingent analysis of mitigtion financing options in the AFOLU sector is required given the serious lack of potential currently for finance, from markets or otherwise. | Accepted, Revised for SOD |
| 5699 | 11 | 5 | 21 | | | Words 'REDD mechanisms' may be replaced by "comprehensive REDD mechanism known as REDD-plus mechanism". | Accepted, Revised for SOD |
| 7536 | 11 | 5 | 21 | 5 | 22 | "One of the most striking aspect of policies for the AFOLU sector is the implementation of REDD mechanisms and its variations that can represent a very cost-effective option for mitigation" is based on the Stern report. However, we realize tha REDD requires large costs of system development and transaction throgh experiments of negotiation and development for REDD. | Accepted, Some limitations for REDD+ implementation and related programs were included in section 11.10 |
| 10580 | 11 | 5 | 21 | | | Put REDD in full first time used. Also could explain it in a footnote and also for REDD+ (first quoted on page 10) | Accepted, Revised for SOD |
| 11061 | 11 | 5 | 21 | 5 | 21 | Does the acronym "REDD" need to be defined ahead of this? | Accepted, Revised for SOD |
| 8921 | 11 | 5 | 21 | | | the term REDD should be explained | Accepted, The term was explained - |
| 15144 | 11 | 5 | 24 | 5 | 25 | vagues sentence; reader may not be familiar with transformation pathways at this point | Accepted, These have been defined in |
| 5035 | 11 | 5 | 24 | 5 | 24 | when you say "AFOLU forms a critical component of transformation pathways," I am unsure what you are talking about. I would also think you might say currently implementable and also mention the concept of limikted capacity plus bridge to the future | Accepted, These have been defined in Ch6 |
| 9441 | 11 | 5 | 28 | | 40 | Indeed progress. Although I suspect that the present format limits discussion of the land-energy nexus and the synergies and tradeoffs between urban and rural regions | Noted, Statement - not a comment |
| 5036 | 11 | 5 | 31 | 5 | 31 | I might fence off "other land use" from urban use by inserting the word rural | Accepted, Revised for SOD |

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| 5037 | 11 | 5 | 35 | 5 | 35 | I think bioenergy will still be probalematic and you should acknowledge it is split to another chapter (I assume). That did not work so well in ar4 and probably will plague ar5 | Accepted, Now in ioenergy annex |
| 2127 | 11 | 5 | 37 | 5 | 37 | add the following between "...Meyfroidt, 2011)" and "and water…": ", biomass (Muller, A. (2009). Sustainable Agriculture and the Production of Biomass for Energy Use, Climatic Change 94(3-4): 319-331)" | Accepted, Revised for SOD |
| 12364 | 11 | 5 | 38 | 5 | 40 | It is important to remember that even though the new IPCC guidelines on national GHG inventories merge the sectors agriculture and LULUCF (AFOLU), it is decided under the UNFCCC that the sectors will continue to be reported as two separate sectors. Please consider to include this information in a sentence. | Rejected, Is that relevant for mitigation - surely an accounting issue |
| 7610 | 11 | 5 | 4 | 5 | 6 | Bioenrgy expansion is not main driver for land use change. Land use chenge would not occur under sustainable use of timber for bioenergy. Need more anlysis of another cause such as agriculture and expansion urban area. | Accepted, Revised for SOD |
| 7534 | 11 | 5 | 4 | 5 | 6 | Bioenergy is not a main driver for land use change. Before this paragraph, discussion on emission from land use change is required. | Accepted, Revised for SOD |
| 5030 | 11 | 5 | 4 | 5 | 4 | when you say "Land use and land use change associated with bioenergy expansion" I would also add affrestation, adaptation, grassland conversion | Accepted, Revised for SOD |
| 12365 | 11 | 5 | 41 | 5 | 42 | Since it is rather obvious that climate mitigation is not the primary use of land, the senescence could be simplified by stating; "In this chapter we consider the conflicting uses of land for food and fiber provision, for energy production and for conservation of biodiversity and ecosystem services and natural resources" | Accepted, Revised for SOD |
| 13959 | 11 | 5 | 42 | | | livelihoods are essential to add to any list that addresses uses of land. Lands provide livelihoods to billions, not merely food and fiber. Food security encompasses more than just the production of food. The rural nature of billions requires attention to food production as one element of livelihood strategies for this immense proportion of the global population. | Accepted, Revised for SOD |
| 13960 | 11 | 5 | 45 | 5 | 46 | explicitly include livestock/meat as element considered in the demand-side measures | Accepted, Revised for SOD |
| 9440 | 11 | 5 | 7 | | 7 | Here, I assume that availability means something like cost-competitive. The reserve of productive land remains effectively ample, the problem is often cost-competiitiveness. | Accepted, Revised for SOD |
| 14564 | 11 | 5 | 7 | | | DUE TO limited availability of productive land, INCREASING demand for both food and bioenegy may induce…... | Accepted, Revised for SOD |
| 5031 | 11 | 5 | 7 | 5 | 7 | I would add fiber and fodder to "due to growing food and bioenergy" | Accepted, Revised for SOD |
| 12362 | 11 | 5 | 8 | 5 | 8 | End of sentence could be simplified since the main consequence of extended use of fertilizer is higher N2O-emissions. Suggested rewriting: "...which imply more energy use for irrigation and higher N2O emissions from the increased use of fertilizer." | Accepted, Revised for SOD |
| 5032 | 11 | 5 | 9 | 5 | 9 | add land degredation? | Accepted, Revised for SOD |
| 10579 | 11 | 5 | 9 | | | "energy use" is for more than just irrigation | Accepted, Revised for SOD |
| 18022 | 11 | 5 | 13 | 5 | 14 | The term "will likely" is too strong. It attributes causality to the impacts of bioenergy and afforestation and reforestation on competition for land and other natural resources, on an ex-ante basis. Naturally, there are also ways of doing that in manners that avoid or minimize such competition. Thus, the suggestio is to use "may" instead of "will likely". The suggestion is also consistent with the term "may" already used in Section 11.4.3, page 35, lines 43 to 44. | Accepted, Revised for SOD |
| 11902 | 11 | 5 | 27 | 6 | 26 | Consider add a figure or table to summarize the changes in treatment "AFOLU" from IPCC SAR to AR4, and what are new in AR5. | Accepted, section revised - new figure added |
| 8314 | 11 | 5 | 28 | 5 | 40 | Also rural societies affect simultaneously land use of agriculture and forest. This point is enhanced as a reason to discuss agriculture and forest sectors together. | Accepted, Revised for SOD |
| 3532 | 11 | 5 | 41 | | 43 | It is hard to understand this sentence, please reformulate and make it clearer. | Accepted, Revised for SOD |

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| 18236 | 11 | 50 | | | | Page 50: table 11.8 (Potential of mitigation measures of global forestry activities. Global model results indicate annual amount sequestered or emissions avoided, above business as usual, in 2030 for carbon prices 100 US$/Tco2 and less), shows mitigation potentialities economically viable, by key region and mitigation options, calculated using global models which indicate annual amount of CO2 sequestered or avoided emissions by 2030, with carbon prices between 1 and 20 $, 20 – 50 $ and 100 $. In this case is evident that potential mitigation measures by forest activities, globally, are more obvious for Central and South America, followed by Asia countries and USA. Based on these prices, strategies will be focused to reduce deforestation, aforestation (the establishment of forests where there never has been forests) and forest management, being more striking, commercially at a price of 100 $, highlighting that no option represent negatives results, namely, loss. However, they recommend the elimination of uncertainty in the models showed because the lack of baselines does not allow definitive estimates of forest´s mitigation potential. Thus, is expected that combined effects of deforestation and degradation reduction, implementation of forest management, agroforestry and bioenergy will increase from now to 2030 and beyond, depending always of carbon sequestering prices. | Accepted, The issue has been recognized as part of the assessment. |
| 8217 | 11 | 50 | | | | VALUES UNDER FOREST MANAGEMENT COLUMN 3, 12, AND 30 ARE NOT CLEAR, ALSO UNDER REDUCED DEFORESTATION COLUMN 21 AND 30 THE VALUES ARE NOT CLEAR | Accepted, Reduced deforestation and forest management are |
| 5713 | 11 | 50 | | 52 | | The global forestry mitigation potential up to 2030 based on 3 different cost classes should also add one or two paragraphs on various possibilities and conditionalities that would be essential for mobilizing resources for the purpose. For example, enhanced mitigation commitments by developed nations could be the main trigger for the purpose. Similarly, a minimum support price may be helpful in ensuring realization of mitigation potential in forestry sector across the world. | Noted, (Peter, my understanding is that issues like this will be picked up in the synthesis report and/or in section 11.9 on transformation pathways) |
| 5620 | 11 | 50 | | | | . I had difficulty in following this table. I think there should be another column for each region giving the fraction for class 50-100. Thus the USA afforestation activity, the three columns should read 0.3; 0.3; 0.4. The cost columns should values to the nearest 1000. E.g. for forest management in the USA, the value should by 1,590 not 1,59. | Accepted, Table has been reformatted |
| 5835 | 11 | 50 | | | | The description needs some re-phrasing and re-working. It does not become clear what is meant by "Two right columns …". If you want to show fractions, why are values given in total units and not per cent? Please amend "1)" and "2)" accordingly. The potential is not equal over C costs up to a certain point - the 100 US$ - so your description under "3)" is wrong. Do you mean "maximum potential under C costs up to 100 US$"? If you want to have one column with a max. / total potential and two columns with fractions of this total that could be realized at the cost ranges specified in the column header it would be better - in my opinion - to place the "total" column at the left, not the right. Reading direction in English texts is left to right, so you have the important value (total) first and the fractions following. Pay attention to cell formats, too: is "USA / FM / 100" 1,590 or 1.59? You can also save space by using REDD as abbreviation instead of "reduced deforstation". | Accepted, Table has been reformatted |
| 11172 | 11 | 50 | | | | Definition of the activities such as afforestation, Reduced deforestation and forest management are not clear. Some explanations are needed to avoid missleading. | Accepted, Defined the terms in SOD |
| 12425 | 11 | 50 | 1 | 50 | | There seem to be some errors with the use of "," and "." in the numbers. | Accepted, Errors corrected in SOD |
| 9086 | 11 | 50 | 1 | | | Some typo errors ocurred in the Table. | Accepted, Errors corrected in SOD |
| 14443 | 11 | 50 | 1 | | | Check numbers. Decimal value appears to follow U.S. convention. Check value for USA (forest management), Total (deforestation, forest management). | Accepted, Errors corrected in SOD |
| 5621 | 11 | 50 | 10 | 50 | 10 | Removal of annual growth could be at a negative cost. I don't think this table takes into consideration using the NPP of trees. | Rejected, Correct - it does not |
| 4394 | 11 | 50 | | 50 | | units of sequestered C ? | Rejected, Stated in footnote 3 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10625 | 11 | 51 | | | | Please consider Strengers et al. (2008) for the costs of carbon plantations. Reference: Strengers, B.J., van Minnen, J.G., Eickhout, B., 2008. The role of carbon plantations in mitigating climate change: potentials and costs. Climatic Change 88, 343–366. | Accepted, Reference considered |
| 10626 | 11 | 51 | | | | Please consider Tavoni et al. (2008) for the costs of forests alternatives. Tavoni, M., Sohngen, B., Bosetti, V., 2007. Forestry and the carbon market response to stabilize climate. Energy Policy 35 (11), 5346–5353. | Accepted, Reference considered |
| 5622 | 11 | 51 | | | | Global forestry mitigation potential in 2030. The diamond spots on the graph are not explained. Again, I don't think this figure takes into consideration NPP of trees. | Accepted, Figure reformatted/revised in SOD |
| 5836 | 11 | 51 | | | | Please amend legend: the panel shows also diamonds in at least two colours, but no source is given for this. And please check author names (Sohngen / Songhen). | Accepted, Figure reformatted/revised in SOD |
| 14737 | 11 | 51 | 13 | | | …" One important reason that bottom-up…" This phrase is confusing needs to be clearer than it is now. | Accepted, Revised for SOD |
| 5623 | 11 | 51 | 21 | 51 | 22 | "Forestry mitigation options --- to contribute between 1.27 and 4.23 GtCO2/yr for economical viable abatement in 2030". This is extremely low. The current un-used accessible NPP from trees is an estimated 14.82 Gt wood, equivalent to an abatement potential of over 27 GtCO2/yr. This is more than 6 times the 4.32 GtCO2 figure and this is without other abatement measures considered in the text. The same applies to Figure 11.11 on page 52. | Noted, We are dealing with economic, not total biophysical potentials. Biophysical potentials of not the focus of modern assessments |
| 12426 | 11 | 51 | 3 | 51 | 5 | Could you please clarify if the albedo is included in the calculations, e.g. for afforestation? | Accepted, Clarified; no, not included |
| 18237 | 11 | 52 | | | | Page 52: Graph 11.11 (Annual economic mitigation potential in the forestry sector by world region and cost class in 2030), highlights the annual economic mitigation potential in the forest sector by region and cost by 2030. Again are Central and South America which have more mitigation potential for the forest sector, with similar values for sequestration to both lower costs of 20 $ and prices between 20 $ and 100 $, emphasizing that in a PNUMA report, it is suggested that forestry offers a mitigation potential of 1,3-4.2 Gt 1 CO2 / per year and stabilization of climate in 2ºC. These aspects are very important for Venezuela because of the potential represented by its forests and areas under management, estimated in 16.231.389 hectares (162.313,89 Km2). | Noted, Statement - not a comment |
| 5624 | 11 | 52 | | | | The regional bottom up maximum estimate of 4230 MtCO2 is very low and even the global forest sector models of 13,775 MtCO2 is low compared to the NPP from trees of OVER 33,600 MtCO2. Excluding current use of woody biomass, the net NPP is over 27,000 MtCO2. At present about 55% of woody NPP is in the tropics and according to Melillo et all (1993) 66% of NPP is in the tropic (see my article). Thus, the potential for expanding wood consumption, including energy is much greater than stated and much could be achieved quickly with the help of rural people and with proper incentives for them. | Noted, We are dealing with economic, not total biophysical potentials. Biophysical potentials of not the focus of modern assessments |
| 5625 | 11 | 52 | | | | This is extremely low. The current un-used accessible NPP from trees is an estimated 14.82 Gt wood, equivalent to an abatement potential of over 27 GtCO2/yr. This is more than 6 times the 4.32 GtCO2 figure and this is without other abatement measures considered in the text. | Noted, We are dealing with economic, not total biophysical potentials. Biophysical potentials of not the focus of |
| 5837 | 11 | 52 | | | | Please clarify text: You do not need to state "excluding bio-energy" two times. Concerning footnote "a": is it related to the column "regional, bottom-up, mean" only? However, if bio-energy is excluded in general, it does not have to be given here again. Numbers can be compared more easily if they are set right-bound. | Accepted, The table (should be referred to as Table 11.9) was reformatted and double statement removed in SOD. |
| 5838 | 11 | 52 | | | | Please either expand figure or table. Both show parts of the same information, so please delete one and show the information in one place. | Accepted, The table and the figure were reformatted in SOD |
| 13342 | 11 | 52 | 10 | | | occuring | Rejected, Do not understand the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9458 | 11 | 52 | 15 | | 16 | Where would avoiding emissions from U.S. biofuels production go on this chart? North America or scattered everywhere where LUC is avoided? If the Searchinger et al. (2008) paradigm is to be adopted, it is inconsistent with this sort of framework. | Accepted, Explicitly recognized in SOD that net emissions outcome or emission abatement potentials from LUC is not considered in this section?????? (Peter, you are better placed to judge but my understanding is that this issue relates to an LCA but will be addressed somewhat in Chs. 7 and 8 on 'energy systems' and 'transport', respectively. These chapters, through the measurement of leveled costs of energy generation and leveled cost of conserved energy, will look into what feedstocks be used in bio-energy production as well as what fuels be |
| 13341 | 11 | 52 | 5 | | | Economic_mitigation | Rejected, Do not understand the |
| 18238 | 11 | 53 | | | | "… A recent PNUMA report suggests that forestry can offer a mitigation potential of 1,3-4.2 Gt 1 CO2 / per year in the achievement of stabilization of climate at +2ºC". This is a reckless asseveration: confer forests the responsibility of stabilize the temperature increase of global climate; there should be a balance with the diminution of GHGs by the developed countries / Annex 1. On the other hand, an increase of +2ºC is worrying for the life on the planet; this trend implies the design of simulation climate models immediately. In the best-case scenario, sure there will be adverse consequences for humanity and the environment, in particular in those areas identified as of high climate vulnerability. Finally, we encourage the IPCC to review this figure and the party countries to boost a mass dissemination of environmental education for all the population to promote environmental awareness globally. | Rejected, The purpose of IPCC AR5 is not to review non-peer-reviewed reports for governments, but to assess the best available science and provide a synthesis of it |
| 2365 | 11 | 53 | | | | As this is not in cost curve format, be explicit if there is doublecounting between the measures | Accepted, Further assessed and caveats used as and when applicable. |
| 13343 | 11 | 53 | | | | Why use up to. What was the number that the scenario was tested at. Use this number. | Rejected, It was "up to" - these were the thresholds used in the FASOM model |
| 5626 | 11 | 53 | 1 | 53 | 2 | Again the UNEP figure seems very low for the mitigation potential. | Rejected, Looks very reasonable to me - and consistent with many other studies |
| 12429 | 11 | 53 | 10 | | | Manure management has been shown to represent a relatively low reduction potential compared to other measures. It should be indicated in the legend that this does not include the substitution effect for biogas in other sectors used in district heating or as fuel for buses and trucks. | Accepted, Explicitly mentioned in SOD that only CH4 emission reduction potential considered here |
| 11069 | 11 | 53 | 13 | 53 | 13 | Is more than one figure being referred to here as suggested because I can see only one that applies. | Accepted, Changed 'figures' to |
| 11070 | 11 | 53 | 13 | 53 | 17 | Fig. 11.12 does not break down mitigation potential by category (e.g. carbon sequestration) as indicated buy the text, or should a different figure or table be referred to here? | Accepted, Better explained the mitigation options/categories in SOD |
| 13344 | 11 | 53 | 14 | | | CO2e | Rejected, Do not understand the |
| 9335 | 11 | 53 | 15 | | | The word 'is' is suggested to be deleted. | Accepted, Revised in SOD |
| 13345 | 11 | 53 | 15 | | | which may (remove is) | Accepted, Revised in SOD |
| 16600 | 11 | 53 | 18 | 53 | 25 | McKinsey et al. 2009 - is another apparently non-peer-reviewed publication; furthermore, it is a company that gets some of its income from studies of climate change mitigation, and its data is proprietary. Unless you can cite a journal article giving these results, don't court danger by including this paragraph. | Noted, Included for SOD as publically available |
| 5628 | 11 | 53 | 21 | 53 | 21 | What is MACC? Spell out. | Noted, spelt out in its first use. |
| 18288 | 11 | 53 | 24 | | | "a mitigation potential of 1.1-4.3 Gt CO2 / yr" should it be CO2-equ.? | Accepted, Corrected |
| 18289 | 11 | 53 | 24 | | | It would be helpful to have the mitigation potential also expressed as % of total agricultural CO2-equ. Emissions; so far, total emissions are only given as Gt C (not Co2-eq.) | Rejected, Not a good idea, as there are C sinks which act very differently from |

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| 13983 | 11 | 53 | 24 | | | isn't this just circularly referential? Isn't UNEP just using IPCC AR4 data? | Accepted, I don't think so - I reviewed the UNEP report - needs to be checked |
| 5627 | 11 | 53 | 3 | 53 | 3 | 11.6.3 Agriculture. Nitrogen-fixing trees (and shelterbelts) could play an important role in all the potential mitigation measures for agriculture. So the potential may be much greater than indicated. | Rejected, This will be tiny in the global picture |
| 12427 | 11 | 53 | 4 | 53 | 12 | Summarizing the ecomic potential for each practice(measure) for resp 20, 50 and 100 USD in figure 11.12 results in resp about 1 000, 2 400 and 3 300 Mt CO2-eq/yr. These are lower than the figures in the text line 6 resp 1 600, 2 700 and 4 300 Mt CO2-eq/yr. Is there an explanation for the differences? | Rejected, No - the numbers in the figure add up exactly to the numbers in the text. Must be reading the axis incorrectly. |
| 13982 | 11 | 53 | 5 | 53 | 7 | the question of demand must be integrated into this economic analysis. As carbon prices increase, the proported potentials increase significantly. But multiply here -- 4.3 billion tonnes at $100/ tonne is almost a half a trillion dollars. Do you really propose that at some point there will be half a trillion dollars available just for soil carbon sequestration? are you serious? and how are the significant caveats of pp. 31 and 35 factored into this "economic" potential? | Rejected, Very complex -and we can only review work that has already been done. Nobody is proposing how much money will or will not be available- simply estimating the potential that would be realized if these carbon prices |
| 11067 | 11 | 53 | 5 | 53 | 5 | It is not accurate to state that Fig. 11.12 presents "various …..stabilization scenario pathways", it only presents one as indicated in the figure caption. | Accepted, Revised in SOD |
| 11068 | 11 | 53 | 7 | 53 | 8 | The final sentence of this paragraph appears redundant to what was stated in the first sentence, as both sentences are referring to the same figure. | Accepted, Revised in SOD |
| 12428 | 11 | 53 | 8 | 53 | 12 | For clarification a short description of the difference between "Restore cultivated organic soils" vs. "Cropland/Grazing land management" should be given. Does restoring of cultivated soil mean that the soil is converted to natural soil or is it soil that is e.g. drained to produce more crop? | Rejected, The difference is between peatlands (organic soils) and non-peatlands (mineral soils) |
| 15618 | 11 | 53 | 3 | | | This section on economic mitigation potentials in agriculture does not mention any analysis of demand-side measures. I don't know whether such analysis exists to parallel the other IPCC analysis, but Wirsenius S. and others (2010), seems worth discussing as a start. Wirsenius S., F. Hedenhaus, and K. Mohlin (2011). Greenhouse gas taxes on animal food products: rationale, tax scheme and climate mitigation effects. Climatic Change 108(1-2), 159-84. | Accepted, Very few studies - these are all discussed in the systemic perspective section |
| 13346 | 11 | 54 | | | | Be more specific for what the actual actions are that are mitigating GHGs under the heading "Option" | Rejected, The individual measures are presented in table 11.2 in section 11.3 |
| 5629 | 11 | 54 | | | | Trees could play an important role in all the options and thus increase the CO2 equivalent for the different prices of CO2. For the subsistence sector, cheap inputs could increase fertility. They include wood ash (high in K), manure (N), compost (N P K), Lime (CaCO3: this increases the pH and facilitated the release of P), soot (C), bone meal (Ca,) dried blood (N) and no-till etc. | Rejected, This was not in the published studies |
| 5839 | 11 | 54 | | | | Please explain what is given in brackets: min - max., standard deviation, …? | Accepted, Explained in SOD: Standard |
| 13984 | 11 | 54 | | | | are the assumptions underlying these numbers still valid? I would suggest a reassessment -- that's the point of having an assessment called AR5 -- it should evaluate and update AR4, not merely copy the data. | Partially Accepted, Agreed - we have included all new studies in figures 11.10 |
| 12431 | 11 | 54 | 1 | | | The figure needs some more explanation, eg the big differences in mitigation potential in this figure, compared with table 11.10. | Accepted, Revised in SOD |
| 13985 | 11 | 54 | 1 | | | where is the analysis of other financing mechanisms? In the absence of a global carbon price, significant issues of non-permanence and a functioning market, it clearly begs the question of how to mobilize resources for mitigation in agriculture that are not linked to "the carbon market." | Noted, The issue has been dealt with elsewhere in the report. (Peter, I suspect Ch 16 will deal with this issue.) |
| 11071 | 11 | 54 | 4 | | | A recent analysis (In press) by Delgrosso and Cavigelli entitled "Climate stabilization wedges revisited: can agricultural production and greenhouse gas reduction goals be accomplished?" (Frontiers in Ecology and the Environment, In press) could be included in this summary and/or elsewhere in the chapter or the analysis. They conclude that "agriculture could provide wedges of 1350 to 3900 Tg C under realization of technological and human behavior mitigation potentials". I have sent the article via email to comments@ipcc-wg3.de. | Accepted, Included in SOD |
| 12430 | 11 | 54 | 5 | | | This table should be placed together with the text at page 53 line 26 to p 54 line1. | Accepted, Revised in SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11072 | 11 | 54 | 5 | | | What is the value of republishing the information that was already included in Fig. 8.9 of AR4? Did you consider an updated analysis that incorporates the previous as well as more recent information instead of presenting them separately? | Accepted, Agreed - we have included all new studies in figures 11.10 and 11.13 |
| 14268 | 11 | 55 | | 58 | | sections 11.7.1, 11.7.2 & 11.7.3 are unnecessarily prolonged. These can be minimized to have the desired number of pages allocated for this chapter | Accepted, Section re -drafted |
| 5714 | 11 | 55 | 10 | 55 | 17 | In respect of forests, co-benefits or incentivization of ecosystem services other than carbon is being discussed globally. What is the possibility of financing these services alongwith financing of mitigation in the forestry sector? One or two paragraphs on this aspect will also be useful. For example, even mentioning that mixing up of the forestry mitigation and other forest ecosystem services in terms of financing may not be a feasible approach for the present, or that more research would be required to go into the determination of modalities for valuation of other ecosystem services before considering their financing, would be a useful suggestion. | Partially Accepted, We checked references on success/failure of A/R CDM and the voluntary carbon markets in promoting mitigation and other ecosystem services. |
| 11175 | 11 | 55 | 10 | 61 | | I co-benefits, Risks and uncertainties, Barriers and opportunitiesの 3 つに区分して記述している。他の章との横並びなのかもしれないが、記述の多くが重複しており、冗長な印象。11.7.3 spilloversはコンセプトが不明。不要では？ | Rejected, Sorry, we could not read the comment. |
| 11176 | 11 | 55 | 10 | 61 | | From 11.7.1 Co-benefits to 11.8 Barriers and opportunities, there are some dupricates of discriptions in these sections. The concept of these setions must be distinguished clearly. | Accepted, Section re -drafted |
| 11178 | 11 | 55 | 10 | 61 | | The impact of international market prices for crops and timbers should be mentioned as risks or barriers of mitigation options. | Accepted, Considered for the SOD in 11.7 (could also have been in 11.8) |
| 11305 | 11 | 55 | 12 | 55 | 15 | Urban and peri-urban agriculture is a perfect example of AFOLU's land management co-benefit potential, especially on vulnerable sites like steep hillsides and/or floodplains where permanent human settlement is ill-advised. UPAF in this areas may also turn geographic liabilities into livelihoods and increase food security close to where it is needed most acutely. | Partially Accepted, Considered to include positive examples --> checked references |
| 11173 | 11 | 55 | 12 | 55 | 15 | In addition to these example of co-benefits, prevention of landslides and coastal erosion must be included. | Partially Accepted, Included partially in co-benefits and also in 11.5 |
| 5630 | 11 | 55 | 13 | 55 | 14 | I think the sentence should read --- rising salination, lowering ground water levels --- | Accepted, Improved |
| 10116 | 11 | 55 | 19 | 55 | 19 | There are may other important activities with socioeconomic cobenefits like improved livestock healf and improved feedproduciton/regeneration of degraded pastures will increase the income, also improve the nutrition of the household and create a capital assest which improfvew livelihoodsecurity. Another excample is integrated food-energysystems discussed earlier. Agrocofersty will create an income source, improve nutrition etc. | Section has been reviewed including more co-benefits and potential adverse effects from livestock |
| 5631 | 11 | 55 | 20 | 55 | 48 | Change timber production to wood production. | Rejected, Both terms are widely |
| 2634 | 11 | 55 | 21 | | | Mostly not ag to forests but forests to ag. | Partially Accepted, Sentence improved |
| 13347 | 11 | 55 | 25 | | | Are the authors promoting the commercialization of water. | Noted, No, we are only mentioning |
| 16602 | 11 | 55 | 38 | 55 | 38 | The phrase "land tenure" is better than "property rights" here -- more inclusive of traditional tenure systems. | Partially Accepted, Tenure rights included (both elements are important, tenure is often not enough, property |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5096 | 11 | 55 | 46 | 55 | 46 | consideration of cobenefits is somewhat more complex than stated for example under a hypthetical cap and trade elbakdize and mccarl compare co benfits from sequestration with those from reducing power plant emissions and show that the cobenefits offset and reccomend ignoring them since you have to not do selective evaluation but look at tfor all strategies, this is also coverd in the nas report on limiting emissions Fri, R., M. Brown, D. Arent, A. Carlson, M. Carter, L. Clarke, F. de la Chesnaye, G. Eads, G. Giuliano, A. Hoffman, R.O. Keohane, L. Lutzenhiser, B.A. McCarl, M.C. McFarland, M.D. Nichols, E.S. Rubin, T. Tietenberg, J. Trainham, L. Geller, A. Crane, T. Menzies, and S. Freeland, "America's Climate Choices Limiting the Magnitude of Future Climate Change", National Academy Report, The National Academies Press, Washington, D. C, 2010. Elbakidze, L., and B.A. McCarl, "Sequestration Offsets versus Direct Emission Reductions: Consideration of Environmental Co-effects", Ecological Economics, Volume 60, 564-571, 2007. | Partially Accepted, References checked. We agree that attribution of co-benefits and negative effects is difficult and therefore we discuss "potential" effects in the AR5. |
| 13348 | 11 | 55 | 47 | | | net (not nett) | Accepted, Done |
| 11174 | 11 | 55 | 49 | | | Something is missing after the last sentence. Period or additional explanations. | Accepted, Section re -drafted |
| 13350 | 11 | 55 | | | | This section should have a discussion that reduction of emissions from agriculture reduces inefficiencies and improves agricultural profitability. | Partially Accepted, Although the point is interesting, it can not be generalized as for all GHG emissions in the agricultural |
| 15619 | 11 | 55 | 18 | | | The socio-economic co-benefits does not mention those from demand-side consumption measures, which can improve animal welfare. E.g., industrial systems now produce approximately two-thirds of the world's poultry meat and eggs, and more than half of all pork. Food and Agriculture Organization of the United Nations (2009). The state of food and agriculture: livestock in the balance (Rome, Italy: FAO, p. 27). Available at: http://www.fao.org/docrep/012/i0680e/i0680e.pdf. The breadth of scientific evidence demonstrating that intensively confined animals are frustrated, distressed, and suffering under modern production schemes is extensive, conclusively substantiating that battery cages for egg-laying hens and crates for pregnant sows and calves are simply not appropriate environments. Duncan I.J.H. (1970). Frustration in the fowl. In: Freeman B.M. and Gordon R.F. (eds.), Aspects of Poultry Behaviour (Edinburgh, Scotland: British Poultry Science Ltd., pp. 15-31). Špinka M. (2006). How important is natural behaviour in animal farming systems. Applied Animal Behaviour Science 100(1-2),117-28. Baxter M. (1994). The welfare problems of laying hens in battery cages. The Veterinary Record 134(24), 614-9. Dawkins M.S. (1990). From an animal's point of view: motivation, fitness, and animal welfare. Behavioral and Brain Sciences 13, 1-61. Vestergaard K. (1984). An evaluation of ethological criteria and methods in the assessment of well-being in sows. Annales de Recherches Vétérinaires (Annals of Veterinary Research) 15(2), 227-36. Broom D.M., Mendl M.T., and Zanella A.J. (1995). A comparison of the welfare of sows in different housing conditions. Animal Science 61, 369-85. European Commission, Scientific Veterinary Committee, Animal Welfare Section. 1995. Report on the welfare of calves. Adopted November 9. Available at: http://ec.europa.eu/food/fs/sc/oldcomm4/out35_en.pdf. | Accepted, Animal welfare has been included at the social side. Why? Because the understanding of welfare is based on cultural values. References were checked. Special consideration was given to scientific papers |
| 17989 | 11 | 55 | 21 | 55 | 37 | From where does this "increase in the overall capital" come from? In what way would that be a co-benefit, given that the capital would not be available elsewhere in the economy? While the mentioned payment schemes might obviously lead to additional income for land-holders, these seem to be policy instruments to realize mitigation options rather than mitigation options themselves and should be discussed in the policy section. | Rejected, Make your analysis. If you Considered K a finite element or not. Furthermore there are sectors in the economy that are over-capitalized causing a stagnation. This is more a |
| 17990 | 11 | 55 | 24 | 55 | 27 | While increased (or decreased) downstream water availability might well be a co-benefit (or co-cost) of mitigation options such as revegetation or reforestation, why would additional timber be a co-benefit when it should clearly be part of the economic asssessment of the mitigation option? | Rejected, It is a co-benefit of the mitigation. That means that besides the mitigation benefit you get other benefits. Further, getting additional wood doesn't necessary have a direct economic benefit as it can be used by the producer (e.g. firewood, building) When this |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17991 | 11 | 55 | 42 | 55 | 22 | Since these improvements on institutional agreements are hard to quantify, I would frame these as opportunities rather than co-benefits and thus move the discussion to section 11.8.1. | Rejected, Co-benefits are not only quantifiable things. The existing institutional framework can be an opportunity or a barrier . But changes in the institutional framework can be also a consequence of an AFOLU measure |
| 10117 | 11 | 56 | 1 | 56 | 1 | Healt would fit better to socioeconomic benefits, nutrition benefits must be better articulated | Accepted, Done |
| 16603 | 11 | 56 | 15 | 56 | 22 | This paragraph, as with that mentioned in my point 61, is contradicted in the discussion of land sparing on p 69, lines 1-12. The land sparing issue should be discussed in one place so that you have a consistent set of opinions on it. P. 69 is better at including the evidence on both sides, although as mentioned earlier it leaves out several important works. | Accepted, re-drafted |
| 9459 | 11 | 56 | 15 | | 22 | Key point, but poorly articulated and misplaced. | Accepted, re-drafted |
| 13986 | 11 | 56 | 15 | 56 | 22 | this assertion needs to be significantly qualified to reflect the substantial disagreement in the scientific community about these conclusions. | Accepted, re-drafted |
| 12432 | 11 | 56 | 2 | 56 | 2 | Reduced deforestation will have at least the same benefits as reforestation. Please consider to add "reduced forestation" before reforestation. | Rejected, Environmental and health effects from reducing deforestation and reforestation are not necessarily the same. Impacts on watersheds is a good |
| 15200 | 11 | 56 | 2 | 56 | 14 | what's the point here? | Noted, |
| 3871 | 11 | 56 | 20 | 56 | 22 | Bioenergy crops are being exploited with high yields since this is a compulsory market for them in some countries (e.g. USA, Brazil, EU). Thus, the statement for Austria does apply for bienergy crops. This isn't mentioned in Section XY where mainly negative impacts of bioenergy are presented. Please, be fairer in your evaluation. See Pacca and Moreira, 2009. - Pacca, S. and J. R. Moreira, 2009. Historical carbon budget of the brazilian ethanol program, Energy Policy, 2009, vol. 37, issue 11, pages 4863-4873 | Partially Accepted, Reference checked. The discussion on bioenergy co-benefits and potential negative effects has been moved to the annex on biodiversity, where a more balanced view has been |
| 3872 | 11 | 56 | 28 | 56 | 31 | This point must be made clearer. Several papers complain that bioenergy crops require too much water. The amount of water required includes rainfall. Here you claim that surface cover can increase water availability. Please, explain the contradiction pointed out. | Partially Accepted, The impacts discussed here are the impacts from activities aimed at restoring watersheds (i.e. watershed restoration), which is rarely done through bio-fuel plantations. What is often done is a combination of biofuel crops and other (trees and crop) species. Biofuels monocultures on the other side can require much water, but there won't be any reason for making |
| 2635 | 11 | 56 | 33 | | 37 | There are many examples of agricultural yields increasing but as many examples for the need for a new green revolution since yields are down. | Noted, |
| 12433 | 11 | 56 | 38 | 56 | 38 | Please consider to add a few words so the sentence read; "Measures to reduce GHG-emissions from agriculture and forestry may also improve air, soil and water quality" | Accepted, Good suggestion! It increases readability. The whole section has been |
| 10118 | 11 | 56 | 42 | 56 | 42 | This section is vague, mainly refers to other sections, maybe should focus on innovative new technologies , including breeding, pest management, wasteproductuse, …or then skipped if no more content developed | Partially Accepted, Section has been re-drafted |
| 5097 | 11 | 56 | 43 | 56 | 43 | this section does not fit well under its subheading | Accepted, Section reviewed for the SOD |
| 13351 | 11 | 56 | 44 | | | agricultural, not agricclutual | Accepted, checked |
| 10179 | 11 | 56 | 7 | 56 | 14 | In some cases it is unclear whether the studies referred to are theoretical or empirical | Accepted, Section redrafted considering |
| 13349 | 11 | 56 | | | | This section should have a discussion of ammonia volatilization and impacts to air quality as well as ecosystem impacts. | Accepted, Air quality considered in the SOD |
| 14444 | 11 | 56 | | | | This section appears a bit scattered due to the broad topics covered. | Accepted, Section has been re-drafted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14680 | 11 | 56 | 2 | 56 | 3 | Persistant reductions in light levels will tend to reduce the productivity of crop and forest systems. | Accepted, Considered for the SOD, however, few clear references |
| 4266 | 11 | 56 | 40 | 56 | 41 | This section omits important health co-benefits from reduction of ischaemic heart disease as a result of reduction in animal source saturated fat consumption and reduction in large bowle cancer from reduced red and processed meat consumption. There are also benefits from increased fruit and vegetable consumption. Friel S, Dangour AD, Garnett T, Lock K, Chalabi Z, Roberts I, Butler A, Butler CD, Waage J, McMichael AJ, Haines A. Public health benefits of strategies to reduce greenhouse-gas emissions: food and agriculture. Lancet 2009; 374:2016-25 | Partially Accepted, Section re-drafted considering impacts on human health |
| 15620 | 11 | 56 | 40 | 56 | 41 | There are numerous additional studies discussing environmental and health benefits of reduced consumption. I suggest citing and/or discussing some of those briefly here. Mekonnen M.M. and A.Y. Hoekstra (2012). A global assessment of the water footprint of farm animal products. Ecosystems 15, 401-15. Available at: http://doc.utwente.nl/80897/1/Mekonnen-Hoekstra-2012-WaterFootprintFarmAnimalProducts.pdf. Eshel G. and P. Martin (2009). Geophysics and nutritional science: toward a novel, unified paradigm. The American Journal of Clinical Nutrition 89(suppl), 1710S-16S. McMichael A.J., J.W. Powles, C.D. Butler, and R. Uauy (2007). Food, livestock production, energy, climate change, and health. The Lancet 370, 1253-63. Marlow H.J., W.K. Hayes, S. Soret, R.L. Carter, E.R. Schwab, and J. Sabaté (2009). Diet and the environment: does what you eat matter? The American Journal of Clinical Nutrition 89(suppl), 1699S-703S. Donner S.D. (2007). Surf or turf: a shift from feed to food cultivation could reduce nutrient flux to the Gulf of Mexico. Global Environmental Change 17, 105-13. | Partially Accepted, References were checked. The relationship between diet and gHG emissions is addressed in sections 11.4 and 11.7 as well as dietary change |
| 10255 | 11 | 56 | 1 | 56 | 41 | This section is too weak and must be refocused on the human health aspect! There is really much to be considered:<br>- avoided burning of residues that have positive impact in reducing respiratory problems (e.g. Cançado ED, Saldiva PHN, Pereira LAA, Lara LBLS, Artaxo P, Martinelli LA, Arbex MA, Zanobetti, Braga ALF (2006) The impact of sugar cane–burning emissions on the respiratory system of children and the elderly. Env. Health Persp. 114: 725-729.);<br>- Debate on some substancies proned to reduce methane emission by liter of milk produced such as the Bovine somatotrophine;<br>- The no-tillage and muching option that is also synonymous of a shift in herbicide consumption;<br>- The bioenergy debate arround Jatropha and the presence of tumor promoters and phytotoxin (curcin) in its seed oil (e.g. Horiuchi T, H Fujiki, M Hirota, M Suttajit, M Suganuma, A Yoshioka, V Wongchai, E Hecker, T Sugimura. (Mar 1987) resence of tumor promoters in the seed oil of Jatropha curcas L. from Thailand. Japanese Journal of Cancer Research, 78(3):223-236;<br>- The possible presence of polycyclic aromatic hydrocarbons (PAHs) is Biochars (e;g. Hilber et al. 2012. Quantitative Determination of PAHs in Biochar: A Prerequisite To Ensure Its Quality and Safe Application, J. Agric. Food Chem., 2012, 60 (12), pp 3042–3050 | Partially Accepted, Section re-drafted considering impacts on human health |
| 10256 | 11 | 56 | 42 | 57 | 2 | This section is too short in its present form to be informative. | Accepted, Length of the sections is given. We have redrafted the section and hope that even if short it will be |
| 15621 | 11 | 56 | 42 | 57 | 2 | One additional technological consideration may be cultured meat production. Tuomisto H.L. and M.J.T. de Mattos (2010). Life cycle assessment of cultured meat production. 7th International Conference on Life Cycle Assessment in the Agri-Food Sector in Bari, Italy, September 22-24. Available at: http://oxford.academia.edu/HannaTuomisto/Papers/358909/Life_cycle_assessment_of_cultured_meat_production. | Accepted, Livestock sections improved throughout |
| 17992 | 11 | 56 | 2 | 56 | 6 | The climate benefits are no additional benefits to mitigation and should not be discussed under the framework of co-benefits. | Accepted, done |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10627 | 11 | 57 | | | 8 | Please consider the Caparrós et al. (2010). This paper analyzes reforestations in Spain including, in addition to commercial values, social preferences. The paper also studies the impact of different carbon accounting methods on the speciees selected. Reference: Caparrós, A, Cerdá, E., Ovando, P. and Campos, P , 2010. Carbon Sequestration with reforestations and biodiversity-scenic values. Environmental and Resource Economics 45: 49-72. | Accepted, References checked |
| 10120 | 11 | 57 | 10 | 57 | 1 | The argumentation here assumes that mitigaiton is connected to carbon markets, but mitigation and possible financing mechanisms are two different things. Reduction of net emissions is mitigaiton. How this is achieved is another issue, carbon markets is one options, not very probably in my view in small holder/pastoralist context in developing countires (major land users). Since agricultural investments (including farmers as the maininvestors) are about 1500 billion/year. directing thesefor climate smart agricultural investments (with mitigation as a co-benefit0 will I think be the major means of financing for mitigaiton in agriculture. Some kind of mitigation top up (to cover MRV if countries want to demonstrate downward deviation from ther baseline in their national reporting), investment suport for specially atractive mitigation practices with long lead limes ets. seem much more realistic alternative for agriculture that carbon markets. Through NAMAs Annex 1 countries could also offset theri emissions if they cannot do it in theri own agsectro (countries like New Zealand). LUC is another issue and has to be linked to red where a landscape approach looking at all ecosystem services is needed | Rejected, Without proper financing measures it is unlikely to get the AFOLU potential used. This is special critical in developing countries. The carbon markets (including all, Kyoto, the voluntary markets and the semi-regulated markets) are a main instrument promoting AFOLU activities. Carbon markets and agriculture are not necessarily two different things. Here it seems to be a confusion by the reviewer. The VCS for example includes methods for agriculture in its voluntary scheme |
| 11213 | 11 | 57 | 11 | 57 | 25 | Section 11.7.2.1 on socioeconomic risks and uncertainties could expand the analysis of risks of mitigation measures on indigenous peoples and local communities to include low carbon developments like dams and carbon sequestration (tree plantations) that risks marginalising community land and resource rights and causing environmental damage etc | Partially Accepted, The risk mentioned here is not only for indigenous peoples but for many rural communities. The issue has been included in the SOD |
| 5098 | 11 | 57 | 11 | 57 | 11 | I would not call the following risks they are tradeoffs "Some mitigation measures may result in a decrease in the amount of land available for food 11 production (e.g. reforestation of farmland to sequester carbon or produce bioenergy), decrease 12 yields (e.g. competition between trees and crops, reduced yields with reduced fertilizer inputs), or 13 directly compete for food materials as a bioenergy feedstock (e.g. conversion of sugar or maize to 14 ethanol)." | Rejected, It is a trade-off in the sense of land availability . However it is a high risk from the livelihood perspective |
| 3873 | 11 | 57 | 11 | 57 | 11 | Here it is stated that multiuse of land decreases yield and has negative impacts on GHG mitigation. Early in this paper multiuse of land is recommended as a mitigation source. How can we live with such contradiction? | Rejected, It is written that "some mitigation measures MAY result..." We didn't mention any specific and we didn't |
| 5099 | 11 | 57 | 15 | 57 | 15 | what is the risk in "Mitigation projects may have rules that require the mitigation activity to be in place for 70-16 100 years; this can reduce future flexibility in land-use." this is a barrier | Rejected, Defining use for such a long period can be an important risk for livelihoods in developing countries as these are locking any future use that |
| 5510 | 11 | 57 | 16 | 57 | 17 | The reviewer strongly agrees with the issue of the required 70-100 year time frame as counterproductive to many mitigation strategies. Commercial tree plantations for example can have a 40 year rotation period- and not qualify as mitigation- however these types of plantations provide sustainable forests, multiple benefits as well as carbon storage. The required time frame also puts constraints on crediting for soil carbon and an emphasis on increasing inert C in soil systems, again counterproductive. As the potential benefits of rapid action within this sector are large and cost productive- this is a key hurdle to be overcome | Noted, Thanks. This comment is completely opposed to the previous comment. |
| 5840 | 11 | 57 | 17 | 57 | 18 | Not clear: why should land holders want to repurchase C credits? The projects are tailored to generate credits. Buying credits can only be necessary if the project failed the expectations? | Partially Accepted, That can make sense e.g. in developed countries through JI projects. Consider rewording |
| 16604 | 11 | 57 | 18 | 57 | 19 | This assumes both a broad carbon market including land use credits, and landholders who participate in it actively. Neither is the case currently and as mentioned in my point 4, the trends are no longer moving in that direction. Delete. | Rejected, It only assumes that this is possible. If the possibility exists then land-holders need to consider this |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12436 | 11 | 57 | 18 | 57 | 20 | Please consider to explain the meaning of "beyond 2015". The meaning of this sentence is hard to understand. | Partially Accepted, Page is incorrect. The sentence is in page 58. It is expected that a new agreement under the UNFCCC will be achieved at the latest by 2015. This is one of the outcomes of the last COP in Durban. However, as there is not yet clarity about the architecture of such an agreement |
| 5100 | 11 | 57 | 25 | 57 | 25 | personally I think there there are risks that you omit likel that with distribution of future carbon prices, amount of sequestration, monitoring reliability or emissions reduction, disturbances like fires, future value of resource and opportunity costs. Also indirect land use is a risk as we dont often know what it is | Partially Accepted, Issues were considered and some included in the SOD |
| 5101 | 11 | 57 | 25 | 57 | 25 | I don't find "The impacts of greenhouse gas mitigation in the AFOLU sector on other climate drivers (such as 27 albedo and water balance) are discussed in detail in section 11.5 so are not discussed further here." to be a risk it is a known consequence and a tradeoff | Accepted, Discuss with Ravi and Frank |
| 12437 | 11 | 57 | 26 | 57 | 26 | Please specify which section "The section on systemic perspectives" refers to. | Accepted, Redrafted |
| 3874 | 11 | 57 | 29 | 57 | 32 | Here you are presenting negative aspects of land use intensification. Earlier in this paper, high yields were described as a good approach to reduce GHG emissions. I understand that what is important is the amount of fertilizers used in relation to the volume of useful crop harvested. | Partially Accepted, High yields are not considered as negative impacts in the SOD |
| 11214 | 11 | 57 | 3 | 57 | 8 | As well as the observation in the text that mitigation might have positive impacts on tenure, land use rights and governance, there is an equal risks that these measures might have negative impacts if human rights standards, FPIC and rule of law are not adhered to... | Noted, We agree, and this has been mentioned in other subsections of the chapter (e.g. 11.4.4) |
| 5632 | 11 | 57 | 3 | 57 | 8 | Fully agree with this paragraph. Line 7 change greated to greeted. | Accepted, Thanks. Term corrected. |
| 10119 | 11 | 57 | 3 | 57 | 3 | This is weak, much more needs to be said about mitigation, since it is a very contentuos issue. Mitigation in agriculture in existing land area can be framed as a co-benefit of adoting climate smart practies i.e. increasing productivity sustainably on existing land area, building the resilience and adopting long term adaptation strategis, and then having mitigaiton as a co-benefit. The contentuous issue is really land use change and the role of agriculture and bioenergy there, this has been well discussed earlier, probably taking a lnad scape approach securing multiple objectives trhoug inclusive participatory processes is the way forward here. | Partially Accepted, Page 57 line 3 deals with public perception. We have considered "smart agriculture" in the SOD: However the term is not really defined, neither there is a definitive agreement on it. Thus we include the positive impacts only. |
| 5103 | 11 | 57 | 31 | 57 | 31 | there may be risks in environmental quality from increased n use and runoff, pesticides can also be a problem | Accepted, Discussed in the SOD in environmental co-benefits and risks |
| 5104 | 11 | 57 | 31 | 57 | 31 | there is a major risk of practice reversal particularly if programs are voluntary | Rejected, The comment is highly speculative. There is not much to prove |
| 5105 | 11 | 57 | 31 | 57 | 31 | there is also a major risk of non performance. I have been working with steve rose and he has estimates from a trader on delivery risk due to international contraacts, political instability, individual performance ets that shows some high riskes (20-50% non performance) | Accepted, Discussed in section 11.5 |
| 5106 | 11 | 57 | 31 | 57 | 31 | wher you say (R.B. Jackson et al., 2005) documented several effects of afforestation/ 35 reforestation on the environment" I think this is wrong (I am a coauthor) they really looked at water not the total environment, you should use the word water in the sentence | Accepted, Redrafted |
| 5102 | 11 | 57 | 32 | 57 | 32 | leakage is a known concept in mitigation and I would avoid use of the word | Accepted, Redrafted |
| 3875 | 11 | 57 | 35 | 57 | 48 | Here the statement is against land cover increase. Just a few paragraphs before land cover was presented as a potential benefit for water. We need a final conclusion on that. | Accepted, Redrafted |
| 12435 | 11 | 57 | 39 | 57 | 40 | Do plantations have increased nutrient demand compared with cropland, as stated in the sentence ? | Accepted, Redrafted |
| 12434 | 11 | 57 | 4 | 57 | 4 | Please consider to add "can" before have, to make the statement more nuanced and more consistant with p.57 line 11-14. | Accepted, Redrafted |
| 13353 | 11 | 57 | 40 | | | Space between words: increase_nutrient: changes soil chemistry (s on change) | Accepted, Redrafted |
| 5633 | 11 | 57 | 43 | 57 | 48 | Some litter decomposition can raise the pH, especially from broadleaf trees. Agroforestry crops --- have been used. Used for what? VOC emitted --- by most of the species commonly used. What common species? | Accepted, Redrafted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10192 | 11 | 57 | 48 | 58 | 3 | What about reduced land run-off of precipitation due to increased uptake by biomass and soil after reforestation/afforestation, as well as dew harvesting by the forest? See e.g. Meuser (1990) Agricultural and forest meteorology, 50: 125-138; del Campo et al. (2006) Forest Ecology and Management, 235: 107-115 | Accepted, One of the references is too old, the other one is only 2006. We searched for more recent references on |
| 13352 | 11 | 57 | 7 | | | greeted not greated | Accepted, Redrafted |
| 10257 | 11 | 57 | 3 | 57 | 8 | There will be difference between countries (developping, developped,…), and also rather similar to section 11.8.4. | Accepted, We tried to include the regional differences in the SOD |
| 5381 | 11 | 57 | 4 | 57 | 5 | The first sentence of this paragraph is really a sweeping statement. What evidence has been offered that mitigating terrestrial carbon emissions are going to throw farmers off their land. How do we know that this is the cause and not other drivers, e.g., there have been a number of reports of China and oil-rich states buying up large tracts of land in Africa to grow food which is then imported into the country that bought the land. Certainly that is displacing small farmers. How do we know that mitigation will be negative. What evidence has been presented in Chapter 11 for such a sweeping statement? See for example Collier, P. and S. Dercon, AFRICAN AGRICULTURE IN 50 YEARS: SMALLHOLDERS IN A RAPIDLY CHANGING WORLD?, in Expert Meeting on How to Feed the World in 2050, Food and Agriculture Organization of the United Nations, Economic and Social Development Department, FAO, Editor 2009, Food and Agriculture Organization of the United Nations: Rome, Italy.http://www.fao.org/docrep/012/ak542e/ak542e00.htm ftp://ftp.fao.org/docrep/fao/012/ak542e/ak542e18.pdf | Partially Accepted, Section has been re-drafted. New references are included, more were checked |
| 14445 | 11 | 57 | | | | This is a very important risk with mitigation strategies. Good to see it receives attention in this chapter. Does this topic receive more attention in other chapters? | Noted, Thanks |
| 15622 | 11 | 57 | 10 | 57 | 25 | To the extent that mitigation measures encourage industrial farm animal production practices, there are numerous socio-economic risks for consideration, including to small farmers and animal welfare. Mirle C. (2012). The industrialization of animal agriculture: implications for small farmers, rural communities, the environment, and animals in the developing world. The 10th European International Farming Systems Association Symposium in Aarhus, Denmark, July 1-4. Workshop 1.3: Understanding agricultural structural changes and their impacts, to support inclusive policy dialogue and formulation. Available at: http://www.ifsa2012.dk/downloads/WS1_3/ChetanaMirle.pdf. | Partially Accepted, Livestock sections improved throughout |
| 17995 | 11 | 57 | 27 | 57 | 34 | The negative impact of mitigation options in terms of other climate drivers are no additional costs to mitigation and should not be discussed under the framework of co-costs. | Partially Accepted, Added to table |
| 15623 | 11 | 57 | 33 | 57 | 34 | Agricultural intensification in animal agriculture could also lead to increased grey water footprints. Mekonnen M.M. and A.Y. Hoekstra (2012). A global assessment of the water footprint of farm animal products. Ecosystems 15, 401-15. Available at: http://doc.utwente.nl/80897/1/Mekonnen-Hoekstra-2012-WaterFootprintFarmAnimalProducts.pdf. | Accepted, Unfortunately it is not a scientific reference. However we considered the issue. |
| 10180 | 11 | 58 | 12 | 58 | 13 | Expand on this topic: i.e. which technologies and which areas, and what are the reasons for banning? | Accepted, technology sub-section |
| 5107 | 11 | 58 | 13 | 58 | 13 | we are facing a tech risk in united states. Namely cellulosic ethanol is not advancing at the assumed rate | Noted, Statement - not a comment |
| 5108 | 11 | 58 | 13 | 58 | 13 | there is also a tech risk in ag technological progress namely if the technology advances at a rate slower that population growth we have a real problem with production diverting mitigation. This is covered in Mosnier, A., P. Havlk, H. Valin, J.S. Baker, B.C. Murray, S.J. Feng, M. Obersteiner, B.A. McCarl, S.K. Rose, and U.A. Schneider, "Alternative U.S. Biofuel Mandates and Global GHG emissions: The Role of Land Use Change, Crop Management and Yield Growth", Energy Economics, second review, 2012 | Accepted, We checked more scientific references on the topic and by the authors. Although, before having this as an important risk, other technological challenges were included in the SOD. For other sectors this might be more important than for AFOLU, where the major challenge is probably not an |
| 5635 | 11 | 58 | 14 | 58 | 24 | The general public perception is that the cutting of trees is deforestation, when in most cases it is harvesting. An effort to correct this should be vigorously pursued! | Rejected, The statement that "the general perception is" something is vague. The text clarifies in some places |
| 10178 | 11 | 58 | 14 | 58 | 24 | Based on the scientific knowledge of today, what measures would be most effective at the global scale and at the regional scale, respectively? | Partially Accepted, This is a valuation. What is most effective depends on the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11306 | 11 | 58 | 20 | 58 | 22 | Re: the use of the term 'perceived' in this context, is this to say that there is no evidence of the risks in biotechnology or animal feed additives? Again, in the current political climate this could be misconstrued by corporate interests as a dismissal of any risks. Would it be better to change to 'real or perceived health and/or environmental risks'? | Rejected, The text refers to the effects caused by the uncertainties regarding international agreement(s) within the UNFCCC. |
| 16606 | 11 | 58 | 22 | 58 | 24 | This final sentence is needlessly provocative, implying that the scientists know better than the public. Delete. | Accepted, deleted |
| 10181 | 11 | 58 | 23 | 58 | 24 | Therefore the need to be specific in this report | Accepted, redrafted |
| 5842 | 11 | 58 | 24 | 58 | 46 | Please give an explanation what you mean by "spill-over" in this here context, e.g. in the glossary, because this is synonymous with side-effects and can thus mean anything from "co-benefit" to "risk of desaster". I do not see any reason to mention scale effects and environmental markets so broadly here, this is redundant. The text could be shortened to "they exist". As everything written here is already mentioned elsewhere in the text the text of the section could be deleted and only the table be retained. | Accepted, We considered spill overs as co-benefits that go beyond the original system of the AFOLU measure. There is still discussion going on how exactly to deal with spillovers in the AR5. |
| 11826 | 11 | 58 | 26 | | | insert the section number so that it is clear which section is meant | Accepted, Redrafted |
| 5636 | 11 | 58 | 37 | 58 | 37 | Change timber yield to wood yield. | Rejected, Timber is a widely accepted |
| 5109 | 11 | 58 | 53 | 58 | 53 | I would think mention of indirect land use and leakage might appear in "Where this displaces other 42 commodities, there are likely to be impacts on markets." | Noted, There is a cross-cutting group on leakages. In the drafting group, we agreed that we don't include international leakages at the moment. The issue is mainly argumentative, and |
| 5634 | 11 | 58 | 6 | 58 | 13 | Technological considerations. Technical consideration are: whether to end the rotation at the point when mean annual increment (MAI) is maximum, that is when current annual increment (CAI) dissects the MAI curve from above; to fell when economic returns are maximum (usually before maximum MAI); or to let the crop grow to maturity. In the latter case the C sequestration will be maximum, but in the two former cases, the thinning and felling yields will give the greatest returns. For a mixed-aged plantation the C stock and thinnigs/felling, will be greater than the C stock in the mature trees. | Accepted, Technological issues were re-drafted for the SOD |
| 5841 | 11 | 58 | 6 | 58 | 13 | Mitigation projects without consideration of the potential use of biomass grown on the land or other management issues are wasted. Please bear in mind that sequestration means "removal from the atmosphere", not "fixing C in this place and leaving it here". | Rejected, Use of biomass as well as waste management and various management issues (options) are |
| 10121 | 11 | 58 | 6 | 58 | 6 | Needs strengthening, again not much content | Accepted, Redrafted |
| 16605 | 11 | 58 | 7 | 58 | 8 | Again, it is asserted that "a large proportion" of the AFOLU sector is in soil and vegetation sequestration, without an estimate of what that proportion is nor a citation. Both are needed. | Partially Accepted, Link to the corresponding section in the chapter |
| 10182 | 11 | 58 | 4 | 58 | 5 | Reforestation/afforestation on previous agrocultural land, such as grazing areas, may reduce biodiversity since species specific to these agrocultural habitats will disappear while forest species may be limited in their dispersal or have problems establishing populations due to habitat specifics. See e.g. Cocca et al. (2012) Land Use Policy, 29: 878-886; Bruun et al. (2010) PRESLIA, 82: 345-346; Brunet et al. (2012) Scandinavian Journal of Forest Research, 27: 245-254; Amici et al. (2012) Ecological Complexity, 9: 55-62; Stenert et al. (2012) Marine and Freshwater Research, 63: 283-292; Otero et al. (2011) Land Use Policy, 28: 207-218; | Partially Accepted, References checked. Impacts on biodiversity are included. |
| 4267 | 11 | 59 | | | | There is no mention of any health co-benefits in this table | Partially Accepted, Health co-benefits and risks included in the SOD |
| 3876 | 11 | 59 | | | | Row Technological risks, 4th. Column. Promotion of innovation is a positive input of bioenergy as stated here and in the IPCC-SRREN. At Section XY only negative aspects of bioenergy are mentioned and even this one positive aspect is absent there. Make Section XY fairer. | Partially Accepted, Technological issues redrafted |
| 5843 | 11 | 59 | | | | Do you want to give the sources with the table, or why do you show numbers in brackets? | Rejected, Brackets were used during drafting and for guidance among the writing team. The numbers in brackets should have been deleted. However, we |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11073 | 11 | 59 | | | | what do the numbers in parentheses refer to within Table 11.11 and some other tables? | Rejected, Brackets were used during drafting and for guidance among the writing team. The numbers in brackets should have been deleted. However, we |
| 2636 | 11 | 59 | | | | This table is mostly agriculture and should state that. It has been difficult throughout the chapter to balance the agricultural information with forests data. Since they are really different - one perennial and the other annual - they are difficult to summarize together. | Partially Accepted, Ensure balance between the sectors |
| 10445 | 11 | 59 | 0 | 59 | 0 | Potential negatice impact of ill defined land tenure rights in the poor communities is multifold. The poorly defined property rights will result in biased compensation for the most vulnerable | Accepted, Land tenure is discussed in 11.7 and 11.7 and included also in |
| 5110 | 11 | 59 | 1 | 59 | 1 | there are a numner of risks in here not in the text might point to this in text on risk. | Accepted, redrafted |
| 5111 | 11 | 59 | 1 | 59 | 1 | also what do the numbers in parentheses mean? | Rejected, Brackets were used during drafting and for guidance among the writing team. The numbers in brackets should have been deleted. However, we |
| 15624 | 11 | 59 | 1 | 59 | 1 | The summary Table 11.11 should include risks to small farmers and animal welfare under "Socio-economic effects." Mirle C. (2012). The industrialization of animal agriculture: implications for small farmers, rural communities, the environment, and animals in the developing world. The 10th European International Farming Systems Association Symposium in Aarhus, Denmark, July 1-4. Workshop 1.3: Understanding agricultural structural changes and their impacts, to support inclusive policy dialogue and formulation. Available at: http://www.ifsa2012.dk/downloads/WS1_3/ChetanaMirle.pdf. | Noted, Unfortunately it is not a scientific reference. However, we considered the issue. |
| 11201 | 11 | 6 | 1 | 6 | 10 | This section treats land management by 'sector' without recognising land management functions and customary land tenure systems of indigenous peoples and local communities (these are not 'sectors'). There is a need to insert text here on "communal tenure regimes" and/or traditional and/or customary land owners and managers. | Accepted, Added later in the chapter |
| 3533 | 11 | 6 | 1 | | | What are these issues common to all land uses? Please give some examples. | Accepted, e.g. all have soils and vegetation GHG fluxes; has been |
| 2614 | 11 | 6 | 11 | | 16 | This is one sentence - too long and too many ideas embedded in it. | Accepted, Edited for SOD |
| 18912 | 11 | 6 | 13 | 6 | 14 | consider replacing "scenarios also being considered by IPCC WG I and WG II (i.e. the RCPs)" with "same assumptions (i.e. the Representative Concentration Pathways [RCPs]) that many scenarios that are assessed in the three IPCC Working Groups are based on." Reasoning: RCPs are not scenarios but part of the framework scenarios are based on and they are also used in WG III. In case you are also making use of SSP (Shared Socio-economic Pathways) then also reference these (https://www.isp.ucar.edu/sites/default/files/Scenario_FrameworkPaper_15aug11_0.pdf) | Accepted, Edited for SOD |
| 14569 | 11 | 6 | 17 | 6 | 19 | I would liketo see a slightly improved definition of what is meant by "bottom up " and top down". often bottom up studies are not necessarily small scale, they could be large scale but based in just one sector. May be something like…scale up from site to regional scale sector or resource specific studies" (ie start with land availability and regional tree productivity, or corp productivity. The top down studies: the riginal RCPs actually started with different bottom up policy driven assessments eg. agressive mitigation in lots of sectors including AFOLU in the 4 IAMs that originally developed the mitigation pathways. I think one of the differences here is bottom up studies often dont consider cross sectoral competiation for demand. Whereas the IAM studies are looking at demand on land use in an integrated way. | Accepted, Replaced terms with more descriptive ones |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15145 | 11 | 6 | 18 | 6 | 18 | replace "the" with "then" | Accepted, Edited for SOD |
| 18913 | 11 | 6 | 19 | | | consider adding a reference to the discussion about bottom-up and top-down to this section as background information | Accepted, Replaced terms with more descriptive ones |
| 15954 | 11 | 6 | 20 | 6 | 23 | The sentence provides three different figures for agriculture, from the text it is not directly clear to what these 3 ranges refer to. In the introductory section a range is given. | Accepted, Revised for SOD |
| 5536 | 11 | 6 | 21 | 6 | 21 | There is a surplus of annual growth of an estimated 9 Gt C or 34 Gt CO2 equivalent. This is not taken into account when considering forest mitigation options (1.3 to 4.2 GtCO2/yr). Thus, the potential for 'forest' mitigation is much larger. | Discuss further at LAM3, We are not condsidering total biophysical potentials here so total extractable NPP is not |
| 14570 | 11 | 6 | 22 | | | rangeD | Accepted, Edited for SOD |
| 10583 | 11 | 6 | 23 | | | Is this range quoted at $100/tCO2eq? | Accepted, Clairfied for SOD |
| 16526 | 11 | 6 | 24 | 6 | 25 | As discussed above (points 4 and 5) the expression of mitigation potentials in terms of responses to a global carbon price reduces their utility considerably, even if they are "refined estimates" as described here. I understand the advantage of modelling and estimating them this way in terms of analytic simplicity (using marginal abatement curves), but that doesn't justify using an anachronistic approach that doesn't correspond to the world of the second decade of the 21st century. | Noted, We can only report what is in the literature so have to report potentials at the costs calculated |
| 10584 | 11 | 6 | 24 | | | Add "(LULUCF) | Accepted, Edited for SOD |
| 4989 | 11 | 6 | 28 | 6 | 29 | Sentence: The section describes …… in drivers. No need for this sentence | Accepted, Deleted |
| 13519 | 11 | 6 | 28 | 6 | 29 | Sentence: The section describes …… in drivers. No need for this sentence | Accepted, Deleted (duplicate comment) |
| 15146 | 11 | 6 | 28 | 6 | 28 | insert "them" after "compares" | Accepted, Edited for SOD |
| 14571 | 11 | 6 | 28 | 29 | | could delete first sentence as title says it. | Accepted, Edited for SOD |
| 5800 | 11 | 6 | 28 | 6 | 37 | Combine lines 28 - 29 and 34 - 37. This paragraph could thus be reduced to half ist length. | Accepted, Edited for SOD |
| 16527 | 11 | 6 | 32 | 6 | 32 | Clarify here and in Figure 11.1 whether these figures are for gross or net emissions. | Accepted, Clarified gross and net |
| 9442 | 11 | 6 | 4 | | 6 | The distinctions presented here are too broad and do not contribute much to the piece. | Rejected, Improve distinction instead |
| 14567 | 11 | 6 | 4 | 6 | 8 | these two sentances could be combined | Accepted, Edited for SOD |
| 5038 | 11 | 6 | 4 | 6 | 4 | where you say "The land managers are also very different" I might add "and time frames of concern" after managers | Accepted, Edited for SOD |
| 8832 | 11 | 6 | 5 | 6 | 5 | Can the land use 'agriculture' be considered short term? The rotation are of shorter term than in forestry, but generally the land occupation in an agricultural practice (even fallow) can be long term | Accepted, Edited for SOD |
| 10581 | 11 | 6 | 5 | | | ….short-term "returns" by farmers whereas forests are managed for longer-term returns. | Accepted, Edited for SOD |
| 10095 | 11 | 6 | 5 | 6 | 5 | apart from farmers and foresters large land areas, grasslands, are managed by pastoralists who have a long term view | Accepted, Edited for SOD |
| 2613 | 11 | 6 | 5 | 6 | 7 | Why highlight the difference between farmers and forest managers? Farmers being small private landholders doesn't work for the industrialized world. | Accepted, Edited for SOD |
| 10238 | 11 | 6 | 6 | 6 | 7 | " the different land managers have perceptions of themselves as one otr the other of these"…I do not understand | Accepted, Edited for SOD |
| 16525 | 11 | 6 | 7 | 6 | 8 | Delete "small" from the phrase "small private landholders". Many of the most important landholders for AFOLU (e.g. deforestation in Latin America due to soy and beef expansions) are very large, owning thousands or even tens of thousands of hectares. | Accepted, Edited for SOD |
| 7054 | 11 | 6 | 7 | 6 | 8 | The statement "agriculture tends to be managed by small private landowners; forestry by Government and corporate entities" is an over-generalization and not true for many parts of the world. | Accepted, Edited for SOD |
| 5799 | 11 | 6 | 7 | 6 | 8 | Concerning forestry, please be careful with your interpretation of FAO FRA page 121. ff. The world's regions differ in the share of ownership types (what can have significant impacts on mitigation policy implementation), and ownership and management must not necessarily be in the same hand. | Accepted, Edited for SOD |
| 10096 | 11 | 6 | 7 | 6 | 7 | there are wast land areas with communal tenure systems, notable partures and grasslands, where one can also trough introduction of trees "cross over"sectors | Accepted, Edited for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8922 | 11 | 6 | 7 | 6 | 8 | On a global perspective White and Martin estimates that 77% of the global forest estate are administered by governments, 4 % belong to communities and indigenous groups, 19% are private ownership based on traditional or entitled rights; in some important forest countries up to 80% of the state own forest are managed by private firms under long-term lease/concessions [White, Andy; Martin, Alejandra 2002: Who owns the World's forests, Center for Environmental Law, Washington, DC ] | Accepted, Added reference and details later in the chapter |
| 14568 | 11 | 6 | 8 | | | suggest to delete "also" | Accepted, Edited for SOD |
| 11802 | 11 | 6 | 8 | | | What about private and community forest owners/managers? | Accepted, Edited for SOD |
| 10582 | 11 | 6 | 8 | | | Forests owned mainly by private landowners in NZ and Sweden I think - not always corporates/governments. | Accepted, Edited for SOD |
| 13305 | 11 | 6 | 11 | 6 | 19 | Long confusing sentence, rephrase for clarity | Accepted, Edited for SOD |
| 3534 | 11 | 6 | 1 | | 10 | Agriculture' and 'Forestry' are different sectors, but in order to better deal with common issues between both sectors (for e.g. forest converted to agricultural land, afforestation, reforestation, mitigation options), it is good practice to treate them in a single sector. Therefore, saying that there are significant differences between the sectors (policies, governed by different ministries, etc) is a fact, is abvious, it cannot be otherwise. I would suggest to reformulate the paragraph and include some ideas like "since both sectors are governed by different policies, ministries, etc., there is a need, when it comes to mitigation, to consider agriculture and forestry as a single sector to avoid to dissipate and jeopardize mitigation efforts" | Rejected, Acknowledging that there are differences is important |
| 6928 | 11 | 6 | 11 | 6 | 16 | Please provide a more specific reference to WGI/WGII AR5. | Accepted, Added for SOD |
| 5366 | 11 | 6 | 3 | 6 | 4 | It seems needlessly perjorative and factually incorrect to assert that farmers manage their lands focused only on the "short term." I don't see how that can possibly be true for all farmers across the world. If there is an important point that needs to be made here, it needs to be restated. Otherwise delete. | Accepted, Edited for SOD |
| 3169 | 11 | 6 | 27 | | | Much of section 11.2 is also covered in WG1. Sections 11.2 and 11.3: streamline the tables and the prose; much of the prose in the main text repeats the tabular points. | Accepted, Section was largely revised for SOD, and became shorter. Some |
| 3536 | 11 | 6 | 28 | | 37 | I would suggest to reformulate the first sentence as follows: "This section describes new trends in GHG emissions and major drivers since the publication of the AR4". Please indicate also in the paragraph, as sources of GHG emissions, non-CO2 emissions (CO, NOx) from, for e.g., biomass burning (forest fires, savannah burning, etc.). Saying that "Global trends in total emissions from AFOLU activities between 1971 and 2010 and contributions of single sources are shown in figure 11.1a" is in contradiction with what is shown in Figure 11.1a, please harmonize. | Accepted, Edited for SOD |
| 7056 | 11 | 6 | 32 | 7 | 19 | This part of the intro to 11.2, including figures 11.1a and b, should be removed because this formulation of the information is unnecessary, easily misinterpreted and far less transparent than the more detailed discussion of the issue that follows.<br>It would also help to reduce the length of this section - a stated goal of the review. | Accepted, Agreed - edit |
| 6929 | 11 | 6 | 34 | 6 | 34 | Relevant for WGI AR5, encourage to ensure consistency between WGI (Chapter 6 for sure) and WGIII on the issue of land use, land use change. | Accepted, Has been cross-referenced to WGI |
| 14672 | 11 | 6 | 6 | 6 | 6 | If it is true, as some paper suggest, that the Hadley pressure cells have broadened, moving to higher latitudes north and south. As things become drier, particularly in the high latitude subtropics, there will be more fires. | Accepted, Figure has been removed; fire dealt with later |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9916 | 11 | 60 | 1 | | | An analysis of 104 empirical studies of innovation to change showed the following barriers, that could refine and structure the discussion of barriers:<br>Issues of resourcing (76%), for instance, “not enough resources” (Post and Altman 1994), “lack of adequate resources such as time and staff” (Adams and McNicholas 2007), limited or no budgeting (e.g. Harris 2000 and Anumba et al. 2006), access to capital and lack of time (Rohdin and Thollander 2006).<br>Issues of capabilities (75%), for instance, “low technology literacy” (Stewart, Mohamed and Marosszeky 2004), “ill-equipped in terms of training and expertise” (Whitaker 1987), “employees are not trained” (Tamimi and Sebastianelli 1998), “lack of understanding” (Waldron 2005), “lack of technical skills” (Rohdin and Thollander 2006), “lack of skill, knowledge and expertise” (Kirkland and Thompson 1999), etc.<br>Issues of communication (64%), for instance, “communication barriers” (Heide, Grønhaug and Johannessen 2002), “communication overload and distortion” (Allen 2002), “lack of communication within the team” (Attaran and Nguyen 1999), “lack of communication among those sharing responsibility for different aspects” (Kunda and Brooks 2000), “poor communication practices that damaged employee commitment to projects” (Jacobs et al. 2006), “tension among departments arising from the incompatibility of actual or desired responses” (Aggarwal 2003), etc.<br>Issues of organizational structure (62%), for instance, bureaucracy (e.g. Molinsky 1999; Borins 2000; Abdul-Hadi, Al-Sudairi and Alqahtani 2005), “salary structure” (Al-Qirim 2007), “complexity, centralization, and formalization”(e.g. Allen 2002), “rigid organizational boundaries” (Butler 2006), “departmental fortresses” (Cicmil 1999), and organizational structure (e.g. Scarbrough and Lannon 1988; McGaughey and Snyde 1994; Yauch and Steudel 2002).<br>Abdul-Hadi, N., Al-Sudairi, A. und Alqahtani, S. (2005): Prioritizing barriers to successful business process re-engineering (BPR) efforts in Saudi Arabian construction industry, In: Construction Management \& Economics, Vol. 23, Nr. 3, S. 305-315.<br>Adams, C.A. und McNicholas, P. (2007): Making a difference: Sustainability reporting, accountability and organisational change, In: Accounting, Auditing and Accountability Journal, Vol. 20, Nr. 3, S. 382-402.<br>Aggarwal, N. (2003): Organizational Barriers to Market Orientation, In: Journal of Management Research, Vol. 3, Nr. 2, S. 87-97.<br>Allen, R.Y.W. (2002): Assessing the impediments to organizational change: A view of community policing, In: Journal of Criminal Justic, Vol. 30, Nr. 6, S. 511-517.<br>Al-Qirim, N. (2007): The adoption and diffusion of E-commerce in developing countries: The case of an NGO in Jordan, In: Information Technology for Development, Vol. 13, Nr. 2, S. 107-131.<br>Anumba, C.E.H., et al. (2006): Understanding structural and cultural impediments to ICT system integration: A GIS-based case study, In: Engineering Construction & Architectural Management, Vol. 13, Nr. 6, S. 616-633.<br>Attaran, M. und Nguyen, T.T. (1999): Design and implementation of self-directed process teams, In: Management Decision, Vol. 37, Nr. 7, S. 553-561.<br>Borins, S. (2000): What Border? Public Management Innovation in the United States and Canada, In: Journal of Policy Analysis and Management, Vol. 19, Nr. 1, S. 46-74.<br>Butler, J.C. (2006): Ten Lessons Learned: Data Warehouse Development Project, California Department of Fish and Game, In: CrossTalk: The Journal of Defense Software Engineering, Vol. 19, Nr. 10, S. 16-20 | Consider, The references provided were mostly for other sectors. The drafting team looked at the importance of the following issues as barriers for AFOLU: lack of resources, communication barriers, and organizational barriers as the main three categories mentioned by the reviewer. |
| 5112 | 11 | 60 | 1 | 60 | 1 | I think transactions costs are a major barrier. In particular the us avg numbers for tillage yield of carbon were one 1/4 ton per acre and to sell a 10,000 ton contract takes 40,000 acres which is at 600 acres per farm (avg farm size was 643 acres a couple of years ago( is about 700 farmers transactions costs would be high crop insurance is about 25%. larger costs would occur in developing countries with small farm sizes amounting to sat 70000 farms is average farm size is 2 ha. i think this was discussed in Post, W.M., J.E. Amonette, R. Birdsey, C.T. Garten Jr., R.C. Izaurralde, P.M. Jardine, J. Jastrow, R. Lal, G. Marland, B.A. McCarl, A.M. Thomson, T.O. West, S.D. Wullschleger, and F.B. Metting, "Terrestrial Biological Carbon Sequestration: Science for Enhancement and Implementation", Science and Technology of Carbon Sequestration, Editors B. McPherson and E. Sundquist, American Geophysical Union, Geophysical Monograph Series, Volume 183, 350 pp, 2009. | Accepted, The issue of transaction costs is included in 11.8. Newer references were included. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11827 | 11 | 60 | 1 | | | Wouln't be "Barriers and oportunities to AFOLU mitigation" or so be a more complete title for this section? | Rejected, Titles are given |
| 5114 | 11 | 60 | 11 | 60 | 11 | why single out unfccc as a source of incentives many others could do so | Accepted, Good point. Voluntary markets are included in the text |
| 5115 | 11 | 60 | 13 | 60 | 13 | what about education level and acess to information | Accepted, Good point. Skill and |
| 2637 | 11 | 60 | 19 | | 21 | There are many other uses of forests that do not always require deforestation. | Noted, We fully agree |
| 5113 | 11 | 60 | 22 | 60 | 22 | land ownership and property rights is also an issue | Partially Accepted, Land tenure has been already addressed in other sections. We didn't want to put the same issues in all sections. On the other |
| 2638 | 11 | 60 | 22 | | 33 | This is a difficult case to make since the countries with clear land tenure (most of Europe, USA) are also the countries conserving their forests and not using forests as working forests. While countries with low land tenure are the suppliers of forest products to the countries with clear land tenure. So this is not very simple. | Rejected, These are not the only countries conserving forest. There are interesting experiences in developing countries (e.g. Brazil, Costa Rica, Bhutan). The issue is certainly not |
| 10122 | 11 | 60 | 3 | 60 | 3 | See my previous comment in agriculture in existing areas mitigation is a cobenefit, it does not make sense to discuss mitigaiton actions separately. LUC and REDD is another issue. I think this framing is WRONG and leads precisely the type of misconceptions about ag mitigation maintained by many developing countries and NGOs. I urge you to think carefully about the framing of mitigation in agriculture.Also looking further the text, mitigaitoon has to be framed in development context, so the question of people being too poor to mitigate is again to me a comletely false framing. | Rejected, I don't see how this comment is linked to the text in page 60, line 3. Further co-benefits are discussed in section 11.7 |
| 5637 | 11 | 60 | 30 | 60 | 30 | --- improve C storage and use, is usually a better financial option, especially for local people. | Partially Accepted, Considered while |
| 15203 | 11 | 60 | 31 | 60 | 33 | delete sentence | Accepted, Changed |
| 6781 | 11 | 60 | 34 | 61 | 3 | add " some mitigation technologies may bring negtive effects for conservation biodiversity,some may benefit for conservation biodiversity". | Accepted, Checked for references and considered when drafting the SOD |
| 16607 | 11 | 60 | 35 | 60 | 35 | Citation needed for these estimates (nearly 1/3 to 1/2). | Accepted, Included references |
| 15204 | 11 | 60 | 35 | 60 | 35 | differs from earlier statistics quoted. Should be consistent. | Accepted, Harmonised for SOD |
| 5638 | 11 | 60 | 35 | 60 | 35 | This statement is wrong. The NPP for land plants is an estimated 53 GtC. One third of this is 17.5 GtC and one half is 26 GtC. Also page 32, line 6 gives a figure of 25% - 13 GtC! In the text on page 6 above, I have calculated that the maximum loss of NPP from land use change, use of wood products and food production is of the order of 3.5 GtC/yr or 7% of NPP. Also, the only real loss of NPP is through 'deforestation' which is a net NPP of 31-49 MtC/yr: this is less than 0.1%. The use of wood products and food does not cause a loss of NPP, for if annual NPP is not used it reverts back to the atmosphere, mainly in the form of CO2. Lines 35-42 need rewriting. | Rejected, The estimates of maximum theoretical potential for biomass growth and exploitation are noted, but we do not consider maximum theoretical potential for any technology in WGIII AR5 - instead we consider the economic potential, as constrained by economics, and note that the market potential is |
| 14446 | 11 | 60 | 37 | 60 | 38 | This is a very important risk with mitigation strategies. Good to see it receives attention in this chapter. Does this topic receive more attention in other chapters? | Noted, Thanks |
| 3877 | 11 | 60 | 45 | 60 | 47 | The examples provided are due to climate change and not due to AFOLU mitigation options. Please, reconsider your statement. | Rejected, We are discussing barriers. Specific soil conditions and water availability as well as natural variability and resilience to the specific systems will determine the size of the potential by |
| 13987 | 11 | 60 | 1 | | | the state of the carbon market should be evaluated in this section. Also to be included in this section should be the question of who is responsible for emissions vs. where the mitigation potential lies. The overarching principle of common but differentiated responsibilities that underpins global political agreement on mitigation action is essential to understand why action may or may not be taken. | Accepted, We consider constraints of financing mechanisms (including market mechanisms). |

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| 18001 | 11 | 60 | 18 | | | There should be a cross-reference to Chapter 4 that are supposed to provide the framework for all SD discussions in the WGIII AR5. | Accepted, Checked cross-references |
| 14681 | 11 | 60 | 35 | 60 | 35 | I think 25 to 40% was stated above in the text. | Partially Accepted, Checked in the text |
| 15625 | 11 | 60 | 37 | 60 | 37 | The animal agriculture sector alone is likely to add significant pressure to several sustainability thresholds, including reactive nitrogen mobilization and biomass appropriation. Pelletier N. and P. Tyedmers (2010). Forecasting potential global environmental costs of livestock production 2000-2050. Proceedings of the National Academy of Sciences of the United States of America 107(43), 18371-74. Available at: http://www.pnas.org/content/early/2010/09/27/1004659107.full.pdf+html. | Partially Accepted, The reference of Pelletier and Tyedmers is more relevant for 11.7. The issue of land limitations/land as finite element is included in 11.8 |
| 5511 | 11 | 61 | | | | This table is not essential | Accepted, Table deleted |
| 11828 | 11 | 61 | | | | It is unclear why "available land" is an opportunity (or how this is meant) | Accepted, Text improved |
| 5844 | 11 | 61 | | | | Opportunities: What opportunities come from "increasing desertification"? | Accepted, Text improved |
| 2640 | 11 | 61 | | | | Same comment on land tenure and whether it will help or create opportunities. Governments mostly own the forests and generate much of their economic return from this so they will not release rights easily to communities living in or around the forests. | Partially Accepted, Clear land tenure can create opportunities for AFOLU mitigation options. This has been |
| 4990 | 11 | 61 | 11 | 61 | 11 | Sentence: These issues are discussed in full in section 11.7. Delete this sentence or correct | Accepted, Text improved |
| 13520 | 11 | 61 | 11 | 61 | 11 | Sentence: These issues are discussed in full in section 11.7. Delete this sentence or correct | Accepted, Text improved |
| 5117 | 11 | 61 | 13 | 61 | 13 | in the U.S. unwillingness to accept that climate change is occuring and we need to do something about it is a major barrier | Rejected, Political issue. |
| 5639 | 11 | 61 | 20 | 61 | 29 | I am in full agreement with this paragraph. | Noted, Thanks |
| 9460 | 11 | 61 | 23 | | 23 | optimization of what? | Partially Accepted, Text improved |
| 10184 | 11 | 61 | 26 | 61 | 29 | Do you have references on this statemenet, i.e. has this been shown empirically? | Accepted, Text improved and more |
| 12877 | 11 | 61 | 32 | | | Add to the technological line - Barrier: Accurate forest carbon monitoring for REDD; Opportunities: Standard scientific methods from IPCC National Greenhouse Gas Inventory Guidelines, remote sensing data, Monte Carlo quantification of uncertainty | Accepted, Lack of monitoring capacity can become a major barrier for REDD+ (Herlod, 2009) |
| 5116 | 11 | 61 | 5 | 61 | 5 | this is rather an overstatement. There is often a need to improve existing items to say in front of pests and other suceptabilities. I would think r and d investment rates might be a barrier plus a need to continue to invest to adpat existing mitigation to the effects of climate change | Partially Accepted, Scale of funding resources included in the SOD |
| 11307 | 11 | 61 | 5 | 61 | 11 | Again, this suggests (to the present reader anyhow) that amongst the barriers to dietary additives and crop trait manipulation, their risks are not valid. It would be more credible if the possible risks of additives and manipulation were considered fairly. | Rejected, What is meant by fairly? |
| 2639 | 11 | 61 | | | | All of the technology discussion is for agriculture and forests are really not included in any of the technology discussions. | Accepted, Updated text in the SOD |

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| 12876 | 11 | 61 | 4 | 61 | 11 | This section omits the major issue of forest monitoring for REDD. Add something like "Although monitoring forest carbon in forests with high spatial variation of tree density and species composition poses a technical barrier for the implementation of REDD (Baker et al. 2010), the IPCC National Greenhouse Gas Inventory Guidelines (Aalde et al. 2006) provide one opportunity because they offer standard scientific methods that countries already use to report AFOLU emissions and removals under the UNFCCC. Also, field research in high-biomass forests (Gonzalez et al. 2010) show that remote sensing data and Monte Carlo quantification of uncertainty offer a technical opportunity for implementing REDD." Aalde, H., P. Gonzalez, M. Gytarsky, T. Krug, W.A. Kurz, S. Ogle, J. Raison, D. Schoene, N.H. Ravindranath, N.G. Elhassan, L.S. Heath, N. Higuchi, S. Kainja, M. Matsumoto, M.J.S. Sánchez, and Z. Somogyi. 2006. Forest Land. In Intergovernmental Panel on Climate Change. National Greenhouse Gas Inventory Guidelines. Institute for Global Environmental Strategies, Hayama, Japan. Baker, D.J., G. Richards, A. Grainger, P. Gonzalez, S. Brown, R. DeFries, A. Held, J. Kellndorfer, P. Ndunda, D. Ojima, P.E. Skrovseth, C. Souza, and F. Stolle. 2010. Achieving forest carbon information with higher certainty: A five-part plan. Environmental Science and Policy 13: 249-260. Gonzalez, P., G.P. Asner, J.J. Battles, M.A. Lefsky, K.M. Waring, and M. Palace. 2010. Forest carbon densities and uncertainties from Lidar, QuickBird, and field measurements in California. Remote Sensing of Environment 114: 1561–1575. | Accepted, Barriers and opportunities regarding MRV included in the SOD. |
| 15626 | 11 | 61 | 4 | 61 | 11 | Perhaps worth mentioning cultured meat production in section on technological barriers and opportunities. Tuomisto H.L. and M.J.T. de Mattos (2010). Life cycle assessment of cultured meat production. 7th International Conference on Life Cycle Assessment in the Agri-Food Sector in Bari, Italy, September 22-24. Available at: http://oxford.academia.edu/HannaTuomisto/Papers/358909/Life_cycle_assessment_of_cultured_meat_production. | Partially Accepted, The issue has been considered. We searched for scientific references. |
| 11074 | 11 | 61 | 4 | | | The section on "Technological barriars.." could be expanded considerably. In particular, mitigation potential in the agricultural sector can be highly site-specific even within specific regions or cropping systems. For example, within different areas of the midwest US the potential for no-till agriculture to generate soil carbon storage is limited due to climatic and soil factors. See Chatterjee and Lal, 2009. Soil and Tillage Research 104(2):270-277 and Venterea et al. 2006. Soil Sci. Soc. Am. J. 70: 1752-1762. The same issues apply with regard to N2O emission reduction potential: For example, some studies have found that controlled-release or stabilized nitrogen fertilizers reduced N2O emissions by up to 70% compared with conventional fertilizers in irrigated systems in a semi-arid climate (e.g., Shoji et al. 2001. Commun Soil Sci Plant Anal 32:1051-1070; Halvorson et al. 2011. J Environ Qual 40:1775-86), while studies in more humid, rain-fed locations found no significant benefit (e.g., Venterea et al. 2011. J Environ Qual 40: 1521–31; Sistani et al. 2011. J Environ Qual 40:1797-1805). A recent (in press) article (sent via email to comments@ipcc-wg3.de) addresses this issue with regard to N2O in some detail: Venterea et al. Technical challenges and opportunities for mitigating nitrous oxide emissions from fertilized cropping systems. Frontiers in Ecology and the Environment. | Accepted, Barriers and opportunities related to the natural assets (soil, water, etc) were included as environmental barriers. References were checked, some included. |
| 15627 | 11 | 61 | 5 | 61 | 6 | It is not necessarily the case that there are no technological barriers for already-applied mitigation technologies. Lokey E. (2009) shows the significant challenges of biodigester operation. Lokey E. (2009). The status and future of methane destruction projects in Mexico. Renewable Energy 34, 556-69. | Partially Accepted, The section on technological barriers and opportunities has been updated for the SOD. |
| 4395 | 11 | 61 | | 61 | | not sure how to interpret “available land” as an opportunity for environment and health effects | Accepted, Text has been improved to be |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5641 | 11 | 62 | 13 | 62 | 13 | Bioenergy --- reaching as high as 100EJ by 2030. This is = to 5.35 Gt wood equivalent, - 2.66 GtC, or 5% of NPP. | Rejected, The estimates of maximum theoretical potential for biomass growth and exploitation are noted, but we do not consider maximum theoretical potential for any technology in WGIII AR5 - instead we consider the economic potential, as constrained by economics, and note that the market potential is likely to be still lower due to the many |
| 12439 | 11 | 62 | 14 | 62 | 15 | Does the sentence mean that bioenergy will require the use of 15-16 % up to 50 % of all land on earth? Please consider to clarify. | Accepted, Clarify that these are IAM scenario outputs - not projections of |
| 14738 | 11 | 62 | 18 | | | Line 18-20: “An exception is (Steven K. Rose et al., 2012) who reported agriculture, forest carbon, and bioenergy abatement levels for various climate stabilization policies´. This is not clear. In any case the reference citation should be: An exception is Rose et al. (2012) who reported… | Accepted, Zotero updated for SOD |
| 5845 | 11 | 62 | 18 | 62 | 23 | What has been assessed as "forest carbon" in this study? A considerable share of forest carbon (all which is included in aboveground biomass) can also be used in bio-energy generation and HWP. If the study did not include substitution effects and HWP under "forest biomass" please either delete the lines or use terminology that indicates that not forestry but C stock increases in the forest only were part of the study. | Accepted, Clarify with Steve Rose and amend for SOD |
| 12440 | 11 | 62 | 20 | 62 | 22 | Do all the percentages in this entence relate to the all-over global abatement of the emissions of GHGs? | Accepted, add word "global" |
| 10186 | 11 | 62 | 20 | 62 | 23 | Using past tense when discussing scenarios for the future is not intuitive | Accepted, Change wording |
| 13988 | 11 | 62 | 20 | 62 | 22 | no agricultural carbon is included? This should be pointed out. | Accepted, Not included in the model - |
| 11786 | 11 | 62 | 24 | 63 | 17 | All sentences including figure 11.14 should be deleted to avoid misunderstand of readers that carbon tax is the best way to achieve the 450ppm target. There is a possibility in (B) scinario to bring higer elecricity fee to pepole instead of the significant incresing of food praice, because (B) would be thought to need more ristrict measuers like introducing CCS, too much other renewable energies compared with (C). | Accepted, This figure will be replaced for the SOD |
| 5642 | 11 | 62 | 24 | 62 | 32 | Bioenergy ‘leakages’. Biomass can be used directly as a feedstock for charcoal production and electricity generation. This paragraph assumes that wood waste and switch grass etc. will be converted to ethanol. It may be more cost effective and more environmentally sustainable to dry distill the ‘non-oil’ plant biomass, rather than trying to break down the cellulose to simple sugars and then distill the mash into ethanol. | Rejected, it does not assume this - checked with Chapter 6 |
| 5744 | 11 | 62 | 31 | 62 | 32 | This aspect is investigated in more detail in "Biofuels and the underlying causes of high food prices" (GBEP/FAO) (http://www.globalbioenergy.org/fileadmin/user_upload/gbep/docs/BIOENERGY_INFO/0810_Flammini_-_Biofuels_and_the_underlying_causes_of_high_food_prices_GBEP-FAO.pdf) | Rejected, Statement - not a comment. Select peer reviewed literature in preference |
| 16608 | 11 | 62 | 4 | 62 | 15 | As mentioned previously, the Wise et al results assume a global carbon tax on all fossil fuels -- this explains why they give such divergent estimates from other studies (e.g. 50% of land in bioenergy), and should be mentioned. | Accepted, This figure will be replaced for the SOD |
| 5640 | 11 | 62 | 4 | 62 | 36 | This hardly takes into consideration, the existing use of NPP. | Rejected, The estimates of maximum theoretical potential for biomass growth and exploitation are noted, but we do not consider maximum theoretical potential for any technology in WGIII AR5 - instead we consider the economic potential, as constrained by economics, and note that the market potential is likely to be still lower due to the many |
| 12438 | 11 | 62 | 9 | 62 | 12 | Does this sentence mean that the global landscape will contribute to reduction of global CO2-emissions in 2030 with 0-3 Gt CO2/yr, possibly up to 10 Gt CO2/yr? Please consider to clearify. | Accepted, Yes - clarify |
| 13355 | 11 | 62 | 9 | 62 | 12 | Sentence is confusing, rephrase. | Accepted, Edit for SOD |

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| 15628 | 11 | 62 | 1 | | | Note relevance of discussion of Davidson E.A. (2012) to this section. Davidson E.A. (2012). Representative concentration pathways and mitigation scenarios for nitrous oxide. Environmental Research Letters 7, 024005. Available at: http://iopscience.iop.org/1748-9326/7/2/024005/pdf/1748-9326_7_2_024005.pdf. | Accepted, Add new reference |
| 7543 | 11 | 62 | | 62 | | Extreame senarios may give misleadings. Discussion on Land use should be focused on deforestation, not bioenergy crops. More fisible senarios and discussion are required. | Accepted, This figure will be replaced for the SOD |
| 5512 | 11 | 63 | | | | The caption here should be edited to make the point more succinctly- it might be easier to do this by eliminated (B) and just noting that no significant changes in land distribution would be seen with limits on fossil fuel, …. Main point of this is that a focus on bioenergy would eat up land area | Accepted, This figure will be replaced for the SOD |
| 7343 | 11 | 63 | | | | Figure legend has a lot of redundancy - reword. | Accepted, This figure will be replaced for |
| 18655 | 11 | 63 | | | | (Interesting figure on page 63 comparing global land use under different scenarios. Source: M. Wise et al., 2009 Implications of limiting CO2 concentrations for land use and energy, Science 324, 1183 -1186) | Rejected, Statement - not a comment. |
| 5643 | 11 | 63 | | | | I don't think this takes into consideration the use of NPP. | Rejected, The estimates of maximum theoretical potential for biomass growth and exploitation are noted, but we do not consider maximum theoretical potential for any technology in WGIII AR5 - instead we consider the economic potential, as constrained by economics, and note that the market potential is likely to be still lower due to the many |
| 11308 | 11 | 63 | 1 | | | Excellent graphics that manage to layer several dimensions of quantitative data in a spatial format. This chapter would benefit from more figures like these. | Accepted, This figure is pasted in from a paper. It will be replaced, but we will endeavour to provide useful figures for |
| 12441 | 11 | 63 | 10 | 63 | 11 | Please consider to add "energy" and "for bioenergy" so the sentence states: "As a result, the relative increase in land required for biomass and other energy crops exceeds the relative increase in demand for bioenergy." This will make it easier to understand. | Accepted, Edit for SOD |
| 5846 | 11 | 63 | 11 | 63 | 16 | The text "Illustrative figure … impact on all land use," is redundant.Please delete and include statement concerning unmanaged forests and pastures in the text above. The information given about the scenarios is not sufficient, too. For example, what does UCT stand for? Besides, given the wide array of drivers, I would certainly question any scenario that leads to an increase in UNmanaged lands, be it pasture or forests, in the future. This would violate any findings from land-use history (except: if "unmanaged lands" includes "devastated, deforested and degraded beyond usability") . | Accepted, This figure will be replaced for the SOD |
| 8013 | 11 | 63 | 2 | | | The illustrated result, energy crops will cover about 30 % of the global land area in 2050 and about 50% in 2100, seems to be unrealistically large. Does this have a consistency with the biomass supply potential from cropping systems described in Page 24 and Table 11.3 ? | Accepted, This figure will be replaced for the SOD |
| 11829 | 11 | 63 | 3 | | | has this abbreviation (UCT) been introduced? | Accepted, This figure will be replaced for |
| 5644 | 11 | 63 | 5 | 63 | 5 | What is FFICT? | Accepted, This figure will be replaced for |
| 11830 | 11 | 63 | 5 | | | has this abbreviation (UCT) been introduced? | Accepted, This figure will be replaced for |
| 5645 | 11 | 64 | 1 | 64 | 11 | I assume SD is sustainable development, but what is SOD? | Noted, Second Order Draft |
| 10190 | 11 | 64 | 12 | 64 | 18 | Consequences for biodiverstiy migth merit its own section, and should at least explicitly be added somewhere | Partially Accepted, Add more information - but not in this section |
| 5119 | 11 | 64 | 16 | 64 | 16 | when you say "The rapid increase of biofuels production worldwide" and say subsidies I am not totally in agreement. The big driver has been energy prices, mandates and in place technologies (due to earlier subsidies) | Accepted, Discuss and add reference to support (not incorrect page number - should be page 70) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2641 | 11 | 64 | 20 | | 29 | This is an interesting policy discussion. The first paragraph is not supported or reinforced by the earlier discussions. This note about Europe would be good to briefly explain since it will have policy implications beyond European borders. | Accepted, Expanded |
| 10188 | 11 | 64 | 25 | 64 | 29 | more of this, and for all regions! | Accepted, Expanded |
| 5646 | 11 | 64 | 27 | 64 | 29 | Only carbon sequestration is mentioned, not sequestration and use. | Rejected, The estimates of maximum theoretical potential for biomass growth and exploitation are noted, but we do not consider maximum theoretical potential for any technology in WGIII AR5 - instead we consider the economic potential, as constrained by economics, and note that the market potential is likely to be still lower due to the many |
| 12442 | 11 | 64 | 28 | 64 | 28 | It makes sense that afforestation and bioenergy can compete with other land use, but please consider to explain how "crop land management" could compete with "other land use". | Accepted, Expanded |
| 12443 | 11 | 64 | 30 | 64 | 30 | Maybe the meaning is better expressed by"Nationa and international agricultural, forest and climate policies have the potential ……" | Accepted, Edited for SOD |
| 5118 | 11 | 64 | 37 | 64 | 37 | this is more on potential than policy | Accepted, Edited for SOD |
| 5647 | 11 | 64 | 37 | 64 | 38 | Rather than Forests provide --- I would say Trees on all land-use types provide. They also provide goods and services to about half the world's population, (>3 billion people), not half a billion users. | Accepted, Trees can occur on land that is not forestry - good point |
| 7211 | 11 | 64 | 37 | | 42 | About carbon sequestration 1) forest C stocks can be increased by increasing biomass on existing forest acreage 2) forest C stocks can be increased by expanding forest land; missing: 3) protection of existing natural forests (not perse by improved management, but by saving it from being converted). | Accepted, Edited for SOD |
| 5648 | 11 | 64 | 39 | 64 | 39 | Change 'forest acreage' to 'forest area'. | Accepted, Edited for SOD |
| 10123 | 11 | 64 | 39 | 64 | 40 | Forest degradation due to charcoal produciton is a major issue which whoudl be mentioned here | Accepted, Edited for SOD |
| 12444 | 11 | 64 | 41 | 64 | 44 | Please consider to specify "alternative sinks" and explain whether "forests can continue to act as sinks…" comprises only tropical forest, but also temperate and boreal forests. | Accepted, Has been clarified for SOD |
| 16610 | 11 | 64 | 45 | 64 | 46 | The Brazilian reduction in emissions from deforestation has been large and rapid, and deserves to be explained in more detail. I'd suggest several sentences or a Box. Also, the peer-reviewed studies relevant to it (e.g. Cederberg, Macedo, Rudorff) should be cited rather than the PRODES web site. | Accepted, Edited for SOD |
| 10259 | 11 | 64 | | 71 | | need to be update with recent debate on green economy, Rio+20 outcomes, Green climate funds,…<br>Policies have also started to adress the intersectorial aspect (Agriculture versus Forest, as annonced at the beggining of chaper 11!) and exemple should be given. perhaps in this sence, a focus should be dedicated to ex-ante tools available for policy makers, and tools beeing developed to implement policies (e.g. Climagri in France to help territories and cities over 50000 inhabitnats to comply with the law (see Climate-Energy Territorial Plan). | Accepted, Edited for SOD |
| 7544 | 11 | 64 | | 66 | | This subsection includes many kind of options and it is difficult to undersand. It is devided into sub-subsections. | Accepted, Edited for SOD |

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| 15629 | 11 | 64 | 19 | | | For section on sectoral policies, the importance of the animal agriculture sector deserves discussion, as well as potential co-benefits and risks (e.g. animal welfare, health, and non-climate environmental implications). Pelletier N. and P. Tyedmers (2010). Forecasting potential global environmental costs of livestock production 2000-2050. Proceedings of the National Academy of Sciences of the United States of America 107(43), 18371-74. Available at: http://www.pnas.org/content/early/2010/09/27/1004659107.full.pdf+html. Unger N., T.C. Bond, J.S. Wang, D.M. Koch, S. Menon, D.T. Shindell, and S. Bauer (2010). Attribution of climate forcing to economic sectors. Proceedings of the National Academy of Sciences of the United States of America 107(8), 3382-87. Steinfeld H., P. Gerber, T. Wassenaar, V. Castel, M. Rosales, and C. de Haan (2006). Livestock's long shadow: environmental issues and options. Food and Agriculture Organization of the United Nations. Available at: ftp://ftp.fao.org/docrep/fao/010/a0701e/a0701e.pdf. McMichael A.J., J.W. Powles, C.D. Butler, and R. Uauy (2007). Food, livestock production, energy, climate change, and health. The Lancet 370, 1253-63. Mirle C. (2012). The industrialization of animal agriculture: implications for small farmers, rural communities, the environment, and animals in the developing world. The 10th European International Farming Systems Association Symposium in Aarhus, Denmark, July 1-4. Workshop 1.3: Understanding agricultural structural changes and their impacts, to support inclusive policy dialogue and formulation. Available at: http://www.ifsa2012.dk/downloads/WS1_3/ChetanaMirle.pdf. The breadth of scientific evidence demonstrating that intensively confined animals are frustrated, distressed, and suffering under modern production schemes is extensive, conclusively substantiating that battery cages for egg-laying hens and crates for pregnant sows and calves are simply not appropriate environments. Duncan I.J.H. (1970). Frustration in the fowl. In: Freeman B.M. and Gordon R.F. (eds.), Aspects of Poultry Behaviour (Edinburgh, Scotland: British Poultry Science Ltd., pp. 15-31). Špinka M. (2006). How important is natural behaviour in animal farming systems. Applied Animal Behaviour Science 100(1-2),117-28. Baxter M. (1994). The welfare problems of laying hens in battery cages. The Veterinary Record 134(24), 614-9. Dawkins M.S. (1990). From an animal's point of view: motivation, fitness, and animal welfare. Behavioral and Brain Sciences 13, 1-61. Vestergaard K. (1984). An evaluation of ethological criteria and methods in the assessment of well-being in sows. Annales de Recherches Vétérinaires (Annals of Veterinary Research) 15(2), 227-36. Broom D.M., Mendl M.T., and Zanella A.J. (1995). A comparison of the welfare of sows in different housing conditions. Animal Science 61, 369-85. European Commission, Scientific Veterinary Committee, Animal Welfare Section. 1995. Report on the welfare of calves. Adopted November 9. Available at: http://ec.europa.eu/food/fs/sc/oldcomm4/out35_en.pdf. | Accepted, Added more detail on livestock here |
| 16611 | 11 | 65 | 1 | 65 | 1 | "The mechanism" presumably refers to REDD+ but this should be said explicitly (the previous sentence had it in the plural). | Accepted, Edited for SOD |
| 7212 | 11 | 65 | 1 | | 7 | o Somewhere here I would add some text on PRC projects (peatland rewetting and conservation) as a new activity, at least in the voluntary market (e.g. Winrock, VCS). This could be a very promising and cost effective tool for emission reduction. | Accepted, Added for SOD |
| 11179 | 11 | 65 | 1 | 65 | 3 | Explanations for REDD-plus is not consistent with the international agreement. Detailed modarity for establishment of national reference level(s) have not yet agreed. | Accepted, Harmonized and revised throughout the chapter |
| 2642 | 11 | 65 | 1 | | 15 | Comment - the policy discussions is not balanced with the earlier materials, e.g., changing diet etc. They need to be better blended together so there is a consistent voice for the chapter. Most of the policies appear to be for forests while the drivers of increased emissions appears to be agriculture - especially during the last decade. | Accepted, Strengthened agricultural policy parts for SOD |
| 10124 | 11 | 65 | 10 | 65 | 10 | Does this really address agriculture as a driver of deforestation , the prices of agricultural products are increasing, the demand for more food feed and fibre is growing, , is this taken into account in the calculations. | Accepted, Edited for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13699 | 11 | 65 | 13 | 65 | 13 | Add after "...Kyoto Protocol": "Therefore, in the political discussion regarding the integration of REDD+ into the market mechanisms under international climate policy, there has been a marked reluctance due to the fear that emission credits from REDD+ might crowd out credits from other project types (Michaelowa and Dutschke 2009). " Reference: Michaelowa, A.; Dutschke, M. (2009): Will credits from avoided deforestation jeopardize the balance of the carbon market?, in: Palmer, C.; Engel, S. (eds.): Avoided deforestation. Prospects for mitigating climate change, Routledge, Abingdon, p. 130-148 | Accepted, Harmonized throughout the chapter |
| 5514 | 11 | 65 | 16 | 66 | 35 | This discussion on nuts and bolts of implementation is too detailed for this type of section. A box with a portion of this information would be more helpful- integrating some of this into an additional column for Table 11.13 is another option | Accepted, Summarized, edited, and shortened for SOD |
| 14447 | 11 | 65 | 16 | 65 | 49 | Good to see these social concerns outlined in this chapter. | Noted, Thank you |
| 16612 | 11 | 65 | 18 | 65 | 20 | The 86% figure may have gone down in recent years; check FRA 2010 instead of 2005. | Accepted, Checked numbers and edited |
| 5847 | 11 | 65 | 20 | 65 | 22 | Please add a reference - why do you put the emphasis on temperate forests when most of the LUC and Deforestation-related emissions come from tropical forests? | Accepted, Edited and added reference |
| 9182 | 11 | 65 | 20 | 65 | 36 | It has been reported for long that there are large potential at low costs - but nothing happened in last decades. There mush have been lack of human capacity , coordination and so forth - that has to be assessed. I guess the situation is similar to so-called "energy efficiency gap". | Noted, Statement - not a comment |
| 12445 | 11 | 65 | 27 | 65 | 35 | These lines seem hard to understand and also contain som contradictions, please consider to rephrase. | Accepted, Edited for SOD |
| 7545 | 11 | 65 | 3 | 65 | 5 | "The REDD-plus approach would finance not only forest conservation, but also sustainable forest management and nhancement of carbon stocks restoration / afforestation / reforestation)" is not correct. It should be revised into "The REDD-plus approach would finance not only deforestation and forest degradation, but also forest conservation, sustainable forest management and enhancement of carbon stocks". In the decision, restoration / afforestation / reforestation are not described. | Accepted, Harmonized and revised throughout the chapter |
| 5649 | 11 | 65 | 3 | 65 | 3 | The REDD+ approach must be tied to increasing agricultural productivity, especially in the subsistence sector. | Accepted, Harmonized and revised |
| 17147 | 11 | 65 | 33 | | | Important to mention more clearly the impact of REDD on Idnigenous Peoples as cited in the literature. See fo rInstance: Anderson, N (2009) REDDy or not? The Effects on Idngienous Peoples in Brazil of a global mechanism for Reducing Emissions from Deforestation and Degradation. In Journal of Sustainable Development 2 (3). Also see Ghasoul, J., Butler, R., Mateo-Vega, J, Pin Koh, L. (2010) REDD: A reckoning of environment and development implications. In Trends in Ecology and Evolution 25 (7) 396-402. And Ribot, J., and Anne Larson (2012) Reducing REDD risks: affirmative policy on an uneven playing field. In International Journal of the Commons 6 (2) | Accepted, Comment was included in section 11.10. Deeper discussion was prevented by space limitation |
| 7213 | 11 | 65 | 33 | | 35 | See earlier comments: discussion on the failure of REDD (+) programs,. Why do they fail? What can be improved to make REDD more successful? Obstacles for implementation of REDD(+)? Etc. | Accepted, Comment was included in section 11.10. Deeper discussion was |
| 7547 | 11 | 65 | 36 | 66 | 35 | Explanation of REDD+ and the present situation of it is not matured having many small errors. For example, the most important decision on REDD+ under UNFCCC is Cancun accords, but it is not referred. Mechanisms of REDD+ should be explained. Safeguards including biodiversity, local people and human rights also should be referred here. | Accepted, Comment was included in section 11.10. Deeper discussion was prevented by space limitation |
| 3763 | 11 | 65 | 41 | 65 | 41 | "Although the threat of leakage would remain." This threat can be addressed through broad participation of many forest countries in the REDD+ mechanism, including those with high forest cover and low deforestation rates (da Fonseca, 2007). For example, "the most effective reference level designs balance incentives to reduce historically high deforestation emissions with incentives to maintain historically low deforestation emissions." (Busch et al, 2009). da Fonseca, G.A.B., Rodriguez, C.M., Midgley, G., Busch, J., Hannah, L. and Mittermeier, R.A. (2007). “No forest left behind.” PLoS Biology 5(8):1645-1646. Busch, J., Strassburg, B., Cattaneo, A., Lubowski, R., Bruner, A., Rice, R., Creed, A., Ashton, R. & Boltz, F. (2009). Comparing climate and cost impacts of reference levels for reducing emissions from deforestation. Environmental Research Letters, 4:044006. | Accepted, Harmonized throughout the chapter |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5651 | 11 | 65 | 46 | 65 | 47 | For proper MRV, good inventories and maps are needed. Remote sensing can help with mapping and changes of land use over time. | Accepted, Comment on MRV technologies and costs was included in |
| 5513 | 11 | 65 | 8 | 65 | 15 | It would be helpful to have a map where the most significant mitigation options for a region along with associated cost and sequestration potential are identified. This comment goes back to the mention of costs of mitigation options in Europe on pg 64 ln25 | Accepted, Regional breakdown now given - but will be improved for FD |
| 7546 | 11 | 65 | 8 | 65 | 9 | I cannot agreed with "REDD can be very cost effective" that is a message from the Stern report. It was a kind of economics analysis. Now we realize that REDD requires large costs of system development and transaction throgh experiments of negotiation and development for REDD. | Accepted, Harmonized and revised throughout the chapter |
| 5650 | 11 | 65 | 8 | 65 | 8 | REDD+ will only be accepted fully if the local participants agree to it and get properly rewarded. At present, some of REDD+ money goes to Outside contractors and to governments, with little left for local people. | Accepted, Harmonized and revised throughout the chapter |
| 9181 | 11 | 65 | 8 | 65 | 15 | But these low cost options are limited. Compensation for oppportunity costs will get more expensive soon. | Noted, Discussion included in broad |
| 16613 | 11 | 66 | 1 | 66 | 18 | This paragraph explains the Bali Action plan and the NAMAs discussion in the following years, but not the REDD+ discussion. It, and its decisions (particularly those in Cancun and Durban) are more relevant to REDD+ in the next few years than the NAMAs questions, which are much broader in terms of sectors covered. | Accepted, Text was revised |
| 10125 | 11 | 66 | 12 | 66 | 14 | at the moment there are 18 agricultural Namas and 29 forestry submitted, the text covers only forestry, text needed on agriculture | Accepted, Strengthened agricultural policy parts for SOD. Comment on |
| 16614 | 11 | 66 | 19 | 66 | 35 | This paragraph discusses the carbon market relating to REDD+, which is mostly voluntary and very small, but leaves out the non-market approaches. These, particularly the Norway-Brazil arrangement related to the Amazon Fund, have been much larger both in monetary terms and in terms of the emissions reductions already accomplished (several hundred million tons). They deserve at least as much space. This could usefully be put in a Box. | Accepted, Box was included |
| 10126 | 11 | 66 | 19 | 66 | 35 | Note that NAMAs can be financined form any sources, probably agricultural NAMAs where mitigaiton is a co-benefit would be most sensibly financed by normal agricultural investments which are geared to support climate smart production systems. The economuc incentive for farmers comes from increased productivity and reduced risk, the extra cost for mitigation is really MRV if countries want to include the mitigaiton impacts in tehri national reporting | Accepted, Comment on MRV technologies and costs was included in section 11.10 |
| 7548 | 11 | 67 | | 68 | | This table is not enough for REDD+. REDD+ partnership, UN-REDD, Norway-Indonesia REDD+ Partnership and Indonesia-Australia Forest Carbon Partnership should be listed in this table. | Accepted, Information was included |
| 5652 | 11 | 67 | | | | There is no programme for mapping and inventory. This is essential to monitor land use changes and to assess biomass stock and yield on all land use types. Without such information many initiatives may be misguided. | Accepted, Added to data gaps |
| 16616 | 11 | 69 | 1 | 69 | 12 | This is the land sparing paragraph that should be combined with the earlier ones and expanded to include other relevant references (e.g. Angelsen, Minang, Perfecto and Vandermeer). It should be placed early in the chapter rather than left to this final section. | Accepted, This has been put in earlier section where this is first discussed |
| 10127 | 11 | 69 | 1 | 69 | 12 | Reducing global cultivated area seems highly unlikely given the increasing demand from population and income growt. Keeping the present area only is ambitious enough goal (but might be realistic though) and would meand much improved productivity from areas with productivity gap, much more use of sustainable farming practices reducing N2O emissions and manuremanagement to reduce CH$ emissions and produce eousehold and farm energy and reduction of waste from all food systems. | Noted, Statement - not a comment |
| 11831 | 11 | 69 | 10 | 69 | 12 | Is there a reference for this statement? | Accepted, Added reference |
| 5516 | 11 | 69 | 13 | | 21 | Very important point | Noted, Thank you |
| 13991 | 11 | 69 | 15 | | | salient? Needs a citation. I would not agree with this claim. | Noted, Revised for SOD |
| 5653 | 11 | 69 | 17 | 69 | 17 | What is PES? | Accepted, Spelled out on first use |
| 10191 | 11 | 69 | 17 | 69 | 17 | What PES stands for is not given in the text, a list of acronyms and abbreviations would be useful | Accepted, Spelled out on first use |
| 15206 | 11 | 69 | 18 | 69 | 21 | hard to read; tighten | Accepted , Revised for SOD |
| 10128 | 11 | 69 | 22 | 69 | 22 | This depends on commodity price developments and the amount of investments to improved prodcutivity in agriculture | Accepted , Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5848 | 11 | 69 | 24 | 69 | 40 | Information in text is redundant, can be deleted. | Accepted , Revised for SOD |
| 11309 | 11 | 69 | 26 | 69 | 28 | This may place too much emphasis on the ability of technology alone to increase land use efficiency (for one, there is the rebound effect). Secondly, 'agricultural chemicals, to eliminate poverty and malnutrition'? Consider rewording at the very least. The phrase conjures up the Green Revolution and the more recent Rio+20 debate in which the G77 argued that an equitable green economy cannot require expensive technological imports. | Accepted , Revised for SOD |
| 12446 | 11 | 69 | 36 | 69 | 36 | To enhance understandability, please consider to rephrase the sentence to "…..responsible to 3% of global GHG emissions…" | Accepted , Revised for SOD |
| 12447 | 11 | 69 | 39 | 69 | 40 | Could it be explained how nutrient management can help reduce methane missions from rice and please give a reference? | Accepted , Revised for SOD |
| 15630 | 11 | 69 | 1 | 69 | 21 | In the discussion of land-using sector policies and intensification, the significant challenges to cattle ranching intensification projects may deserve mention. Cohn A., M. Bowman, D. Zilberman, and K. O'Neill (2011). The Viability of Cattle Ranching Intensification in Brazil as a Strategy to Spare Land and Mitigate Greenhouse Gas Emissions. CCAFS Working Paper no. 11. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org. Bowman M.S., B.S. Soares-Filho, F.D. Merry, D.C. Nepstad, H. Rodrigues, and O.T. Almeida (2012). Persistance of cattle ranching in the Brazilian Amazon: a spatial analysis of the rationale for beef production. Land Use Policy 29, 558-68. | Accepted , Revised for SOD |
| 14682 | 11 | 69 | 1 | 69 | 3 | Food prices are rising making land sparing unlikely. | Accepted , Revised for SOD |
| 6822 | 11 | 7 | | | | Very helpful graphic - perhaps CO2e more useful scale than C? | Accepted , Harmonize units throughout - |
| 14572 | 11 | 7 | | | | I have a major problem with this figure regarding the LUC and deforestation data. LUC is mostly driven be deforestation yet we see in panel b LUC results show a decline in emission since the 1980s and in panel a deforestation emissions increase substantially abetween the 1980s and later decades. You cannot compare ramankutty and Piao with Pan like this, it is mixing apples and oranges. Among other things, Pan treats temeprate and tropical forests differently, their temeprate forest numbers are (LUC + sinks due to claimte and CO2) from inventory data, their tropical data separates these out using a model . Also it means in panel a you are only dealing woth conversions to and from forests, and not other land use conversion (e.g. pastures and crolands into grasslands.) I would show CO2 from LUC (including deforesation ) in panel a. There are also some refs where you could split def only in the tropics e.g. those you give an others. I would give these nummbers int eh text and total LUC here. I can help you with this | Accepted, figure to be redrawn using WGI model data on LUC emissions |
| 14573 | 11 | 7 | | | | re. fires. In panel a. Can you be clear what type fo fires, and whether these are gross or net emissions ie. . The GFEd database includes emissions from deforestation fires which would double count with deforestation emissions. It includes natural fires in forests and grasslands which have annual gross emissions but small net emissions due to regrwoth of vegetation. peatland fires will have large net emissions which are not otherwise cvered under deforestation or LUC. | Accepted, New databases considerd |
| 14574 | 11 | 7 | | | | panel b: the SD between the model results hown does nto represent the uncertainty. This is also not the full range of reults. For WG1 we asked modelling groups to do runs up to and including 2009 to get decadal averages that are comparable acorss decades going up to the 2000s. It would be good to use these numbers for consistency. Ican check with hte WG1 LAs and the model contributers that they ae happy for this to be done. Alternatively, use the synthesis results in Houghton 2012, on which I am co-authro, againa and can help with numbers. | Accepted, figure to be redrawn using WGI model data |
| 11903 | 11 | 7 | | | | The data sourses are confused. Please check. | Accepted, agree, figure to be redrawn |
| 11803 | 11 | 7 | | | | Please Explain why the standard deviation of the periods 1980-1989 and 1990-1999 are so large while for the later periods they are comparably small | Accepted, they are smaller in the later period as fewer models covered this period, however this figure will be redrawn to be consistent with new runs |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7176 | 11 | 7 | | 7 | | Page 7, figure 11.1. It would be good to include all main sources that fall under AFOLU: CO2 and CH4 from fires, N2O from agricultural soils, CH4 and N2O from manure, CH4 from rice cultivation, CH4 from enteric fermentation, CO2 from deforestation, CO2 from drained peat soils | Accepted, Now done |
| 7177 | 11 | 7 | | 7 | | Page 7, figure 11.1. Drained peat soils are large sources of CO2 and have a high potential for conservation and restoration (they store more than twice the carbon in all terrestrial biomass). In this fig. drainage of peat would be together with fires and deforestation one of the major sources. | Accepted, agree, but not likely to get numbers on this for different decades, could say something about it in text |
| 7178 | 11 | 7 | | 7 | | Page 7, figure 11.1. Are the fire numbers averaged over dry AND wet years? Or are numbers taken from el nino years in which fire existed more frequently? The figure suggests that this is the case. | Accepted, I imagine they are averaged over the decade, may need to check |
| 7179 | 11 | 7 | | 7 | | Page 7, figure 11.1. Are global numbers used, of is the figure for certain sources biased towards a certain climatic region (e.g. tropics, or temperate zones)? E.g. Ramankutty reports on tropical forests, Pan et al on temperate forests etc | Accepted, suggesting re-draw figure should take care of this, just use global modelled net CO2 from LULUCF |
| 10585 | 11 | 7 | | | | Can't see how range bars are so small in 2000-2009 and 1990-2007 if there is high uncertainty in first 20 years. Footnote a) could maybe be shortened - just be listing references. | Accepted, see above, fewer models, but will redraw using WGI data |
| 10097 | 11 | 7 | | | | The emmissions from agricultural soils do not include CO2 emissions from organic soils, drained peatlands, which are in agricultural use and this is an important source of emissions in some areas. Also degraded pastures on organic soils are an important source of emissions of CO2. I also wonder are the cumulative CO2 emissions from drained organic soils under forestry (which continue until all the peat has oxidized) represented here | Accepted, agre peatlands underrepresented, probably not enough data on previous decased to include in figure but shoudlspecifically mention in text. |
| 8598 | 11 | 7 | | | | In this figure, it is important to discriminate fires associated to deforestation processes and other LUC from those that occur in natural fire-adapted systems (ie. Tropical savannas) | Accepted, agree need more clarity, |
| 8923 | 11 | 7 | | | | it seems unlikely that the values have remained the same for enteric fermentation from 1980 to 2010 , despite a significant increase in animal production | Accepted, Check numbers and revise accordingly |
| 12366 | 11 | 7 | 1 | | | Comment to Figure 11.1 b); For enhanced transparency the "net C emissions per year" should be converted to CO2-equivalents to make the figure direct comparable to Figure 11.1 a). If the conversion factor is given this can be done even if the referred publications gives the emissions in Gt C/year. | Accepted, suggesting merging these two figures anyway and only showing net LULUCF modelled emissions from |
| 12367 | 11 | 7 | 1 | | | Two questions arises from the stacked bars of figure 11.1 a); 1) Does the CO2 emissions from deforestation include emissions also from forest soils? 2)Is carbon loss from agriculture soils and human activity on peatlands neglected in the figure? If these sources are not included it should be indicated clearly in the caption. | Accepted, yes the numbers include forest sils, no they do not typically include peatland emissions, will add comemnt to text/caption |
| 14411 | 11 | 7 | 1 | | | Figure 11.1 seems to say that by far, deforestation and fires are the main source of AFOLU emissions (about 3/4ths). But neither one is really “agriculture.” (Could usefully clarify whether fires refers to forest fires caused by campers – presumably forest fires caused by lightening are not anthropogenic – or fires set in agricultural practices to clear fields.) Looks like there is far more scope for emissions reduction through ending deforestation than, for example, through reducing animal share of diet or changing crop practices. Maybe there was a good reason why agriculture was separated from deforestation in earlier IPCC reports. Surely the main message remains the importance of curbing deforestation, and the opportunity presented by afforestation. | Accepted, Agree. Actally much deforestation is by fire and for agriculture. Need to clarify the fire part here. |
| 12867 | 11 | 7 | 1 | 7 | 19 | For carbon emissions from land use change, the 95% confidence interval is the standard measure of uncertainty (see Intergovernmental Panel on Climate Change. 2006. National Greenhouse Gas Inventory Guidelines. Institute for Global Environmental Strategies, Hayama, Japan.) So, convert the uncertainty in these graphs to 95% CI. That would also allow for comparison with other published forest emissions results. | Accepted, I assume these graphs are showing 1 SD which = 68%, so would need to go to 2 SD. But anyway should merge these graphs and not show LUC |
| 14718 | 11 | 7 | 1 | | | Global trends in CO2….change to CO2 | Accepted, OK |
| 13961 | 11 | 7 | 1 | | | it's not at all clear how b relates to a, given values for co2 emissions included in a and changes in units co2eq vs c. | Accepted, agree, will merge using WG1 data |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13527 | 11 | 7 | 15 | 7 | 15 | It seems obvious that the main efforts are directed to progressively solve the complex interplay of factors linking the farm and agroforestry with LUC, deforestation and fires, while advancing to detect reliable correlations of these processes with GHG emissions, because with current methods such as remote sensing, can measure the magnitude of deforestation in a much more easy, coherent and reliable manner than the measurement of the produced emissions. Until then, me must use the available data, even if they are not very consistent, because they respond broadly to the relationship between GHG emissions, its causes, and proportions. Deforestation and fires (A) are largely the main contributors to CO2 emissions, and clearly much more than agricultural soils, manure management, rice cultivation and enteric fermentation, ie, essential activities for food production (B); namely, A/B= 40/11 (1980-1989), 53/13 (1990-1999), 46/14 (2000/2009), 49/13 (1990-2010). It also appears that CO2 emissions from fires fell from 27 (1980-1989) to 23.33 in average (23+18+20/3=41/3=20,33) in the last 30 years. Fires are sometimes related to deforestation, and both have to do with the uncontrolled “expansion of the agricultural frontier”, but we must recognize that while its management is a complex multifactorial process, a progressive decrease of its magnitude could markedly reduce CO2 emissions, without conflicting with food production on well-organized bases and social science and technology methodologies. A different problem is posed by the N2O and CH4 emissions, but that is a fertile field for practical scientific and technological progress in the understanding of natural phenomena. | Rejected, Statement - not a comment |
| 2595 | 11 | 7 | 16 | 7 | 16 | "RA Houghton, 2003, 2010" should be "Houghton, 2003, 2010;" | Accepted, agree |
| 2596 | 11 | 7 | 16 | 7 | 17 | "S. Piao et al., 2009;" should be "Piao et al., 2009;" | Accepted, agree |
| 2597 | 11 | 7 | 19 | 7 | 19 | "(RA Houghton et al., 2012)." should be "(Houghton et al., 2012)." | Accepted, agree |
| 10166 | 11 | 7 | 20 | 8 | 6 | This text appear a bit unstructured, a suggestion for improvement is 1. change in land use: i) global pattern, ii) regional scale, 2. change in productivity and its reasons, 3. change in livestock | Accepted, Agree |
| 16529 | 11 | 7 | 21 | 7 | 28 | The relation between the pasture numbers in the first sentence ("In 2009 total agricultural land…) and the 4th ("In accordance to the wider definition…") is not clear. Is "about 25% of the global land surface" calculated using the figure of 3356 Mha, or some other number? If so, what is this other number? | Accepted, Numbers were checked and text revised largely for the SOD. |
| 14575 | 11 | 7 | 21 | 7 | 22 | the share has remained stable but what has the land area done? | Accepted, Numbers were checked and text revised largely for the SOD. |
| 2615 | 11 | 7 | 21 | | | Immediate question came up how agricultural land has changed from 2009 to an earlier date. Saw that it was covered in the next paragraph. Would be good to present how the amount of ag land has changed in first paragraph. This would make sense then to discuss the components of the ag land. | Accepted, Numbers were checked and text revised largely for the SOD. |
| 12868 | 11 | 7 | 23 | 7 | 24 | Say instead "Agricultural lands, including croplands and rangelands, occupy 40–50% of the ice-free land surface of the Earth (Bartholomé and Belward 2005, Ellis et al. 2010)." Bartholomé, E. and A.S. Belward. 2005. GLC2000: A new approach to global land cover mapping from Earth observation data. International Journal of Remote Sensing 26: 1959-1977. Ellis, E.C., K.K. Goldewijk, S. Siebert, D. Lightman, and N. Ramankutty. 2010. Anthropogenic transformation of the biomes, 1700 to 2000. Global Ecology and Biogeography 19: 589-606. | Accepted, Text revised largely for the SOD, included post 2007 references |
| 3537 | 11 | 7 | 23 | | 24 | Please include a reference to this statement. | Accepted, Text revised largely for the SOD, included post 2007 references |
| 14576 | 11 | 7 | 23 | 7 | 24 | better as introductory sentence to paragraph?? | Accepted, Text revised for SOD |
| 11904 | 11 | 7 | 23 | | | (see AR4): please indicate the section or page of AR4. | Accepted, Text revised for SOD |
| 11112 | 11 | 7 | 23 | | | "croplands and pastures are one of the largest terrestrial biomes on the planet" - this statement is not precise, and may lead to incorrect concepts. Regarding what are they "one of the largest" biomes? Area? That is OK, but when we are talking about emission, removals and mitigation, and the share of natural and human-induced processes, then a more detailed and precise picture is necessary. | Accepted, Text revised largely for the SOD, included post 2007 references |
| 11905 | 11 | 7 | 25 | 7 | 33 | This section is about "prodution and consumption trends", not about the area of pasture or grazing land. Consider to delete or move to a suitable place (The definition of grassland also mentioned in page 45, line 30). | Accepted, Numbers were checked and text revised largely for the SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14577 | 11 | 7 | 26 | 7 | 28 | so agric is 15% of the 40% mentioned above?are these numbers from same data source?. Bit confusing | Accepted, Numbers were checked and text revised largely for the SOD. |
| 12869 | 11 | 7 | 27 | 7 | 27 | The 2006 IPCC National Greenhouse Gas Inventory Guidelines have superceded the older good practice guidance. So, say instead "...used in the IPCC National Greenhouse Gas Inventory Guidelines (IPCC 2006)..." Intergovernmental Panel on Climate Change. 2006. Agriculture, Forestry, and Other Land Use. National Greenhouse Gas Inventory Guidelines. Institute for Global Environmental Strategies, Hayama, Japan.) | Accepted, Text revised for SOD, reduced in pages |
| 5801 | 11 | 7 | 3 | 7 | 19 | The text is too long. Please consider just giving the sources and a statement about differences in regional coverage and other sources of incomparability. | Accepted, Figure replaced / removed for SOD |
| 5042 | 11 | 7 | 31 | 7 | 31 | this is the last time I will say this but when you say "Overgrazing 31 often happens on drylands as a result of pressure from food demand" I would have said food, fiber and energy demand | Accepted, text largely revised for SOD |
| 14578 | 11 | 7 | 33 | | | add comma after "poor regions,…." | Accepted, text largely revised for SOD |
| 4565 | 11 | 7 | 34 | 7 | 35 | The statement " The amount of arable and pasture land per-capita has increased in deveoping countries by 5% and 10% respectively between 20002 and 1970s, despite a continued decreasing trend in developed countries (FAOSTAT, 2011)" is not clear and it is somehow confusing. Probably more clarity is needed. | Accepted, Numbers were checked and text revised for SOD |
| 12368 | 11 | 7 | 34 | 7 | 35 | substitute "despite" with "opposite to" to make the sentence logical | Accepted, text largely revised for SOD |
| 15148 | 11 | 7 | 34 | 8 | 6 | do stats in this paragraph line up (or contradict?) | Accepted, Numbers were checked and |
| 14579 | 11 | 7 | 34 | 7 | 36 | sentence could be worded better and sswap 200s and 1970s. Would be good to know absolute numbers in terms of land area as well as % increase per capita as gives sense of what is to do with pper capita increase and hwat to do with population. But also note that a lot of the land for agriculture in developing countries isfor the export market to develpoped countries, so increase in per captial land does not imply people have more food. may be owrth making this point | Accepted, Numbers were checked and text revised for SOD |
| 5040 | 11 | 7 | 34 | 7 | 34 | I don't look at the data but I really doubt that the statement :The amount of arable and pasture land per-capita has increased in developing countries by 5% and 34 10% respectively between 2000s and 1970s" as population has grown. The only explanation I could think of is this is due to deforestation or poor wording where arable should be replaced with cropland and the word used should be inserted. i dont think the stock of potential arable and pasture land can change other than through deforestation. simpley put land is generally not being created. | Accepted, Numbers were checked and text revised for SOD |
| 2129 | 11 | 7 | 34 | 7 | 42 | is this consistent? - land area increase and decrease in the lines 34 resp. 42? - It should be made clearer which type of land use changed by which amount over which period. | Accepted, Numbers were checked and text revised for SOD |
| 2616 | 11 | 7 | 34 | | 35 | respectively between 2000s and 1970s is confusing. Is this a decadal comparison or from 1970 to 2000? | Accepted, Numbers were checked and |
| 18915 | 11 | 7 | 34 | 7 | 35 | 5%, 10%, 2000s, 1970s: There is one range but two values, order of the years should be switched. Please correct/clarify. | Accepted, Numbers were checked and text revised for SOD |
| 16530 | 11 | 7 | 35 | 7 | 35 | 2000s and 1970s are reversed. | Accepted, Numbers were checked and |
| 15147 | 11 | 7 | 35 | 7 | 35 | switch order of 1970s and 2000s | Accepted, Numbers were checked and |
| 7333 | 11 | 7 | 35 | 7 | 35 | 2000s and 1970s --- should be 1970s to 2000s | Accepted, Numbers were checked and |
| 5041 | 11 | 7 | 36 | 7 | 36 | when you say "Changing land-use practices have enabled world grain harvests to double" I would add technological progress and maybe crop management as ferilizer and varietal improvement have been important as have changes in crop mix | Accepted, text revised for SOD |
| 10586 | 11 | 7 | 39 | | | Is the 311 Mha increase as a result of deforestation? Could clarify | Rejected, A better question is "did deforestation result from the land clearance for agriculture?" - the answer would depend on where the expansion |
| 14719 | 11 | 7 | 4 | | | (Y. Pan et al., 2011) should be changed to (Pan et al., 2011) | Accepted, Zotero updated for SOD |
| 2594 | 11 | 7 | 4 | 7 | 5 | Y. Pan et al., 2011 should be Pan et al., 2011 | Accepted, Zotero updated for SOD |
| 9443 | 11 | 7 | 40 | | 40 | WG3 refers to developed, OECD, and Annex One countries. The latter two categories are much more meaningful than "developed." | Accepted, Regions harmonised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18916 | 11 | 7 | 41 | | | 7%, 75Mha: It is unclear whether this is about developed countries only. If so, it would be good to give the developing country values that partially make up for the developed country trend. For consistency please have a "-" before numbers throughout the chapter and make sure that this is the case for % values AND absolute values. It should e.g. be "-3.1% or -31.6 Mha)" etc. | Accepted, Numbers have been checked and text revised accordingly |
| 5039 | 11 | 7 | 5 | 7 | 5 | you refer to pan with "1990-2010" in one place and "1990-2007" which is it? | Accepted, Check numbers and revise |
| 14720 | 11 | 7 | 7 | | | (GR van der Werf et al., 2010) change to (van der Werf et al., 2010) | Accepted, Zotero to be updated for SOD |
| 8315 | 11 | 7 | 6 | 7 | 6 | Authors should note that the amount of carbon emission is varied according to a land use type. | Accepted, Revise for SOD |
| 3535 | 11 | 7 | | | | It is very hard to understand that Figure 11.1 (a) include all land use categories (LUC) in AFOLU. For e.g. does 'fires ($CO_2$)' covers all LUC (forest, cropland, grassaland, etc.)? Also, it is not clear whether this figure 11.1 (a) include emissions from all carbon pools (living biomass, dead organic matter, soils), please clarify. Please indicate what are the LULUCF activities indicated for Figure 11.1(b). How settlement as LULUCF category is treated? Are all C pools included in Figure 11.1(b)? Please include as much information as possible to demonstrate the completeness of your assessment (i.e. justify that the entire AFOLU sector is covered in the assessment), otherwise indicate what is missing in the current literature. This is very important for future scientific and IPCC work. Also, please increase consistency between both figures 11.1(a) and 11.1(b): 11.1(a) shows data for 1980-2010 while 11.1(b) shows data for 1980-2007. Explain clearly what is AFOLU and LULUCF in this chapter (indicate the different categories). | Accepted, Figure to be replaced / removed for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7057 | 11 | 7 | 16 | 7 | 19 | We fear that the primary source for Figure 11.2 (Houghton et. al. 2012) does not accuractely reflect recent information. In particular, Houghton 2012 asserts that the forest sink is due to fertilizatoin and climate effects whereas the information in Pan et al 2011 clearly shows that forest regrowth, expansion and management are key contributors to growing forest stocks and the global forest sink. (See Pan, Y., Birdsey, R., Fang, J., Houghton, R., Kauppi, P., Kurz, W., et al. (2011). A Large and Persistent Carbon Sink in the World's Forests. Science Vol. 333 , 988-993.)<br>Net emissions due to land use, land use change and forestry are best calculated from Pan et al. This publication, by leading international authorities and built on actual national inventory data, shows different picture than implied by Figure 11.1b, and explains the unexplained sink described in AR4 | Accepted, Comment actually refers to Figure 11.1. Figure to be replaced / removed. The commentator is confused between land use change net emissions due to direct activity of land use and land cover change, and the response of ecosystems to the indirect effects of environmental change in the two different papers. this is not surprising as the current chapter text and indeed the Pan et al. paper are not clear on this. Human activity on the land (land use land-use change and forestry LULUCF) is a net source of CO2 emissions, primarily due to tropical deforestation. The Pan paper uses the Houghton model to calculate the NET LULUCF flux in the tropics, but also splits the model results up into the GROSS flux from forests loss, and the GROSS sink from regrowing vegetation (e.g. much of the tropics undergoes shifting cultivation as well as net forest area loss). Then the other thing the Pan paper does is collate inventory data in tropics to show that extant forests not undergoing human management are currently net sinks for carbon, this is due to indirect effects of environmental change (CO2 fertilization, climate). This is consistent with Houghton 2012. In fact Houghton was an author on both papers. Houghton |
| 12183 | 11 | 7 | 3 | 7 | 7 | First sentence of the paragraph lines 3/4/5 are not clear. In one source it is mentioned as 1990-2007 where as in the next line as 1990-2010. Why the data of 1980s ( perhaps 1980-1989) is not comparable with 1990-2010.<br>FAO is the best source of data on deforestation but that has not mentioned here.<br>Similarly the sentence starting C emissions from fires from 1980-1989 and ---for 1980 only is not clear.<br>It is also not clear how the data of CO2 emissions has been harmonized and presented in the figure 11.1. | Accepted, Revise for SOD |
| 5493 | 11 | 7 | | | | Section 11.2.1- would it be possible to include some information on trends re import and export of primary production in this section? | Noted, Could not find space |
| 11291 | 11 | 7 | 20 | | | Quantitative data in this section would be much more comprehensible if shown graphically (i.e. on a map or chart). | Accepted, Tabulated or inserted figures |
| 12925 | 11 | 7 | 20 | 10 | 14 | Topics in this section should be discussed following three categories of "Cropland", "Grassland", "Wetland". Trend of C flux was discussed in such categories in 11.2.2, so readers can easily compare the discussion in Production and Consumption trend with in the trend of C flux. | Accepted, Revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 10129 | 11 | 70 | 13 | 70 | 13 | A discussion on mitigaiton in livestock produciton is completely missing and it is the biggest emitter, animal healt and feeding practices (more production of protein per animal, sick animals hyngry animals do not produce but they do emit), how the feed is produced (deforestation consequences, but could also be a carbon sink) , manuremanagement and produciton of biogass (FAO has done a lot of work on this). | Accepted, Livestock sections have been strengthened |
| 10130 | 11 | 70 | 13 | 70 | 13 | Also energy in agricultural context is much larger issue that only biofuel production , energy is needed in the households (forest degradation) and in farming (irrigation pumps, machinery, transport, processing) this can be produced as apart of farming system with clear mitigaiton benefits but maybe this is addressed in the energychapter | Noted, Energy chapter issue |
| 2643 | 11 | 70 | 14 | | 28 | The discussion seems to suggest that only agricultural crops can be used to produce biofuels. This is not correct and forest materials are also used to produce liquid fuels. | Accepted, Clarified for SOD |
| 5517 | 11 | 70 | 21 | | | Biofuels are mentioned frequently in this chapter but I have not seen any type of assessment of relative benefits:costs of different types of biofuel or detailed discussion on the relative energy to costs for different types of biofuels. Tools for appropriate assessment of different biofuels would also be helpful. | Rejected, This occurs in the energy chapter and the bioenergy cross cut chapter |
| 7214 | 11 | 70 | 21 | | | ' coherent biofuel policies need to be promoted'. This only counts if the existing biofuel policies are sound, reliable, and promote the production of 'true' sustainable biofuel. And this is not the case yet. Discussion needed on e.g. Roundtables such as RSPO, RSS, RSB. RSPO for example does not even have GHG criteria yet in their policy. This needs to be discussed | Accepted, Revised for SOD |
| 12448 | 11 | 70 | 32 | 70 | 32 | Is the emission reduction of 104 Mt CO2-eq per year or accumulated over ten years? Please consider to clarify. | Accepted, Checked numbers and revised accordingly |
| 10613 | 11 | 70 | 38 | | | Australia didn't have the "world's first" scheme. NZ emissions trading scheme started in 2008 and the forestry sector was included from 1 January with forest C credits being traded since then. http://www.mfe.govt.nz/publications/climate/emissions-factsheets/factsheet-17.html | Accepted, Removed claim that Australia was the first - unimportant and should not single out countries except as |
| 12449 | 11 | 70 | 41 | 70 | 44 | Line 42 "reducing fertilizer use" indicates that N2O emissions are included in the scheme. The expression "Carbon Farming Initiative in line 43/44 and "Australia's carbon emissions" however suggests that only C-related emissions are included. Please clearify. | Accepted, Revised for SOD |
| 12450 | 11 | 70 | 44 | 70 | 44 | Clearify if the figure 460 million tonnes is C, or CO2-eq and if it is per year. | Accepted, Checked numbers and |
| 5654 | 11 | 70 | 44 | 70 | 44 | "--- cut Australia's carbon emission by 460 million tonnes by 2050". Units tC or tCO2 equivalent? | Accepted, Checked numbers and |
| 5849 | 11 | 70 | 45 | 70 | 46 | Please give the complete name of the certification initiative: "Forest Stewartship Council". | Accepted, Revised for SOD |
| 15207 | 11 | 70 | 6 | 70 | 7 | extensive citation for simple sentence | Accepted, Revised for SOD |
| 14448 | 11 | 70 | | | | Good summary of research areas that should be supported. I recommend leaving this section intact. | Accepted, Retained this section, but added to it and developed it further |
| 17148 | 11 | 71 | 10 | | | A Case Study on the important role that traditional/indigenous agriculture makes in climate change mitigation might be a valuable includsion in this chapter. | Noted, Very limited space |
| 5850 | 11 | 71 | 10 | 72 | 5 | There are two topics missing from your list (at least): 1.) Better understanding of the indirect effects of land-use, especially of the use of biomass grown on the land in HWP and / or bio-energy, with an emphasis on cascading use and recycling. 2.) Better understanding of the optimization of biomass production in agriculture or forestry with regard to the climate change impacts and trade-offs (in both cases: positive and negative). Linking 1.) and 2.) is a matter of course. | Accepted, Added to gaps list |
| 6782 | 11 | 71 | 10 | 72 | 5 | date about the effects of Nitrogen deposition or other air pollution on the carbon stocks or non-CO2 emission.soil inorganic carbon changing following land use change.the trade-off about adaptation and mitigation in AFOLU sector. | Accepted, Added to gaps list |
| 5655 | 11 | 71 | 11 | 71 | 42 | First and foremost: | Noted, Not a full comment |
| 5656 | 11 | 71 | 11 | 71 | 42 | An inventory of biomass, especially trees on all land use types. Where important, inventories of residues both plants and animals. Data required on stock and annual growth. | Accepted, Added to gaps list |
| 5657 | 11 | 71 | 11 | 71 | 42 | Good land use maps and monitoring for land use changes over time. | Accepted, Added to gaps list |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 5658 | 11 | 71 | 11 | 71 | 42 | Regarding point 10. Better data on forest degradation. This sentence assumes that selective logging, collection of fuelwood/poles and NTFP, charcoal production etc. is a principal cause of forest degradation. In most cases the removal of these products is harvesting. Dead wood is the first choice of fuelwood collectors. They are doing a service in decreasing the risk of forest fires. Also trees outside the forest (TOF) are a significant source of fuelwood and poles. Such trees have been neglected in this First Order Draft. TOF could supply much of the firewood (and poles) in developing countries. | Accepted, Added to gaps list |
| 5659 | 11 | 71 | 11 | 71 | 42 | Point 11. What are DGVMs? | Accepted, Spelled out DGVMs |
| 5660 | 11 | 71 | 11 | 71 | 42 | Point 14. The dry distillation of biomass for liquids energy should not be neglected. | Accepted, Added to gaps list |
| 4352 | 11 | 71 | 11 | 72 | 5 | Indication of these gaps are useful to understand uncertainty of future projection in AFOLU and study targets. I can add some, e.g. migration and survival of native forest species, responces of vegetation and soil for extreme climates, linkage after several potions in AFOLU | Accepted, Considered and added those considered important |
| 18290 | 11 | 71 | 13 | | | "A global, high resolution data base of typical land management practices": the same applies for typical animal housing systems and manure management practices, please add this as a gapof knowledge | Accepted, Added to gaps list |
| 18291 | 11 | 71 | 16 | 71 | 18 | the same applies for livestock management practices,please add this as a gap of knwoledge | Accepted, Added to gaps list |
| 11075 | 11 | 71 | 16 | 71 | 18 | Suggest changing this item to "Better data on how agricultural management practices including crop rotations, variety selection, fertilization practices (amount, type and timing) and tillage practices affect GHG gas emissions including N2O and CH4 emissions and soil C storage, and how these effects vary at different locations across the globe." | Accepted, Revised for SOD |
| 18292 | 11 | 71 | 18 | | | Please add the following gap of knowledge:"better data on emission level and mitigation options of new technologies e.g. in animal housing, manure management, feeding practices, etc." as we also need data on the newly developed technologies | Accepted, Added to gaps list |
| 2644 | 11 | 71 | 19 | | 21 | Studies need productivity (NPP) data and not just C stocks to calculate C sequestration potentials. | Accepted, Added to gaps list |
| 13671 | 11 | 71 | 19 | 71 | 21 | This data and knowledge gap should be saparated as follows:<br>- More accurate data on C stocks in biomass for grasslands, croplands and wetlands, and C stocks in pools of dead organic matter for different types of ecosystems around the world, including forests<br>- More accurate long-term monitoring data on C stocks in soils for different types of ecosystems and different management around the world, including forests | Accepted, Considered and reorganized |
| 2645 | 11 | 71 | 26 | | 28 | Most of the burning of forests and fires in Indonesia is for planting palm oil plantations and not shifting agriculture | Partially Accepted, Expanded bullet point |
| 2646 | 11 | 71 | 29 | | 30 | There is a need for a better word than degradation. Degradation can be a heavily human laden word or value. A change may be negative for humans because it decreases the delivery of an ecosystem service but the ecosystem itself may be shifting within its range of change without it being negative. | Accepted, Defined degradation |
| 7215 | 11 | 71 | 3 | | | the length and complexity of the biofuel supply chains make the sustainability issue very challenging'. That is true, however, it is of major importance to study the total chains, since otherwise very wrong, highly impacting decisions on e.g. biofuel policies could be made, because simply the knowledge is not there. E.g. the promotion of palm oil produced on any kind of land (including peatland) as a biofuel. While afterwards it turns out that biofuels that contain palm oil produced on peat has very negative impacts in terms of GHG emissions compared to fossil fuels | Accepted, Nuance Discussion and refer back to bioenergy section |
| 2647 | 11 | 71 | 31 | | 33 | Llarge global data bases already exist (FAO) so one would question the need for more data collection. It would be better to mine the large existing data bases instead of just collecting more data. | Accepted, Reworded bullet point |
| 2648 | 11 | 71 | 38 | | 39 | This needs to include soils | Accepted, Reworded bullet point |
| 2649 | 11 | 71 | 41 | | 42 | Bioenergy is not one type of energy but a broad group of different types of energy - gas, liquids, etc. | Accepted, Nuanced discussion and referred back to bioenergy section |
| 10260 | 11 | 71 | | 72 | | A major gap to be added: an effective initiative is necessary to build an on-line dedicated tier2 database for the AFOLU activities | Accepted, Added to gaps list |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13356 | 11 | 71 | | | | There is a poor understanding of the relationship between animal nutrition and enteric fermentation. Current global manure management estimates are extremely crude and poor. There is a poor understanding of the impact of draining of wet areas (potholes) on carbon balance on agricultural soils. There is a poor understanding of forested wetlands/peatlands and the impacts of forestry on forested wetlands/peatlands. In general the gaps in knowledge here are focussed mainly on land use and are just touch on knowledge gaps in AFOLU. | Accepted, Added to gaps list |
| 11181 | 11 | 71 | | | | Knowledge of practical technology for sustainable forest management in diversed natural and social conditions are important to reducing emissions from deforestation and forest degradations in developing countries in the long term. But it is still insufficient. | Accepted, Added to gaps list |
| 4280 | 11 | 71 | 10 | | | Fire is identified as a data gap; fire statistics are probably better and more readily avaialble thatn insect and disease data, which may be as important or even more important, but is not identified as a data gap. A gap in the data gaps list :) | Accepted, Added to gaps list |
| 11180 | 11 | 71 | 19 | | | More accurate data on C stocks in forest biomass are also needed especially for the natural forest in developing countries. Correcting forest biomass data is more difficult than in the cropland/grassland and diversity is much larger. | Accepted, Added to gaps list |
| 15208 | 11 | 72 | | | | it's not just ag and l-u change. It's all kinds of land uses and land-use change | Accepted, Edit for SOD |
| 13992 | 11 | 72 | | | | add in change in diets. Mention the problems with 4.3 Gt estimate. | Accepted, Edit for SOD |
| 13993 | 11 | 72 | | | | some barriers such as non-permanence cnanot be resolved. | Rejected, Statement - not a comment |
| 13994 | 11 | 72 | | | | increased incorporation of manures and composts will increase soil fertility, soil health, water infiltration and water holding capacity, etc. | Rejected, Statement - not a comment |
| 2650 | 11 | 72 | 1 | | 2 | We need productivity of the total ecosystems (above and belowground) to better understand the carbon budget | Rejected, Statement - not a comment |
| 18293 | 11 | 72 | 17 | 72 | 28 | The question on "main mitigation options" is not being answered | Accepted, state explicitly |
| 9461 | 11 | 72 | 17 | | 28 | This chapter does plenty to demonstrate the mitigation potential of mitigation options, but does little to nothing to demonstrate that these are actionable strategies. | Accepted, Write more in policy section to suggest what is already happening |
| 18294 | 11 | 72 | 30 | | | I suggest to add a question liek "How can consumers influence GHG mitigation by their choice of diet and agricultural products?" | Partially Accepted, Will add something on diets under mitigation options - see |
| 5851 | 11 | 72 | 38 | 73 | 4 | What you refer to here is the direct mitigation potential through C sequestration and storage in situ or by e. g. avoided degradation / deforestation. You neglect indirect effects of biomass use, what can lead to erroneous conclusions. | Rejected, Accounted for in the energy chapter |
| 5661 | 11 | 72 | 9 | 72 | 16 | Annual flux from land use and land-use changes account for 12-20% --- 1.1 +/- 0.9 GtC. This is a very large figure for +/-! | Noted, Yes - it is a very complex system and the uncertainty is large |
| 15631 | 11 | 72 | 3 | 72 | 4 | In terms of knowledge and data gaps, the effects of mitigation options on the social and economic conditions of poor people are not the only gaps to be considered. More should be done to improved knowledge and data on a wide range of social and economic impacts, as well as non-climate environmental impacts. This includes, for example, animal welfare, which to my knowledge has been rarely considered in this context. | Rejected, Animal welfare considered already in earlier comments; will be included in the main chapter |
| 5382 | 11 | 72 | 8 | 73 | 9 | This reviewer feels that there really needs to be a bullet here in the FAQs that says doing noting about climate change represents a real and already present danger for AFLOU and therefore the baseline needs to be framed in terms of deviating from this bad outcome trajectory and not on restoring the earth to some idyllic natural state. | Accepted, Revise for SOD |
| 7084 | 11 | 73 | | | | The answer to the FAQ needs to be expanded to included the mitigation benefits associated with forest products. In this context, it should be noted here that in the fourth assessment report, it was found (and is still true) that as regards mitigation benefits of forests, the maximum long-term benefits are attained via sustainable forest management to maintain or increase forest carbon stocks while producing a continuing output of forest-based products. (Fourth Assessment Report, WGIII, Chapter 9, Executive Summary) | Accepted, Revise for SOD |
| 10193 | 11 | 73 | 10 | 73 | 12 | However, reforestation of burnt areas will lead to CO2 sequestration again, which is not the case if the area originally was left deforested | Noted, Statement - not a comment |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 11833 | 11 | 73 | 17 | | | FAQ 11.6: Shouldn't there be a a FAQ about trade-offs as well? | Rejected, We are working to the IPCC |
| 2150 | 11 | 73 | 18 | 73 | 26 | add the role of improved soil quality, fertility etc. from increased soil organic carbon levels (water retention, absorption, etc.) - given the big mitigation potential of SOC sequestration, co-benefits thereof have to be communicated clearly as well. | Accepted, Revise for SOD |
| 10194 | 11 | 73 | 20 | 73 | 20 | For clarity change to "reforestation, afforestation and reduced deforestation" since it is a reduction in the last but an increase in the first two that results in mitigation. Alternatively write out "increased" before reforestation and afforestation. | Accepted, Revise for SOD |
| 13537 | 11 | 73 | 28 | 73 | 28 | explained, integrated, or used for feedback for profound changes in concept, approach and scope? | Rejected, We are working to the IPCC |
| 11832 | 11 | 73 | 6 | 73 | 8 | In which sense does the feedback from thawing permafrost to the climate relate to AFOLU? Just by ist overall effect on warming? | Noted, Yes - via feedback to increase future warming |
| 6940 | 11 | 73 | 27 | 73 | 28 | Models to do what? We suggest to revise the title to be more explicit in order to better capture the content. | Accepted, To estimate mitigation potential in the AFOLU sector - clarify |
| 6939 | 11 | 73 | 5 | | | We are concerned about the current focus of the FAQ. Most of this FAQ deals with physical science and climate change feedbacks. We suggest to either delete the FAQ or to move the focus on the emissions side to avoid unnecessary overlap and duplication with the WGI AR5 assessment, Chapter 6 WGI AR5. | Accepted, This FAQ removed |
| 16621 | 11 | 74 | | 103 | | I have emphasized the importance for the credibility of the chapter, given possible attacks as with AR4, of avoiding citations to reports that are not either peer-reviewed or citations of official government or intergovernmental publications. The following are those which may fall into this category. (I hope not, but it's important to check!): Berndes Goran 2012, Calder 2005, CATF 2009, CBD and Giz 2011 Chan et al 2010, Eliasch 2008, Herold 2009, Jackson 2009, Joosten 2010, Mayrand and Paquin 2004, McKinsey and Company 2009, Peters-Stanley et al 2011, Shiraishi et al. 2006, Strassburg et al. 2007 (I believe this is the "white-paper" equivalent of Strassburg et al. 2009), WBGU 2009, and WBGU 2011. | Accepted, Okay - thanks - we havel taken advice |
| 7670 | 11 | 74 | 29 | 74 | 36 | The two papers by P. Asante et al mentioned here contain both a fundamental error. This will be shown in the following paper, which conclude very differently with regard to the importance of dead organic matter: Holtsmark, B., M. Hoel, K. Holtsmark (2012) Optimal harvest age considering multiple carbon pools - a comment. Journal of Forest Economics (in press) | Accepted, Removed reference, or have shown the counter-case |
| 15209 | 11 | 76 | 1 | 76 | 5 | repeated reference | Accepted, Zotero updated for SOD |
| 16531 | 11 | 8 | 10 | 8 | 10 | ".. Expected to double" with respect to its value in what year? | Accepted, Text largely revised for SOD, included reference years |
| 10587 | 11 | 8 | 10 | | | FAO projection of 70% more food will be needed by 2050 than 2005/2007 production could be quoted: FAO 2009, How to feed the world in 2050, Food and Agriculture Organization of the United Nations, Rome. 35 pages. www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf | Accepted, Text revised for SOD |
| 11976 | 11 | 8 | 11 | | 11 | "M head" maybe better as million head first time as people may get confused | Accepted, Agreed - revised |
| 18917 | 11 | 8 | 11 | 8 | 12 | For better readability change the million values to billion. | Rejected, Billion means different amounts in different parts of the world |
| 5802 | 11 | 8 | 15 | 8 | 22 | Please explain "EIT" and bear in mind that cattle, buffalo, sheep and goats are all ruminants, too. So you could simply delete the term from line 20. | Accepted, The guidance at LAM3 on regional breakdown is agreed, and those have been used for SOD. Regions are |
| 9444 | 11 | 8 | 21 | | 21 | The term drivers is pervasive in the scientific literature, but its meaning varies widely. Here, it should be defined or excised | Accepted, Text largely revised for SOD. Term 'drivers' used in accordance to |
| 14583 | 11 | 8 | 22 | | | would be good to make the point somewhere in this para or the one below that amount of land and agric cops needed to sustain livestock production, ie. not just a matter of increasing pasture land, but of feed production. | Accepted, Text largely revised for SOD |
| 4566 | 11 | 8 | 24 | 8 | 26 | The use of the term developing regions is not very common and may be difficult to understand. I suggest that the term developing countries in Asia be used instead. | Accepted, The guidance at LAM3 on regional breakdown is agreed, and those have been used for SOD. Regions are |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18918 | 11 | 8 | 24 | | | "for the world": add a time span | Accepted, Text revised for SOD |
| 13307 | 11 | 8 | 25 | 8 | 25 | remove "for" before "Asia" | Accepted, Revised for SOD |
| 10100 | 11 | 8 | 25 | 8 | 25 | The per capita food availability in Africa has to my knowledge decreased | Accepted, Numbers have been checked, text revised for SOD |
| 9445 | 11 | 8 | 26 | | 28 | Since when has the share of livestock products in developed nations begun to decline? The 1970's also? | Accepted, Text largely revised for SOD, included reference years |
| 2130 | 11 | 8 | 26 | 8 | 26 | may write "almost doubled" instead of "up 92%" - to avoid that an inattentive reader may think that meat constitutes for 92% of the diet. | Accepted, Text largely revised for SOD, included actual numbers |
| 13306 | 11 | 8 | 3 | 8 | 6 | With the increase in N fertilizer, there has been an increase in the amount of reactive N in the biosphere, and as a consequence a corresponding increase in N2O and see Galloway et al. The N cascade ( | Partially Accepted, This is dealt with later in the chapter dealing with changes |
| 10098 | 11 | 8 | 3 | 8 | 4 | There has been a significan increase in fossile fuel use due to mechanisation, production of fertilizers, the irrigation pumps use significant amount of fuels and also emit harmful substancies (I try to dig a reference if I have time) | Partially Accepted, This is accounted for in the energy sector |
| 6823 | 11 | 8 | 34 | | 36 | Is increasing use of artifical fertilisers possible in these developing countries given rising oil prices and land degradation etc? FAO (Save and Grow, 2011) promotes "sustainable crop production intensification (SCPI), which produces more from the same area of land while conserving resources, reducing negative impacts on the environment and enhancing natural capital and the flow of ecosystem services." | Accepted, Text largely revised and shortened for SOD |
| 9325 | 11 | 8 | 34 | 8 | 36 | The likelihood that increased crop and livestock production will be met through expanded use of synthetic fertilizer does not seem to be a good proposition. The synthetic fertilizers, which were the moving force behind the green revolution of 1960s and 70s, are blamed for atmospheric pollution, i.e. nitrate contamination of groundwater through leaching from agricultural fields and emission of nitrous oxide ( a greenhouse gas) through the process of denitrification. This is supported by a statement on page 15, line 11 of this Chapter (Chapter 11) that 'In total, 76% of greenhouse gas emissions on croplands come from the application of fertilizer'. | Rejected, Of course - we are not advocating it - we are reporting the trends |
| 5700 | 11 | 8 | 34 | 8 | 36 | Please add that enhanced use of chemical fertilizers and expanded livestock production will, however, increase GHG emissions. | Accepted, We have added that - but we are not advocating it - we are reporting |
| 8924 | 11 | 8 | 34 | 8 | 36 | "and by the substantial conversions from forest to arable / grazing land" | Rejected, Provide reference |
| 10101 | 11 | 8 | 35 | 8 | 35 | Expanded livestock production capacity? Improved, increased? | Accepted, Changed to "increased" |
| 14584 | 11 | 8 | 36 | | | see point above, again it would be useful in the context of this para to have data on crop yeild/ha in the past, currently and potential for increase. | Accepted, Text revised for SOD |
| 10099 | 11 | 8 | 4 | 8 | 5 | There has been a very significant intensification in China, which at the moment uses most N fertilizers per ha but also South Korea, Vietnam, Indonesia | Accepted, Regional breakdown removed |
| 15229 | 11 | 8 | 4 | | 6 | Missing parallel comparison to food yields. 700% increase in chemical fertilizer use and 70% increase in irrigation (ok). But this resulted in non-proportional increases in food production. For example, grain yields increase by 1.5-fold from 1961 to 2006 (FAO stats). Suggest adding this comparison inputs vs. yields increases (to highlight innefficiencies and impacts of GR technologies). | Accepted, Have shown yields per capita increasing, and yield per unit input going down |
| 14721 | 11 | 8 | 5 | | | (J. A. Foley et al., 2005), needs to be changed to (Floey et al., 2005). In this matter several authors throughout the text are cited in different ways. In my opinion this should be standardized. | Accepted, Zotero to be updated for SOD |
| 14722 | 11 | 8 | 5 | | | …" agricultural intensification has mainly occurred in the Southern Asia (e.g. Bangladesh and Sri Lanka) (Royal Society, 2009)." Agricultural intensification in the Savanas areas of Brazil (Central part of the country) has also been intensified since the 70's. Significant areas were de forested and soybeans crop and grazing lands were planted. | Accepted, Removed regional statements |
| 2598 | 11 | 8 | 5 | 8 | 5 | "(J. A. Foley et al., 2005);" should be "(Foley et al., 2005);" | Accepted, Zotero to be updated for SOD |
| 14580 | 11 | 8 | 6 | | | it would also be good to have information on yield/ha in different regions over time to see past icnrease and potential for further yield icnreases. | Accepted, Have shown yields per capita increasing, and yield per unit input going |
| 14581 | 11 | 8 | 6 | | | delete : in THE Southern Asia | Accepted, Removed regional statements |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16532 | 11 | 8 | 7 | 8 | 22 | This paragraph does not mention pigs, whose numbers have changed rapidly in recent years, particularly in China. There should be a sentence or two mentioning their trend. | Accepted, Non-ruminants and poultry have also been considered. Text largely |
| 2592 | 11 | 8 | 7 | 8 | 9 | It would be more opportune to state where the increase happens: in Europe, milk productions exceds the demand. | Rejected, These are global trends - not the place for regional details |
| 5043 | 11 | 8 | 7 | 8 | 7 | I note this paragraph does not have hogs or aquaculture and that might be a good addition | Accepted, Non-ruminants and poultry have also been considered. Text largely |
| 2617 | 11 | 8 | 7 | | 22 | The organization of information delivery is hard to follow, the word sequence difficult to follow and one sentence is 5 lines long. | Accepted, Text revised for SOD |
| 2599 | 11 | 8 | 7 | 8 | 7 | "the last 50 years" would be given by specific time, for example, during 1961- 2011 | Accepted, Time periods are more |
| 2323 | 11 | 8 | 8 | | 17 | This paragraph could be deleted as other report will deal with impact and adaptation to Climate Change. | Rejected, Trends data needed - not dealt with elsewhere - not about adaptation - |
| 14582 | 11 | 8 | 9 | | | would be good to make the point htat this is linked to both increasing population,a nd increasing meat onsumption per capita in developing nations. There is mor eon this in the next para though so may not be necessary | Rejected, Dealt with in next paragraph |
| 2322 | 11 | 8 | 9 | | 10 | Please, provide references. | Rejected, Each statement is fully |
| 15604 | 11 | 8 | 10 | 8 | 12 | Why exclude poultry (including egg-laying hens) from these production numbers, especially given the shift to monogastric production. Food and Agriculture Organization of the United Nations (2009). The state of food and agriculture: livestock in the balance (Rome, Italy: FAO, p. 13). Available at: http://www.fao.org/docrep/012/i0680e/i0680e.pdf. | Accepted, Non-ruminants and poultry have also been considered. Text largely revised for SOD |
| 15606 | 11 | 8 | 21 | 8 | 22 | Consider mentioning the importance of emissions trends based on economic sectors, specifically animal agriculture; and adding figures on this such as those in Unger N. et al (2010) and Pelletier and Tyedmers (2010). Unger N., T.C. Bond, J.S. Wang, D.M. Koch, S. Menon, D.T. Shindell, and S. Bauer (2010). Attribution of climate forcing to economic sectors. Proceedings of the National Academy of Sciences of the United States of America 107(8), 3382-87. Steinfeld H., P. Gerber, T. Wassenaar, V. Castel, M. Rosales, and C. de Haan (2006). Livestock's long shadow: environmental issues and options. Food and Agriculture Organization of the United Nations. Available at: ftp://ftp.fao.org/docrep/fao/010/a0701e/a0701e.pdf. Pelletier N. and P. Tyedmers (2010). Forecasting potential global environmental costs of livestock production 2000-2050. Proceedings of the National Academy of Sciences of the United States of America 107(43), 18371-74. Available at: http://www.pnas.org/content/early/2010/09/27/1004659107.full.pdf+html. | Accepted, Emissions have been presented by subsectors; section largely revised for SOD |
| 5367 | 11 | 8 | 23 | 8 | 25 | This point about food avialiabilty per capita increasing even in the face of growing world population seems to be a profoundly important point that should perhaps be mentioned in the executive summary and the FAQs at the end of the chapter. This finding seems to have important ramifications for going forward in terms of addressing climate change as well as feeding the world. | Accepted, Have shown yields per capita increasing, and yield per unit input going down |
| 12184 | 11 | 8 | 25 | 8 | 26 | The share of animal product in the diet ? Perhaps it should be per capita consumption to make it more clear | Accepted, Changed wording |
| 15605 | 11 | 8 | 7 | 8 | 22 | Consider more clearly highlighting the animal agriculture sector. Steinfeld H., P. Gerber, T. Wassenaar, V. Castel, M. Rosales, and C. de Haan (2006). Livestock's long shadow: environmental issues and options. Food and Agriculture Organization of the United Nations. Available at: ftp://ftp.fao.org/docrep/fao/010/a0701e/a0701e.pdf. Pelletier N. and P. Tyedmers (2010). Forecasting potential global environmental costs of livestock production 2000-2050. Proceedings of the National Academy of Sciences of the United States of America 107(43), 18371-74. Available at: http://www.pnas.org/content/early/2010/09/27/1004659107.full.pdf+html. Also consider highlighting the amount of crop production going to animal feed. Over 97% of global soymeal production is fed to animals used in agriculture, and during the last four decades of the 20th century, over 60% of the corn and barley crop were also fed to these animals. Steinfeld H., P. Gerber, T. Wassenaar, V. Castel, M. Rosales, and C. de Haan (2006). Livestock's long shadow: environmental issues and options. Food and Agriculture Organization of the United Nations, pp. 38-39, 43. Available at: ftp://ftp.fao.org/docrep/fao/010/a0701e/a0701e.pdf. | Accepted, Non-ruminants and poultry have also been considered. Text largely revised for SOD |

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| 14673 | 11 | 8 | 7 | 8 | 9 | It seems very likely that as feed prices rise, due to climate change related reductions in yield and increasing population pressure on food of all sorts, meat prices will rise resulting in decreased per capita, and possibly absolute, meat consumption. | Rejected, Possibly but we have no reference to base this on |
| 13538 | 11 | 80 | 9 | 80 | 9+ | OPRE - Operational Plan for Renewable Energy, New Energy Division, Ministry of Energy and Mines-MEM & Andean Development Corporation-ADC, Caracas, 1998-2001. | Accepted, Zotero updated for SOD |
| 15210 | 11 | 81 | 27 | 81 | 38 | foley reference in here 3 times; twice as 2009 and once as 2005. | Accepted, Zotero updated for SOD |
| 8599 | 11 | 81 | 27 | 38 | | Check if Foley et al (2009a), Foley et al (2009b) and Foley et al (2005) are not the same | Accepted, Zotero updated for SOD |
| 13539 | 11 | 83 | 31 | 83 | 31+ | González, F.G., Energy and mechanization in agriculture, Central University of Venezuela, Caracas, 1995 (404 pp.). | Accepted, Zotero updated for SOD |
| 13540 | 11 | 86 | 43 | 86 | 43+ | Huici C., J., Integrated Rural Development Project, Community Huanacu, Energy & Development, PROPER-GTZ, N°9, 1996. | Accepted, Zotero updated for SOD |
| 13541 | 11 | 88 | 29 | 88 | 29+ | Kumar, A., Optimizing Small Water Resources of India, Energy & Development, PROPER-GTZ, N°9, 1996. | Accepted, Zotero updated for SOD |
| 8316 | 11 | 9 | | 9 | | Absolute figures are more important than percentages to estimate GHG emission through land use fluctuation. | Accepted, Checked numbers and |
| 14585 | 11 | 9 | | | | I have a slight preference for absolute numbers rather than % change. I understand this allows you to plot all on one figure but I think it is interesting to see relatively how much land is in crops and forests etc. Anyway, I see the rational of doing it both ways. | Accepted, Checked numbers and revised for SOD |
| 7334 | 11 | 9 | | | | It ssems the countries should be better identified on this figure, especially OECD90 and EIT countries. At least give a clue on how to find out what countries are included. Also, I don't like how figure #1 is compressed to make room for the legend. They should all be on the same x scale, and note should be made that the Y axis are different. | Rejected, Regional breakdown is required - but not individual countries |
| 5537 | 11 | 9 | | | | The combined increase in agriculture and pasture should equal the decrease in forest area. It does not seem to be the case! | Rejected, Not true - these can come from natural grasslands |
| 5803 | 11 | 9 | | | | Please rework this figure. The years should be given below all curves to facilitate reading, panels should be of equal size, and it would benefit readers if regions were indicated in the panels, not in the text. The legend can be drawn across both columns of panels what might also allow for a larger size of the font used. | Accepted, Reformatted for SOD |
| 7181 | 11 | 9 | | | | For SE Asia recent numbers of deforestation have been published by Miettinen et al., 2011: 46% of the forest cover is lost between 2000 and 2012 (see also table below). It is interesting to see how the total net gain of forest in total Asia is more than 2.2 M ha yr-1 in the period 2000-2012. Are these numbers in table 11.1 reliable? Please check. | Accepted, Deleted table and used figure |
| 7182 | 11 | 9 | | 9 | | In the study by Miettinen et al (2011), deforestation rates in insular Southeast Asia were determined by comparing satellite imagery between 2000 and 2010 using a spatial resolution of 250 m and land cover maps with regional methodologies and classification schemes. They calculate a net deforestation rate for Indonesia and Malaysia of 1110 ha-1 yr-1. | Accepted, Deleted table and used figure |
| 13663 | 11 | 9 | | | | It is strange that the data for N fertilizer and forest land are shown to start from 2001 and 1990, respectively. They should be started from 1971 so that the trends can be compare to other data. | Rejected, Data not available for different regions |
| 11292 | 11 | 9 | 1 | | | The significance of the data in these six graphs would be much clearer if the scales of their y-axes were standardized. | Accepted, Reformatted for SOD |
| 14422 | 11 | 9 | 1 | | | Formatting of graphs is not uniform. When y-axis has negative values, the x-axis labels are embedded in the graph. Could streamline by using a master x-axis label on the lower graphs (5&6). | Accepted, Reformatted for SOD |
| 14423 | 11 | 9 | 1 | | | The graphs are not aligned evenly. Make all graphs the same size, place the legend outside the graph frame. | Accepted, Reformatted for SOD |
| 16535 | 11 | 9 | 10 | 9 | 12 | These two sentences are misleading, since the changes in wheat production and in rice and soy yields are not due solely to climate change (and in fact probably reflect relative demand and prices more than climate change.) Delete them. | Accepted, Removed, work of WGII |
| 14587 | 11 | 9 | 10 | | | Is it just warming (ie heat stress) or also reduced ppt (drought). May be better to be specific (ie rising heat stress) or to say "due to climate change" | Accepted, Removed, work of WGII |
| 2600 | 11 | 9 | 11 | 9 | 11 | "D.B. Lobell,2011" should be "Lobell, 2011" | Accepted, Zotero to be updated for SOD |
| 18920 | 11 | 9 | 11 | | | "respectively": add time frame (range) here during which the increase in yield has taken place | Accepted, Text revised for SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14588 | 11 | 9 | 12 | | | add some text at beginning of sentence to clarify but also to make it make sense e.g. "MODELLED ESTIMATES OF future changes…." and to clarify, is this in the US? | Accepted, Removed, work of WGII |
| 14589 | 11 | 9 | 13 | 9 | 14 | I would prefer to see the range after the best estiamte in a racket, use "to, be careful of commas versus decimal points, and put the crop type with the number rather than list them all and say respectively as this way it is easier to follow e.g.wheat +1.6% (-4.1 to +6.7); maize -14.1% (-28.0 to +4.3).....etc | Accepted, Removed, work of WGII |
| 18921 | 11 | 9 | 13 | | | "A1B scenario": Please add reference to the SRES | Accepted, Removed, work of WGII |
| 2601 | 11 | 9 | 14 | 9 | 14 | "Tebaldi and D.B. Lobell, 2008" should be "Tebaldi and Lobell, 2008" | Accepted, Zotero to be updated for SOD |
| 14590 | 11 | 9 | 15 | | | surely everywhere not just temerate regions, especially since the next number is a global one. | Accepted, Removed, work of WGII |
| 13962 | 11 | 9 | 15 | 9 | 17 | adaptation is much more complex than just adapting planting dates and cultivar choices, even in rather well understood temperate growing systems, as the drought in the US this summer has demonstrated all too well. See for example recent editorial by lobell at http://globalfoodforthought.typepad.com/global-food-for-thought/2012/09/commentary-series-climate-change-adaptation-lessons-from-2012.html and writings by jarvis of CIAT/CCAFS. | Accepted, Text revised for SOD |
| 16536 | 11 | 9 | 18 | 10 | 3 | In giving data on area losses it is important to point out that, due to differences in carbon density (dry forests and savannas vs. wet forests) the resulting emissions are much larger in relative terms in Latin America and tropical Asia than in Africa. Otherwise the reader may get the impression that Africa is responsible for a substantial proportion of climate change, which it is not. | Accepted, Agree could give density data or even CO2 emissions, could ask houghton to separate out numbers?? FAO should have forest biomass |
| 12369 | 11 | 9 | 18 | 10 | 14 | The section only describes the trends in forest cover. Production and consumption is more than forest cover. We miss a description on trends in forest management (harvest/ standing biomass). | Accepted, agree, could do this, FAO should have numbers - Francesco?? |
| 12370 | 11 | 9 | 18 | 9 | 19 | Would it be possible to specify if the net loss of forests is in a specific year or average over the period? | Accepted, agree should do this, probably average over period |
| 6824 | 11 | 9 | 18 | | 22 | It will be good to note the primary causes/drivers of deforestation as well as the exacerbating factors. | Accepted, OK , again FAO -Francesco |
| 14591 | 11 | 9 | 18 | | | I would prefer to start by giving global numbers then breaking down regionally. But I think there also needs to be some explanation where the data comes from ie. FAO FRA reporting happens every 5 years, relies on country reporting, many uncertainties (grainger paper),. Increasing use of setellite data is improving estiamtes, FAO now including this.Has led to substantial reduction of FAOs past estimates of deforestation rates between FAO FRA 2010 and FAO FRA 2005. Satellite data now increasing being used. Also note that FAO FRA 2010 found a decline in deforestation brates between 200 and 2005, but FAO/JRC report based entirely on satellite data found an increase. In addition to satellite area change data (Hansen et al) there are now satellite estimates of biomass (e.g. Baccini et al, harris et al). | Accepted, agree jo/Francesco rto rework this section |
| 11804 | 11 | 9 | 18 | 10 | 3 | This subsection needs a reference, probably the numbers come from the FRA, which is cited later but it should be cited here as well | Accepted, agree |
| 7180 | 11 | 9 | 18 | 9 | 24 | For deforestation rates it might be useful to give references. Are these numbers based on peer reviewed literature? Are they from national ministries? | Accepted, agree |
| 10588 | 11 | 9 | 18 | 9 | 24 | This para just repeats info in Table 11.1 so delete. | Accepted, agree this section should talk more about drivers of the data se see on |
| 8833 | 11 | 9 | 21 | 9 | 21 | Are (all) forests lost due to fire, lost as land with forest as land use? | Accepted, most forest loss is due to land clearing firs for agriculture. Need ref on |
| 17149 | 11 | 9 | 21 | | | A possible case study to include on the role of IK and Fire Management/Abatement is the case of WALFA in Australia. See Russell-Smith, J., Whithead, P., Cooke, P., (2009) Culture, Ecology and Economy of Fire Managemnet in North Australian Savannas: Rekindling the Wurrk Tradition | Rejected, Seems a bit specific. Do we have a general reference on cause for fire loss on Australia? |
| 5044 | 11 | 9 | 23 | 9 | 23 | today north america is losing a lot of forest to disturbances like fires and pine bark beetles | Rejected, Statement - not a comment |
| 2324 | 11 | 9 | 24 | 10 | 2 | Please, reformulate this sentence | Accepted, Revise for SOD |
| 5748 | 11 | 9 | 26 | 9 | 26 | Please include also FAO Save&Grow guide as a reference (http://www.fao.org/ag/save-and-grow/en/1/index.html) | Rejected, Location cannot be located (no line 26 on page 9) |
| 9447 | 11 | 9 | 8 | | 10 | Clarify whether this refers to yields or total output | Accepted, Removed, work of WGII |
| 11784 | 11 | 9 | 8 | 9 | 17 | Deleate or transfer to WG2 to save the voulme.Climate change impact should be described in WG2. | Accepted, Removed, work of WGII |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15149 | 11 | 9 | 8 | 9 | 17 | paragraph is somewhat difficult to follow/read | Accepted, Revised for SOD |
| 14586 | 11 | 9 | 8 | | | Need an introductory sentence here explaining why claimte affects agric production. | Accepted, Removed, work of WGII |
| 13308 | 11 | 9 | 8 | 9 | 12 | Changes in US grain production could be as much due to market influences as climate influences. Suggest removing this speculation. | Accepted, Removed, work of WGII |
| 5804 | 11 | 9 | 8 | 9 | 17 | Yield per country is a weak indicator as it is a combination of yield per unit of area and area allocated to this crop in the country. Here, do you refer to yields per unit of area within e.g. the USA, or do you refer to yield in the USA, without breakdown in yield effect and area effect? | Accepted, Removed, work of WGII |
| 16534 | 11 | 9 | 9 | 9 | 10 | Sentence on global maize production needs a separate citation. | Accepted, Removed, work of WGII |
| 14412 | 11 | 9 | 9 | | | Maize production 3.8 percent lower because of warming to date – this is extremely important and should be highlighted; maybe it already is, in WGII. | Accepted, Removed, work of WGII |
| 8925 | 11 | 9 | 9 | 9 | 10 | there may be other reasons that the maizeproduction has decreased by 3.8% | Accepted, Removed, work of WGII |
| 4272 | 11 | 9 | 22 | | 23 | The text says "The area of forest in North and Central America was estimated to be almost the same in 2010 22 as in 2000." What was the reason to take this assumption? | Rejected, Not assumed - reported from FAO GRA (2010) |
| 12185 | 11 | 9 | 18 | 9 | 22 | It is essential to give here FAO 2010 as a source to avoid confusion. | Accepted, Move reference citation up |
| 5368 | 11 | 9 | 8 | 9 | 10 | It is not clear at all why one would attribute anthroprogenic climate change to dececrease in US wheat production over the period 1980-2008. It seems there could be many possible market drivers that could also explain this trend. If this is indeed driven by climate change, this is a very important point and the text here needs to more fully develop the point and substantiate it with references to a broader literature and by explaining the drivers. As currently written this seems more like an assertion than a robust technical point. | Accepted, Removed, work of WGII |
| 5852 | 11 | 91 | 36 | 91 | 37 | This (local) address will not work for retrieving this source. | Accepted, Zotero updated for SOD |
| 13542 | 11 | 92 | 22 | 92 | 22+ | OPRE - Operational Plan for Renewable Energy, New Energy Division, Ministry of Energy and Mines-MEM & Andean Development Corporation-ADC, Caracas, 1998-2001. | Accepted, Zotero updated for SOD |
| 13543 | 11 | 93 | 45 | 93 | 45+ | Postel, S., Water for Agriculture: Facing the Limits, Worldwatch Paper 93, December 1989 (54 pp). | Accepted, Zotero updated for SOD |
| 13544 | 11 | 95 | 4 | 95 | 4+ | Rogers, P., et al., Water as a Social and Economic Good: How to put the Principles into Practice; Global Water Partnership, Stockholm, 1998; Sp. ed., Chili, 2001 (41 pp.) | Accepted, Zotero updated for SOD |
| 15472 | 11 | 953 | 8 | 953 | 8 | Need to define LUC for the chapter | Accepted, Glossary issue, but define in |
| 15473 | 11 | 955 | 1 | | | Some grammar issues plus removing internal notes from text description of figure | Accepted, Revise for SOD |
| 15474 | 11 | 957 | 1 | | | Different scales on each figure disorts the % changes between graphs. Suggest selecting one or two y axis values and use for all figures. For graph 1, there is no need to show the entire -ve y-axis for just sheep and goats. The trend is evident. Use a break in the y-axis make this half of the graph smaller. | Accepted, Reformatted for SOD |
| 7654 | 11 | 96 | 35 | 96 | 44 | Searchinger et al. (2008) is listed twice in References. | Accepted, Zotero updated for SOD |
| 15475 | 11 | 990 | 20 | | | The section is essentially correct about the CO2 "fertilisation" effect, however I believe it is worth an expansion (say several more sentences and refs) since there is some confusion on interpreting the results of enhanced CO2 experiments - and contridictions in the literature. How this effect is used in CC modelling can have a large impact on the results - as highlighted with Mensaranta et al. A sentence should be added to reinforce this point. I also believe that any discussion about this subject is not complete unless the seminal paper Karnosky (2003) is not mention. It goes through all the factors that can/might mitigate photosynthesis upregulation - and its conclusions are still relevant. Ref: Karnosky, D.F. (2003). Impacts of elevated atmospheric CO2 on forest trees and forest ecosystems: knowledge gaps. Environment International 29, 161-169 | Rejected, Cannot locate the comment - wrong page number. Paper too old anyway (prefer post 2007 papers) |
| 15476 | 11 | 999 | 18 | 1000 | 4 | I would recommend adding the impact of the Finanical Crisis on carbon prices. The collapse of the value of carbon prices have made mitigation with carbon trading for existing or new forests uneconomic. A perfect example is New Zealand's Emission's Trading Scheme (currently <NZ$5 / tonne CO2). With current very low carbon prices that are unlikely to improve anytime soon, Figure 11.11 is misleading (that shows mitigation potential of carbon prices of less than <US$20/ tonne CO2) | Rejected, Not in this chapter |

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| 17302 | 12 | | | | | Urban issues/local governments: | Noted: This area is rewritten in report |
| 2511 | 12 | | | | | Important and useful table - but where have the 12 drivers come from? There is also much more than can be added to it to make it more comprehensive - it mixes up supply (e.g. infrastructure and energy mix) and demand (e.g. transport) - and it does not really focus on carbon reduction | Accepted: The table is revised as 12.9 in SOD |
| 2521 | 12 | | | | | This is very helpful - there could be more discussion of it through talking about such issues as the energy mix, shorter trips, use of public transport, walk and cycle, through using waste for energy, through carbon sinks, through insulation and design standards, and thorugh buildings design and materials etc. | Noted: The table in deleted in rewriting of this section and therefore the comment is no more relevant. |
| 2534 | 12 | | | | | This is very helpful and could perhaps be used to structure this Section | Noted: The table in deleted in rewriting of this section and therefore the |
| 2539 | 12 | | | | | This table is again helpful and could be made more central to the Chapter's main messages | Noted: The table in deleted in rewriting of this section and therefore the |
| 5532 | 12 | | | | | General comments- well written, clear chapter. It would help to provide more discussion on urban areas with existing infrastructure and urban areas without infrastructure. It would also be good to mention standards for energy efficient construction including the LEED certification program | Noted: Added discussion of importance of infrastructure. LEED is more appropriate in buildings chapter. |
| 5522 | 12 | | | | | This reviewer would suggest that there are more opportunities for mitigation in columns 5 and 6 in this table than the authors have identified. For Agriculture and Forestry- urban agriculture is a rapidly growing phenomena, with agriculture in a farm belt outside of urban areas(peri- urban agriculture) in developing countries also seen as a way to utilize an available labor force, reduce waste associated with food spoilage, and provide an economical land application site for urban generated organic residuals. For residuals management- use of reclaimed water or grey water offers potential benefits not included in the table, energy from controlled anaerobic digestion at centralized wastewater treatment plants for organics diverted from landfills are other benefits not currently listed | Noted: but the table has its own limits on how much it can represent only very important ones are shown. However, we will review this table in next round. |
| 5530 | 12 | | | | | Waste and water infrastructure row- mitigation measures should include landfill diversion, energy recovery in dedicated digesters, composting or direct land application of organics, green infrastructure for stormwater diversion, grey water systems- also consider the full implications of organics diversion with energy recover, land application with use within the urban landscape- nutrient credits, potential soil carbon credits and reduced energy costs for water treatment and landfilling | Noted: The table in deleted in rewriting of this section and therefore the comment is no more relevant. |
| 5529 | 12 | | | | | The Chicago table includes quantity of CO2 associated with each practice- this is very helpful. Including this information for the other two cities would be helpful. It would also be helpful to provide population of each city in the table captions | Noted: We presume reviewer is mentioning Table 12.6. The table is deleted in rewriting of this section. |
| 11041 | 12 | | | | | Against 'Subdivision regulations', the Potential relevance statement is 'Amount of open space required by subdivisions could be important for retaining green carbon sinks in suburbanizing areas'. However, this quantum of green carbon sinks is so negligible in most cities as to render the goal of retaining green sinks virtually meaningless. Against Limitations of Tool… it is suggested that the following words be added: 'However, size of green carbon sink likely very small.' | Noted: The table in deleted in rewriting of this section and therefore the comment is no more relevant. |
| 16659 | 12 | | | | | Table 12.1. This table is problematic because most of the "mitigation opportunities" are spatial features of urban form or structure, with no necessary connection to policy. It would be much better to have that column filled with policies. But that would also require a better treatment and understanding of existing policies and practices in different parts of the world, as noted above. | Noted: but the table has its own limits on how much it can represent only very important ones are shown. However, we will review this table in next round. |
| 16663 | 12 | | | | | Table 12.2: This is a very US-centric list of planning tools. | Noted: The table in deleted in rewriting of this section and therefore the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18381 | 12 | | | | | It would be desirable to add the following works of bibliography in the chapter listed:<br>Cap 12.<br>-Olcina, J., 2010: Spatial planning processes, territorial planning law and flood risk in the region of Valencia (Spain), in Risks Challenging. Publics, scientists and governments. [Menoni, S. ed. ] Taylor and Francis Group, 191-204.<br>-Olcina, J., Hernández, M., Rico, A.M., Martínez, E., 2010: Increased risk of flooding on the coast of Alicante (Region of Valencia, Spain), Natural Hazards, 10, nº 11, 2229-2234.<br>-Olcina, J., 2008: Droughts and their economic and territorial effects on the Iberian peninsula, Environmental Economics [Burny, Ph.; Petrescu, D. C. (editors)], Les Presses Agronomiques de Gembloux, ASBL, 173-192.<br>-Sauri, D. Serra, A. Olcina, J., Vera, J.F., 2011: Climate change and Europe's regions: Key findings. Case study Spanish Mediterranean coast. ESPON Climate. Climate Change and Territorial Effects on Regions and Local Economies / Stefan Greiving (Coordinator) / ESPON (European Observation Network for Territorial Development and Cohesion), 30-39.<br>-Rico, A.M., Olcina, J. and Sauri,D. 2009: Tourist land use patterns and water demand: Evidence from the Western Mediterranean, Land Use Policy, 26, nº 2, 493-501. ANNEX I-GLOSARY<br>-Olcina, J., 2007:<br>Research into climate risk in Spain: challenges for the future, in Spanish Climatology. Past, present and future [Cuadrat, J.M. and Martín Vide, J. (coords.)], Prensas Universitarias de Zaragoza, 421-449. | Noted but less relevant |
| 18382 | 12 | | | | | There is a limited treatment of increased exposure and vulnerability to climate hazards occurred in some areas of the western Mediterranean, in relation to the massive increase in residential building and infrastructure. This has provoked increasing risk territories. For example in areas of the Spanish Mediterranean coast is more likely in 2012 than it had in the late 1989 and 1990. And this has been caused by a massive occupation of land dedicated to housing and infrastructure (soil sealing). An analysis of this can be seen in Olcina (2010) and Olcina, Hernandez, Rico and Martinez (2010). | Rejected: WGII will cover that |
| 18383 | 12 | | | | | There are details to be made in the treatment of the concept of risk from the geographical point of view. The natural –climate- risk must be understood as an expression of territorial actions carried out by humans in the territory who have not taken into account the natural functioning of the environment where they occur. So if the man does not respect the dynamics of the physical land, infrastructure, economic activities, housing to develop man are deemed to be vulnerable to the development of a climatic event of extraordinary range (Olcina, 2007). | Rejected: Out of scope |
| 2552 | 12 | | | | | Table is too generic, implying that the references are generic too. Says everything and nothing at the same time. More accurate references should be provided after each statement. | Noted: The table in deleted in rewriting of this section and therefore the |
| 2551 | 12 | | | | | This figure has been extensively reproduced. Are there empirical evidences to support it, e.g. air pollution studies? These should be quoted, otherwise the chapter looks like an average textbook | Taken into account: Figure removed in section rewriting |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17187 | 12 | | | | | Similarly, a number of studies have found that employees at suburban workplaces tend to commute by car much more frequently than employees at inner-city workplaces. Cities where lower proportions of car commuters and higher shares of employees traveling by public transit, bicycle or by foot have been found at inner-city than at suburban jobsites include the San Fransisco Bay area (Cervero & Landis, 1992); London and other large British cities (Dasgupta, 1994); the Dutch Randstadt area (Schwanen et al., 2001); Atlanta and Boston (Yang, 2005); and Paris (Aguilera et al., 2009), Oslo (Næss & Sandberg, 1996), Trondheim (Strømmen, 2001) and Copenhagen (Hartoft-Nielsen, 2001b; Næss, 2007). Several studies also show that job decentralization from inner to outer parts of cities and metropolitan areas usually does not contribute to reducing average commuting distances (Næss & Sandberg, 1996; Hartoft-Nielsen, 2001b; Næss, 2007; Strømmen, 2001; Cervero & Landis, 1992; Yang, 2005; Aguilera et al., 2009). Admittedly, according to some studies employment decentralization has reduced commuting times (Gordon et al., 1991; Cervero & Landis, 1992; Giuliano & Small, 1993). This has, however, mostly to do with the generally higher shares of fast modes of travel and higher driving speeds in the suburbs than in the inner city. | Accepted: We recognize that location aspect is important .. we have address location aspects from urban form, spatial planning and land value capture viewpoints here. Given there are separate chapters in WGIII on buildings and transportation, we have limited our discussions here. |
| 17188 | 12 | | | | | It is an serious shortcoming of the existing text that the influence of the location of dwellings and workplaces relative to the city center is not mentioned. This must be corrected. | Accepted: Some discussions on location aspects are added in 12.6.4. Discussed |
| 3655 | 12 | | | | | What does the line express specifically? | Noted: The fitted curve, that shows relationship of x and y axis parameters |
| 15459 | 12 | | | | | The following work may be referred to: Bulkeley, H. and Betsill, M., 2003, Cities and Climate Change: Urban Sustainability and Global Environmental Governance. London, UK: Routledge. The influential work of Roger Keil on Networked Disease may also be incorporated in this chapter. Census reports in countries with large urban populations in India and other parts of Asia, show that small towns are growing rapidly and contribute both to emissions, as well as to other forms of pollution, with scarcely any thought for mitigation strategies. A small section on metropolitan cities vis a vis rapid urban growth in hitherto rural hinterlands may be useful. The smaller towns pose many new challenges which are not captured by a 'metrocentric' understanding of urbanization and human settlements. | Noted: the publication is referred.12.2 discussed cities by population size |
| 15505 | 12 | | | | | (Whole Chapter) Almost everything is covered. May be reinforcing link with on going global initiative could be interesting (such as the Green economy, Sustainable cities numerous on-going initiatives, Resource efficient cities). The lock in effect (as well as for the buildings sector) needs also to be underlined. Failure to reduce Cities footprint would consume time and money for predictable poor results. The point now is to transform constraints into opportunities. | Accepted: The related aspect has been discussed in several sections in the revised report. |
| 18852 | 12 | | | | | Detail in what regard the figures would be different (see last sentence). | Accepted: Text is rewritten. We will look at it further in next round to make sure that we provide a balanced picture. This |
| 18824 | 12 | | | | | Clarify where the categories in this table are coming from. Has this come out of your synthesis or are these categories suggested in Blanco (2011)? | Noted: The table in deleted in rewriting of this section and therefore the |
| 18825 | 12 | | | | | Row "Urban Growth Boundaries": Please have a look for further examples, as this is just one from one US state. The Flächennutzungspläne (land development plans) in Germany are another example being practices since decades. | Noted: The table in deleted in rewriting of this section and therefore the comment is no more relevant. |
| 18826 | 12 | | | | | If also the last 2 columns are based on the publications cited in column 2 then make this clear by e.g. having the references in an extra column at the very end (or to save space have footnotes in such a column and the references below the table). | Noted: The table in deleted in rewriting of this section and therefore the comment is no more relevant. |
| 18841 | 12 | | | | | Make this more concise, e.g. by having a bulleted list of the type of plans and have city names and references just as running text in brackets within the respective bullet points. Delete the names of the plans as they can be found via the references and do not add any relevant information. | Noted: The table in deleted in rewriting of this section and therefore the comment is no more relevant. |
| 18842 | 12 | | | | | Synthesize with other information in the chapter. | Noted: The table in deleted in rewriting of this section and therefore the |

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| 18843 | 12 | | | | | Synthesize with other information in the chapter. | Noted: The table in deleted in rewriting of this section and therefore the |
| 18844 | 12 | | | | | Synthesize with other information in the chapter. | Noted: The table in deleted in rewriting of this section and therefore the |
| 18845 | 12 | | | | | Also this table, though covering more information, should be synthesized with other information in the chapter. | Noted: The table in deleted in rewriting of this section and therefore the |
| 18796 | 12 | | | | | If possible mark the (estimated) share of urban for each of the sectors. Make clear that the right is enlargement of the indursty slice on the left (if I am not mistaken). See examples for that in IPCC SRREN Chapter 1 Figure 1.10. (As the graphic designer can do this in the end, for now it is sufficient for you to just somehow indicate the relationship.) | Noted: The figure is deleted. |
| 18809 | 12 | | | | | Does data exists to produce another FIGURE that compares ranges of construction emissions (e.g. of buildings or transport infrastructure) with operataions' emissions? | Noted: The figure is deleted. The section is rewritten |
| 18838 | 12 | | | | | The figure should be removed as it is giving absolute numbers for the mitigation potential of a random number of cities and no information can be drawn from it. The 36% discussed in the text are meaningful. Maybe giving percentages in the figure could be a solution. | Taken into account: Removed |
| 18849 | 12 | | | | | The figure is unclear. The arrows in the lower part I do not understand and they should be labelled. The top part should be explained and the border conditions should be specified (the figure is btw not referenced in the text), e.g. that this while hte green path is about aggregated effects the red part is about marginal effects. Though there should be more figures in this chapter I suggest to delete this one and rather explain what you want to convey in the text as the figure seems to be too reductionist (at least as it is now). | Taken into account: Figure removed in section rewriting |
| 18801 | 12 | | | | | Given the logic "small country" -> "can produce less"/"more secialized" -> "imports more" the figures confirm the common sense. Are they relevant for anything that you want to say here? If this should stay, please also have the figure with linear scale as this will improve accessibility to a wider audience. | Accepted. Removed figure. |
| 17286 | 12 | | 14 | | 16 | here it's better specify what kind of difficulties you find ,as for example life cycle analysis applications | Taken into account: The text is deleted |
| 17287 | 12 | | 41 | | 42 | it's occur some citations of accreditated studies and assessments already done. | Taken into account: The text is deleted |
| 5995 | 12 | | | | | There is no common framework or concept visible for the whole chapter. Definitions and terms are used in a variety of different meanings, often definitions are missing. There is few reference to theoretical frameworks in this chapter, and those reference that are made are inconsistent. Overall, this leads to a missing logical structure of the whole chapter. | Taken into account: The chapter has neen reframed and re-written as SOD as much as possible. Changing chapter sections completely is not an easy |
| 5996 | 12 | | | | | Many statements are far too general although urban trends differ highly between different world regions and types of urbanity. There is no structure for a reasonable analysis of these differences that would allow an actual comparison and assessment of climate change mitigation strategies and opportunities. Why didn't you classify a number of different classical types of urban areas or trends? Overall, this leads to an unequal distribution of examples which obviously is mainly dependet on the authors' personal or professional context. This is insufficient for a global report on climate change. | Accepted: The chapter has been reframed and rewritten. |
| 6027 | 12 | | | | | Regarding chapter whole 12:<br>There is no common framework or concept visible for the whole chapter. Definitions and terms are used in a variety of different meanings, often definitions are missing. There is few reference to theoretical frameworks in this chapter, and those reference that are made are inconsistent. Overall, this leads to a missing logical structure of the whole chapter. | Accepted: The chapter has been reframed and rewritten. |

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| 6028 | 12 | | | | | Regarding chapter whole 12:<br>There is no common framework or concept visible for the whole chapter. Definitions and terms are used in a variety of different meanings, often definitions are missing. There is few reference to theoretical frameworks in this chapter, and those reference that are made are inconsistent. Overall, this leads to a missing logical structure of the whole chapter. | Accepted: The chapter has been reframed and rewritten. |
| 5974 | 12 | | | | | You do not mention urban governance and institutions! You do not show the linkages between the three aspects of the section title. Delete this and refer to chapter 12.6! | Taken into account: This whole section is rewritten |
| 5178 | 12 | | | | | The Section fails to inform that there exists a resolution by the IPCC to establish a general International Standard for Determining Greenhouse Gas Emissions for Cities (IPCC, 2010)<br><br>Reference:<br><br>IPCC – Intergovernmental Panel on Climate Change (2010). International Standard for Determining Greenhouse Gas Emissions for Cities. Version 2.1, June 2010.<br>Available at: http://www.unep.org/urban_environment/PDFs/InternationalStd-GHG.pdf. | Accepted: We have rewritten chapter and we are not sure about its need to mention.. But we will consider again this is next round. |
| 16651 | 12 | | | | | Section needs references | Accepted: But who section is rewritten and this comment is no more relevant |
| 5723 | 12 | | | | | The Chapter authors are to be commended for their recognition of the literature on the advantages of polycentricity over monocentricity of urban form. Note the suggestion by Peter Gordon in “Thinking About Economic Growth: Cities, Networks, Creativity and Supply Chains for Ideas” (2012 – Annals of Regional Science) that “dispersal” has proceeded beyond “polycentricity” and still seems likely to be associated with gains in productivity. William Wheaton (2002) “Commuting, Ricardian Rent, and Housing Price Appreciation in Cities with Dispersed Employment and Mixed Land Use” finds a trend to steady flattening of urban land rent curves as land use becomes increasingly mixed. One of the advantages of this is, that “price” represents a less and less frequently encountered barrier to households locating closer to any particular job or urban amenity. This is in contrast to the very severe price rationing and locational “pricing out” effect in heavily-planned cities. | Accepted: The who chapter is rewrittent and the density argument have been made more balanced. |
| 18792 | 12 | | | | | The tele-working part is not relevant for this argumentation and should be moved. | Noted: the text to which comment was made was deleted in subsequent |

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| 5724 | 12 | | | | | The Chapter authors are to be commended for this observation. Neutral networks also have the advantage that the direction of travel in which roads are utilized during each distinct travel demand period, is less distinctly “one way”. This also reduces the likelihood of congestion. A significant element of the "iron law of urban dispersion" is that when the increased traffic burden consequent on increased demand (whether “planned” or natural) results in once free-flowing roads becoming "stop-start", the congestion delay that results is exponential, not linear. In fact, the number of cars transiting the road network over the crucial time periods is reduced even as the numbers of vehicles attempting to travel has increased. And “spill-back” slows the rate of travel over more and more of the network.<br><br>Once a given node of the urban area is effectively accessible by fewer vehicles at the crucial times of day (ironically because more vehicles are trying to get there) the incentive for urban activity to relocate elsewhere also increases exponentially. “Mode shift” does not compensate for this because traffic is “induced” just as effectively by mode shift as by capacity expansion (Anthony Downs’ law of triple convergence).<br>In a neutral network with dispersed patterns of travel, any road capacity expansion is far more effective because the percentage increase in capacity is greater when adding a lane to a single existing one, or to an existing pair or trio, than in the fruitless adding of a lane or two to a radial highway that already has 8, 10, or more lanes. It is radial highway planning that has “failed”, not “automobility” per se. □ | The text to which comment was made was deleted in subsequent rewriting and no more relevant. Connectivity and accessibility are discussed in 12.4. Detailed discussion of transportation planning is appropriate for the transport chapter. |
| 18793 | 12 | | | | | Not one reference. | Accepted: the text to which comment was made was deleted in subsequent rewriting and no more relevant but this |
| 18795 | 12 | | | | | Not one reference. | Noted: the text to which comment was made was deleted in subsequent |
| 16653 | 12 | | | | | This section is too brief. See previous comment about land use and built environment policies in different parts of the world. “Transit-oriented development” is a US-centric idea. | Noted: the text to which comment was made was deleted in subsequent |
| 2514 | 12 | | | | | This section was the hardest to understand as it is so fragmented and repetitive - this could be cut extensively - the focus on carbon is missing | Taken into account: Noted: The whole section is rewritten. |
| 16654 | 12 | | | | | First paragraph (like other meta-commentary on the chapter) could be omitted. | Taken into account: Done in 12.3 in SOD |
| 5179 | 12 | | | | | In Section 12.4.3 there are 12 sectoral mitigation opportunities listed and presented in Table 12,1, The meaning of the intensity of colours is not explained. | Taken into account: Explanation of the color code will be added in table which |
| 18954 | 12 | | | | | Section 12.4 should focus on system aspects and should not cover what is already contained in other sections or all mitigation options are listed in this section for the first time and referenced from other sections. This will also allow other sections (and possibly chapters) to incorporate numbers with a systems perspective. For section 12.4.1 it would be good to give estimates, possibly develop rough scenarios (or back of the envelope calculations) giving estimates for total emissions of the to-be-constructed building stock. This has the potential to be one of the key messages of the chapter. In case space is an issue then we suggest shortening the conceptual part of this section. | Accepted: These issues are serously taken into acount while rewriting and reframing of chapter in SOD. The revised chapter had addressed these comments. |
| 16655 | 12 | | | | | Describe the different kinds of infrastructure. The language about the systemic view and about socio-metabolic systems (p 15 line 44 to p 6 line 11) is not concrete or specific and could be omitted. | Taken into account: the text to which comment was made was deleted in subsequent rewriting and no more relevant. We have expanded disucssions |
| 3654 | 12 | | | | | What is the consequence of these linkages for climate change mitigation and adaptation policies and measures? Please elaborate or present a link to a subsequent chapter. | Accepted: the text to which comment was made was deleted in subsequent rewriting but we have improved these |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11320 | 12 | | | | | Worth noting here that for the moment, there is no agreement on what an 'urban system' is. Ie. there are many definitions, models, and descriptions all of which are context specific (topical in other words) but nothing robust enough to generate consensus on a multi-topical definition. | Noted: The text to which comment was made was deleted in subsequent rewriting and no more relevant |
| 16657 | 12 | | | | | The authors are peddling a term called “urban metabolism” and make several statements about the sort of research that is better or worse to do. This takes up space. Better to omit all mention of this and simply cite and explain the results of the best studies, and cite and describe the problems with other studies. | Noted: The text to which comment was made was deleted in subsequent rewriting and no more relevant. |
| 16660 | 12 | | | | | 12.4.3.1 – repetition of material appearing here with material appearing in an earlier section. Consolidate. (Earlier in the chapter, should distinguish the various pathways of GHG production and how they relate to settlement patterns, built environment policies, etc (e.g., VMT, home energy consumption, embodied GHGs in goods). | Noted: The text to which comment was made was deleted in subsequent rewriting and no more relevant. |
| 18814 | 12 | | | | | Make Ch.11 aware that you are having this section as there might be overlaps | Accepted |
| 18818 | 12 | | | | | Link to Ch.10 | Accepted: Cross referenced, see SOD |
| 18820 | 12 | | | | | Link to Ch.11 Section 11.3.2 and - I suggest - only cover aspects particular to urban here | Accepted: Coss referencing with other chapters will be in next round looking at |
| 16661 | 12 | | | | | 12.4.3.2 et seq. – More repetition, as above. | Noted: The text to which comment was made was deleted in subsequent |
| 18570 | 12 | | | | | 2. Improve reviewing aspect:<br>There are whole paragraphs that contain bold claims without a single reference (e.g. 12.4.3.7. 2nd and 3rd paragraph). | Noted: The text to which comment was made was deleted in subsequent rewriting and reframing and no more |
| 18804 | 12 | | | | | Link to Ch.9 and reduce length | Noted: The text to which comment was made was deleted in subsequent |
| 18806 | 12 | | | | | add link to emissions of concrete over their lifetime (Luisa Cabeza of Ch.9 has sth. on that - will probably be in SOD Ch.9 - so you can link that) | Noted: The text to which comment was made was deleted in subsequent |
| 18807 | 12 | | | | | Link to Ch.8, clarify which chapter goes into detail and which references and keeps it short | Noted: The text to which comment was made was deleted in subsequent |
| 18811 | 12 | | | | | Link to Ch.7, possible reduce content | Taken into account in revised texts in |
| 2520 | 12 | | | | | This is much better presented than 12.4 | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5180 | 12 | | | | | In Table 12.2 Section 15 implementation tools are listed, But there is no information on how much theses policies contribute to GHG mitigation. Moreover, with one exception, development fees, the most important policies, fiscal measures, such as property taxes or subsidies or loans, e.g. for retrofitting of buildings, or fuel taxes or cordon charges, are not addressed here but separately in Section 12.6.<br><br>This is disappointing as there exists a great volume of research assessing the likely impacts of urban planning policies, including fiscal measures, in different metropolitan areas in developed and developing countries with the help of integrated urban land-use, transport and environment models. Worldwide overviews of current models are Wegener (2004) and Hunt et al. (2005). The results of EU-funded modelling studies on European cities are Lautso et al. (2004), Fiorello et al. (2006) and Marshall and Banister (2007).<br><br>By simulating a large number of scenarios, forecasting models can be used for backcasting, i.e. for telling decision makers what types of policies are required to achieve predefined targets (Hickman and Banister, 2007). Another major advantage of these modelling studies is that they predict the positive and negative synergies between different policies. One example is that land use planning measures aiming at higher-density mixed-use urban land use are much more effective in reducing car traffic when they are supported by fiscal policies making car traffic more expensive and accompanying improvements in public transport. Therefore the sentence “A reduction in motorized transport can be achieved without limiting mobility and accessibility” (p. 30) does not reflect reality.<br><br>References:<br>Hickman, R. and D. Banister (2007). Looking over the horizon: transport and reduced CO2 emissions in the UK by 2030. Transport Policy, 14, 377-387.<br><br>Hunt, J.D., E.J. Miller and D.S. Kriger (2005). Current operational urban land-use transport modeling frameworks. Transport Reviews, Vol. 25, No. 3, May, 2005, pp. 329-376.<br><br>Fiorello D., G. Huismans, E. López, C. Marques, T. Steenberghen, M. Wegener, G. Zografos (2006). Transport strategies under the scarcity of energy supply. STEPs Final Report, edited by A. Monzon and A. Nuijten. The Hague: Buck Consultants International. Available at: http://www.steps-eu.com/reports.htm.<br><br>Lautso K., K. Spiekermann, M. Wegener, I. Sheppard, P. Steadman, A. Martino, R. Domingo and S. Gayda (2004). PROPOLIS: Planning and research of policies for land use and transport for increasing urban sustainability. PROPOLIS Final Report. Helsinki: LT Consultants. Available at: http://www.ltcon.fi/propolis/.<br><br>Marshall, S. and D. Banister, (Eds.): Land Use and Transport. European Research towards Integrated Policies. London: Elsevier,<br><br>Wegener, M. (2004): Oveview of land-use transport models. In: Hensher, D.A., Button, K.J. (Hg.): Transport | Noted: But generally such literature linking whole urban area GHG is very limited, these literatures are mostly on land-use and transportation. |
| 18821 | 12 | | | | | Link to Chapters 8, 9, 11 | Accepted: Since we rewrote chapter, we will do such cross-referencing in next round after we see SOD of other |
| 18940 | 12 | | | | | Section 12.5 stays too much on the conceptual level. More reference are needed and results, best quantified. | Taken into account: The whole section is re-written and is far refined. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16662 | 12 | | | | | 12.5.1. There are in this section more strong claims about the efficacy of “integrated spatial planning.” Selling this concept is a distraction from the chapter and could be omitted or at least drastically shortened. The concept of integrated planning is as old as the hills, and the main concern is to give specific examples of policies that hold promise, not to wax poetic about the virtues of integration. The specific studies that ARE cited here are repetitive of main points made earlier and those articles should be integrated into those sections. The section comes across as advocating rather than a subjective account. | Accepted: The section is rewritten but will be further looked to make it balanced. |
| 2522 | 12 | | | | | This Section on Governance is important - it can again be shortened - with a stronger ending that leads into Section 12.7 - that much of the action is taking place at the city and city regional levels | Taken into account: Rewritten, very much shortened, and streamlined |
| 16664 | 12 | | | | | Sections 12.6 and 12.7 – I don’t know whether these sections assist in what I understand to be the main purpose of the chapter. | Noted: Both sections 12.6 and 12.7 are reframed and rewritten |
| 18829 | 12 | | | | | This first paragraphs of this section are not specific to Ch.12 and should be covered in 15.2.4 and referenced from here. The lower part of this section should become "12.6.1.1 NGOs" and the current 12.6.1.1 should become 12.6.1.2 | Taken into account: As suggested, the first two paragraphs of this section have been deleted. The next paragraph has been moved to a new section 12.6.1.1 |
| 16343 | 12 | | | | | An example of a civil society approach to implementing sustainable development paths based on limit to resources and equity is "one planet living" One Planet Communities (Desai, 2009) http://www.amazon.co.uk/One-Planet-Communities-Sustainable-Living/dp/0470715464/ref=ntt_at_ep_dpi_1 http://www.bioregional.com/oneplanetliving/what-is-one-planet-living/ | Noted: This is a nice example but does not seem really "civil society" driven, rather more driven by architects and planners, and perhaps belongs more |
| 18830 | 12 | | | | | In my view the informal sector should not be discssed here but in other sections of the report (e.g. informal sector in waste in Ch.10) | Noted: The text to which comment was made was deleted in subsequent rewriting and reframing and no more relevant.It would not be fair to discuss civil society organizations in 12.6.1 and completely omit discussion of the often |
| 18831 | 12 | | | | | Link to Ch.15 | Noted: The text to which comment was made was deleted in subsequent |
| 18832 | 12 | | | | | First paragraph is too much US focussed; in general I would expect that there is more literature that could be synthesized here. | Noted: The text to which comment was made was deleted in subsequent |
| 18833 | 12 | | | | | Rather than focussing on institutions and reduction plans (with no information whether these will be met) the focus should be on what the institutions have achieved and what actions/policies can be derived from that. | Noted: The text to which comment was made was deleted in subsequent |
| 18836 | 12 | | | | | This section has overlaps with the first paragraph of 12.7.1 | Noted: The text to which comment was made was deleted in subsequent |
| 5527 | 12 | | | | | One thing that is critical here for developing countries is appropriate infrastructure development. Here my knowledge base centers on waste management and options for decentralized versus centralized systems merit discussion | Noted: This section is rewritten completely. |
| 2533 | 12 | | | | | This Section again needs to be rethought as it seems to be rather bits and pieces with no common themes - the linkages with the previous sections is missing - there is no reflection and it is again very much based on the experience in selected developed cities - Tokyo, London, LA and Chicago - needs some balancing of examples | Accepted: The section is rewritten. |
| 3656 | 12 | | | | | Eventually reduce the number of examples to save space. | Noted: The section is rewritten |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5181 | 12 | | | | | In Section 12.7 urban climate change mitigation plans are discussed. The section presents an impressive number of climate action plans with ambitious GHG reduction targets all over the world and a great variety of approaches and strategies and their linkage with adaptation, other sectoral benefits and tradeoffs. However, in no case the actual experience with these plans and strategies in terms of actually achieved GHG reductions is presented.<br><br>This is again disappointing because despite the lack of a generally accepted measure of urban GHG emissions, there exists a substantial literature on recent trends in GHG emissions of cities (Economist Intelligence Unit, 2009; European Environment Agency, 2006, p. 30; Kamal-Chaoui and Robert, 2009, p. 45; Brown et al., 2008). In developed countries the overall trend is that cities in general have been able to reduce the GHG emissions, but few of them enough to achieve their reduction targets. In North America many cities have continued to increase their GHG emissions (Brown et al. 2008, p.20). Without massive subsidies, retrofitting of buildings is sluggish, and more energy-efficient cars lead to the rebound effect of buying larger cars. The conclusion is that increased efforts will be necessary if the targets are to be achieved (GVA Grimley Ltd., 2011). In emerging or developing countries the rapid increase of middle-class and higher-income households who want to adopt the lifestyles of developed countries leads to fast growth in motorisation, construction and related GHG emissions. The worldwide prospects to achieve the GHG reduction targets of cities are therefore rather poor. This realistic view should be reflected in the Assessment Report.<br><br>References<br><br>Brown M., F. Southworth, and A. Sarzynski (2008). Shrinking the Carbon Footprint of Metropolitan America. Brookings Institution, Washington DC. Available at: http://www.brookings.edu/research/reports/2008/05/carbon-footprint-sarzynski.<br><br>Economist Intelligence Unit (2009). European Green City Index. London: Siemens AG. Available at: http://www.siemens.com/entry/cc/features/urbanization_development/all/en/pdf/ report_en.pdf.<br><br>European Environment Agency (2006). Urban Sprawl in Europe: The Ignored Challenge. Copenhagen: EEA. Available at: http://www.eea.europa.eu/publications/eea_report_2006_ 10.<br><br>GVA Grimley Ltd. (2011). Emission Impossible: Can Cities Deliver on their Carbon Reduction Targets? London: GVA. Available at: http://www.gva.co.uk/WorkArea/DownloadAsset.aspx? id=4294970300.<br><br>Kamal-Chaoui, L. and A. Robert (eds.) (2009). Competitive Cities and Climate Change, OECD Regional Development Working Papers N° 2. Paris: OECD publishing.<br>Available at: http://www.oecd.org/gov/regionaldevelopment/44232251.pdf. | Taken into account: 12.7.4 in SOD has addressed implentation issues and the plan implemnetation has been slow. The section 12.7 has been completely rewritten and is more balanced. |
| 18941 | 12 | | | | | This section is far too detailed and lacks any synthesis. It also does not link to previous sections and does not show how the different aspects detailed in the previous sections are (best) combined. One first step forward would be to have a matrix that details mitigation options (or components of a mitigation strategy) on one axis and example projects on the other axis, ideally supplemented by numbers of reductions achieved. Alternatively, different options could be listed including summarized experiences. – In general, the focus of the chapter should be detailing experiences rather than project descriptions. | Taken into account: The section is completely rewritten. |
| 18950 | 12 | | | | | Section 12.7 needs to reference previous sections. | Noted |
| 18835 | 12 | | | | | The first paragraph overlaps with Section 12.6.4 | Noted: The text to which comment was made was deleted in subsequent |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2549 | 12 | | | | | Needs better geographical balance | Noted: The text to which comment was made was deleted in subsequent rewriting and reframing and no more |
| 18949 | 12 | | | | | The difference between Sections 12.7.2 and 12.7.3 does not become clear from the content. 12.7.2 should be structured so that it synthesizes previous experiences in such a manner that information concerning the respective contribution to mitigation can be presented. | Noted: The section to which comment was made was rewritten in subsequent rewriting and reframing and no more |
| 2550 | 12 | | | | | Fuel decarbonization not cited here (biofuels for transport, solar systems etc) | Noted: The section to which comment was made was rewritten in subsequent rewriting and reframing and no more relevant. See table 12.12 in SOD which |
| 18004 | 12 | | | | | The use of the term trade-off (to describe adverse side-effects) is inconsistent with the agreements made in Wellington (p.35) whereby the term 'trade-off' might convey the impression "that a balancing of positive and negative side-effects of mitigation measures is being carried out... Such decision-making aspects" should be left to the policy chapters. Please liaise with the other chapters during the cross-cutting meeting to ensure consistent usage of the relevant terms across chapters. Since the term also shows up in the first-level heading, a potential change to achieve consistency across chapters needs to be discussed with the TSU. | Noted: Needs to be looked into once again in the next round in view of current SOD text here |
| 18848 | 12 | | | | | Link to Ch.4 | Accepted: All cross referencing with other chapters will be in next round |
| 18851 | 12 | | | | | Link to Ch.9 and WG II - initiate a process to decide where the main location of WG III AR5 will be to discuss UHI. | Accepted: All cross referencing with other chapters will be in next round |
| 15753 | 12 | | | | | Knowledge gaps should be identified and detailed out further as it would lead to better understanding of the current status of efforts taken for climate change. This could be done based on variety of geographic regions. | Taken into account: The text is rewritten |
| 3350 | 12 | | | | | crossreference to 8.4.2.2; note: 8.4.2.2 is likely to be further shortened and will crossreference to 12.2.3.1. | Noted: The text to which comment was made was deleted in subsequent |
| 3351 | 12 | | | | | Can examples be given for this? How relevant of a phenomenon is this? What are the implications in terms of GHG emissions? | Noted: The comments is not clear but texts in this subsection are deleted and |
| 3352 | 12 | | | | | policnentricity, economic activity, mixed use and telecommuting are all put into a singe paragraph. This is highly confusing. These are distinct features. | Noted: This seems to be comment on section 12.3.2.3.. The text is deleted and |
| 3353 | 12 | | | | | TOD --> see also 8.10 | Noted: The text is deleted and comment not valid.. But TOD is discussed in more |
| 3355 | 12 | | | | | This section has considerable overlap with 12.2.3.1. Possibility for a merger. | noted: must be 12.3.2.1 .. Not 12.2.3.1.. But both sections are rewritten.. And |
| 3356 | 12 | | | | | Delete, refer to 12.3, or the other way around | Taken into account:The chapter is reframed and rewritten and such |
| 3358 | 12 | | | | | Some redundancy with previous sections. Can be shortenend. | Taken into account: The texts are rewritten in prevoius sections. |
| 17285 | 12 | | 4 | | 5 | Urban areas generate more than 90% of global economy: I think it's useful specify more how it's possible to confirm that important issue,what are the references and indicators,because it's not convincing enough | Taken into account: The text is deleted in the revision. |
| 17303 | 12 | 0 | | | | The topics of (urban) human settlements, cities and local/regional governments in Chapters 12 and 15.8 need a clearer overall structure. It would be useful to make a clear distinction between human settlements and urban agglomerations on one side, regarding their physical characteristics, and local governments on the other side, regarding their political characteristics and their role within a multi-level setting. | Taken into account: The chapter is reframed and these distinctions (humand settlemtn and urban area) are clearer now. The role of multilevel governance is already in the text but, in revised chapter-framing and the |

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| 17305 | 12 | 0 | | | | The experiences of local governments and their networks as provided in chapter 12.6.2 and 12.7. nearly completely fails to capture the experiences of local governments in Europe, and networks such as theh Climate Alliance (www.climatealliance.eu) who started to commit to mitigation targets and actions already in 1990. | Taken into account: the section this comment refers to got deleted in the rewrite of the chapter for the SOD - the comment is no longer applicable. Hoever, the essence of European |
| 17325 | 12 | 0 | | | | With a view to cities, there is a study on the gender dimension of local climate policy:<br>Alber, Gotelind: "Gender, Cities and Climate Change", Thematic report prepared for the Global Report on Human Settlements 2011, available at<br>http://www.unhabitat.org/downloads/docs/GRHS2011/GRHS2011ThematicStudyGender.pdf | Noted: but less relevant |
| 16643 | 12 | 0 | | | | I appreciate the authors' efforts and recognize the challenge of writing a far-reaching chapter. My comments are critical but intended to be helpful. | Noted |
| 16644 | 12 | 0 | | | | There is language throughout the chapter making somewhat imprecise claims about the causality of urban form and settlements upon energy use. Phrases like "the impact of urbanization" do not acknowledge the fact that increasing productivity and urbanization are inextricable and that urbanization by itself is likely more mitgative of climate change than causing of it, when controlling for economic growth. Economic growth is the more properly understood cause of GHGs. The fact that urban areas contribute a large and growing share of GHGs does not mean that they are a cause of GHGs.<br><br>I would like to see a much more clearly organized set of concepts and to have those laid out from the beginning. List the relevant different aspects of urbanization and of urban settlement patterns (e.g., compactness of urban form, how the pace of urbanization affects GHGs, water-energy-carbon linkages). Then discuss the possible mitigation policies that can affect urban settlement patterns and infrastructure (e.g., urban containment policies, parking policies, transportation investment plans, organization and regulation of water and energy infrastructure). List and describe the accounting issues, but do so briefly and secondary to this main purpose (e.g., LCA, units of analysis, production versus consumption side allocation).<br><br>It is difficult to understand the purpose of many of the sections of the report, such as page 9, section 12.2.3.1, “rate, scale, and location”. The chapter seems like a loosely organized set of comments than a focused treatment of aspects of urbanization that affect GHGs differentially depending on selected explained characteristics. It also seems like an academic literature review discussing methods and pointing out uncertainty, which is not the primary purpose of this chapter—that purpose is to summarize the state of knowledge.<br><br>I stopped making detailed comments on page 25, but note a great deal of repetition of key concepts from section to section that could be collected in one place; a lack of a clear organization; the need to cite the basic evidence up front rather than burying it from section to section; and the need to be careful about making strong claims about how settlement patterns and infrastructure “cause” GHGs. | Noted: The chapter has gone through massive change from FOD, its is reframed and rewritten and we hope that it is clearer now. |
| 18023 | 12 | 0 | | | | The terms compact, sprawl, unplanned, settlements are not clearly defined. They can have different meaning in different countries. For example, a settlement that is considered low density in Europe would be considered as compact in the USA. Some quantification would be useful such as a density ranges and settlement sizes to have a global definition of compactness and settlement types. | Taken into account: The use of the terms have been paid attention and streamlined as much as possible in restructured SOD |

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| 18024 | 12 | 0 | | | | A lot of the analysis is based on general and selective comparisons such as one country has higher densities and lower GHG emissions than another, therefore higher density causes lower GHG emissions etc. However, there are many other reasons for differences between the energy use and efficiency of countries such as climate, cultural, building standards, and fuel costs relative to incomes. Broad comparisons between cities are not sufficient to show causation. | Accepted: The chapter is reframred and rewritten, we have paid attentions to these issues as much as we could. See 12.4.2 in SOD and revised texts of 12.4 |
| 18025 | 12 | 0 | | | | The text tends to focus on the density and compactness of cities even though it acknowledges that a large proportion of the urban population live in towns and smaller settlements and broader an more balanced consideration of settlement types would be helpful. | Accepted: We hope revised text is more balanced. |
| 18026 | 12 | 0 | | | | The text is generally written from the perspective of promoting compaction. For example 'compact or compactness' is mentioned 26 times usually in a favourable light. Alternatives to compaction are described as 'unplanned' or 'sprawl' usually in an unfavourable context. It would be useful to have some unbiased assessment of the potential for planned towns and settlements. As people become wealthier many will want more space and a greener living environment rather than live in large dense cities. | Noted: We have tried to be balanced in revised texts of the chapter. |
| 18027 | 12 | 0 | | | | Words such as 'strong' or 'significant' are often used without quantification | Noted |
| 18033 | 12 | 0 | | | | My general conclusion from the chapter is that spatial planning is a very slow way of impacting on climate mitigation in developed countries but it is very important in developing countries where the rate of urbanisation is much higher. In developed countries the infrastructure investment, vehicle and building technologies and demand management measures can have a bigger impact than spatial planning. The appropriate mix of investment, technologies and demand management is likely to vary according to settlement size and densities. The primarily role of planners is to create successful communities with a good quality of life. The mix of measures to mitigate climate change should be chosen to be appropriate to the planning of these communities rather than vice versa. | Noted: We believe that the tone in the revised chapter is that the opportunities are different in different type of settlements including existing and new settlemnts |
| 15747 | 12 | 0 | | | | The chapter addresses to the complexities of emission measurements in terms of scale. It analyses various asects of settlement planning and management concerning carbon emission. There is lot of repetition in sections concerning urban form, compact city, transport, mitigation possibilities, etc. Some concepts like compact city, mixed use pattern should be discussed differently in the context of developed and developing cities. Cities in developing countries have different DNA. Cities in developing countries have much higher densities and extremely poor infrastructural base than their counterpart in the developed countries. Application of compact city concept requires good infrastructural support. The chapter 12 needs to address to this differenciation and propose the mitigation policies accordingly. Sustainable neighbourhood is considered to be the unit of low carbon city concept but the chapter 12 does not discuss the concept. Chapter 12 has lot of repetition. The removal of repetition can help reduce the length of chapter 12. Urban context in the developing countries requires urgent attention. The chapter 12 gives more emphasis to cities in developed world. | Noted: We have rewritten entire text with these issues into consideration. We hope we are more balanced and have cut many redundencies in revised text. |
| 13242 | 12 | 0 | | | | Montgomery 2008 is quoted to put emphasize on the complexity of international comparison (varying boundaries for cities), which is right and useful to say. However it is not used later on : from the next sentence on, this remark has no effect on the discourse. We suggest to suppress that reference or to give clear examples on how this can affect the subsequent discussion. | Noted: the section this comment refers to got deleted in the rewrite of the chapter for the SOD - the comment is no longer applicable. |
| 18656 | 12 | 0 | | | | A general description and reasoning about urbanisation | Noted |
| 18657 | 12 | 0 | | | | Very little/nothing on infrastructures (and what role different approaches could play) | Accepted: In SOD discussion on infrastructure is scaled up.see 12.4 |
| 18658 | 12 | 0 | | | | “Strong political leadership is key”, true but what is the implication?<br>Very little on how different parts can/will/must interact | Noted: the section this comment refers to got deleted in the rewrite of the chapter for the SOD - the comment is no |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11319 | 12 | 0 | | | | The chapter emphasizes issues but should provide more solutions. It is suggested to move up the point that there are neither agreed common methodologies for urban GHG emissions, nor an agreed framework for estimating emissions for cities, from section 12.2.3.2 to the beginning of the chapter; this basic point sets the stage for the rest of the chapter. Also notably, the linkage between adaptation and mitigation is not made anywhere in this chapter. There is only one use of this concept, in relation to a case study in Dhaka. A bit of an oversight considering adaptation is a tool often used to integrate mitigation programming. | Noted: the section this comment refers to got deleted in the rewrite of the chapter for the SOD - the comment is no longer applicable. However, there are adptation links mentioned in many places, please see 12.8 section. |
| 10400 | 12 | 0 | | | | The number of the tables and figures in this chapter should be reordered. | Taken into account: Re-ordered |
| 18565 | 12 | 0 | | | | Having been in the writing team of the GEA urbanization chapter I am very well aware how difficult it is to come up with a literature based assessment for the mitigation potential of human settlements given the scattered and partly incommensurable evidence. Nonetheless there is a lot of room for improvement here. I have three main comments with some specifications each. | Noted |
| 18566 | 12 | 0 | | | | 1. The structure of the chapter is an enigma.<br>Cut subheadings to one third (it does not make sense to have subheadings followed by texts of just one sentence or one paragraph). | Accepted: The chapter is reframed and rewritten.While many subheadings are yet there, they are better presented. |
| 18567 | 12 | 0 | | | | 1. The structure of the chapter is an enigma.<br>Delete redundancies within the chapter. Many topics appear more than once and seemingly unconnected. This is very confusing to read. Examples are: climate change mitigation, urban form, buildings, density, governance and institutions. | Accepted: The chaper is reframed and rewriten. Streamlining, connectedness and redundecncies are paid attention. |
| 18568 | 12 | 0 | | | | 1. The structure of the chapter is an enigma.<br>Develop a clear and comprehensible structure and make sure this is reflected in the subheadings. | Accepted: The chaper is reframed and rewriten. |
| 18569 | 12 | 0 | | | | 2. Improve reviewing aspect:<br>Redefine the scope of the chapter vis a vis the other chapters (especially chapters 8, 9, 14, 15, and 16) in WGIII. As it is now the claims expressed in the very first sentence of the introduction are continuously frustrated throughout the chapter. Also rural settlements are almost entirely neglected, so the title “human settlements” seems unjustified. | Accepted: The chaper is reframed and rewriten. Rural issues are also covered- See executive summary, 12.2.1, 12.3.1, 12.3.3 and others. |
| 18571 | 12 | 0 | | | | 2. Improve reviewing aspect:<br>Other references seem arbitrarily chosen, while important references are missing. Cross-checking with recent reviews and with assessment reports such as e.g. the Global Energy Assessment or the 2011 WBGU flagship report might help finding the relevant references. | Accepted: Reference is more balanced now |
| 18572 | 12 | 0 | | | | 2. Improve reviewing aspect:<br>There are whole paragraphs that contain bold claims without a single reference (e.g. 12.4.3.7. 2nd and 3rd paragraph). | Noted: The section this comment refers to got deleted in the rewrite of the chapter for the SOD - the comment is no |
| 18573 | 12 | 0 | | | | 3. Include an assessment:<br>Provide a quantitative assessment (a synopsis including a hierarchy), of mitigation potentials of human settlements in terms of (at least) technical potentials and costs. What would really make a difference and how much would it cost? Ideally feasibility of implementation is also included. | Accepted |
| 18574 | 12 | 0 | | | | 3. Include an assessment:<br>To this end it might be useful or even necessary to distinguish different types of settlements or world regions. | Accepted |
| 18575 | 12 | 0 | | | | 3. Include an assessment:<br>Ideally also synergies and possible trade-offs between mitigation and adaptation are addressed (possibly in cooperation with WGII). | Noted |

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| 18460 | 12 | 0 | | | | This draft is professional, interesting, and sometimes illuminating. The main issue is that, on reading through the draft, it often appears that the focus is on summarizing in considerable detail what is known about urban dynamics, well beyond clear connections with climate change mitigation. The best way to shorten the chapter for this IPCC assessment and add to its focus would probably be to review the text paragraph by paragraph, identifying sections where the connection with mitigation is either unclear or does not require so much information about how cities work – as contrasted with implications for GHG emissions and mitigation. But I would suggest to the authors that they save this draft as a starting point for another publication that is aimed at an urban management audience as well as a climate change response audience. Some of the material that won't make it into this WG III chapter because of space limitations is too good to waste – and might even be expanded somewhat in a subsequent book or monograph. | Noted: The SOD is reframed and rewritten. |
| 4215 | 12 | 0 | | | | These comments relative to infrastructure are provided here with recognition of their pertinence to chapters 7, 8, 9, and 10 which treat subsets of infrastructure. | Noted |
| 4216 | 12 | 0 | | | | Infrastructure (buildings, communications, energy, industrial facilities, transportation, waste, water and associated natural features) consists of constructed facilities that shelter and support most human activities. Infrastructure has a vital role in reduction of greenhouse gas emissions, which is the subject of WG III, and in measures to help society adapt economically, environmentally and socially to climate change, which is the subject of the contribution of WGII. The authors of AR5 will be challenged to treat infrastructure appropriately in both contributions without undue redundancy. | Taken into account: Infrastructure related discussions are scaled up substantially in SOD, please see 12.3.2, 12.3.4, 12.4 and others |
| 4217 | 12 | 0 | | | | Infrastructure systems affect human settlements for millennia (consider the ancient Roman road alignments still in service) and infrastructure elements typically have service lives of 50 to 100 years. This has benefits for mitigation of climate change, because of the enduring utility of the embodied energies, but challenges from: | Taken into account: Infrastructure related discussions are scaled up substantially in SOD, please see 12.3.2, |
| 4218 | 12 | 0 | | | | 1. The "lock in" effect of infrastructure systems constraining human settlements because of the economic, environmental and social costs of changing existing infrastructure. | Taken into account: Infrastructure related discussions are scaled up substantially in SOD, please see 12.3.2, |
| 4219 | 12 | 0 | | | | 2. The high costs of changing existing infrastructure systems to adapt to more extreme environments (resulting from climate change effects) that would render them dysfunctional or damaged, and/or the potentially higher costs to society of not adapting the infrastructure systems. | Rejected: Not directly relevant |
| 4220 | 12 | 0 | | | | Alex Gordon, while president of the Royal Institute of British Architects in 1972, addressed these issues by saying that buildings should exhibit: low cost, loose fit, and low energy (http://www.guardian.co.uk/news/1999/jul/29/guardianobituaries3). These qualities pertain to infrastructure systems in general. Infrastructure should be economically viable, adaptable to conditions that were not or could not be anticipated when they were designed and constructed, and produce small green house gas emissions in construction and use. | Noted: Added discussion of embodied emissions in infrastructure. |
| 4221 | 12 | 0 | | | | The chapter and report give substantial and appropriate attention to the knowledge bases in physical and social sciences and even states (e.g. 7.5.3) that they are adequate for mitigation of climate change through reduction of greenhouse gas emissions. However, the path from knowledge to successful implementation of greenhouse gas mitigating infrastructure must be addressed and made feasible. | Noted: Added discusssion on policies and implementation issues |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4222 | 12 | 0 | | | | The path is: knowledge > standards > regulations & practices > enforcement, approvals & implementation > infrastructure systems. In democracies, all stakeholders have authoritative voices in:<br>• the development of standards (a systems integration process in which the direct and indirect effects of new knowledge are considered) (see www.standards.gov for a description of U.S. processes),<br><br>• the adoption of the standards in the regulations of local, state, and national governments and in international treaties,<br>• the approvals of infrastructure projects and urban developments subject to the authorities having jurisdiction and the preferences of the publics served and affected.<br>Stakeholders include:<br>• owners, public or private<br>• financers and insurers<br>• regulators<br>• users (such as residents and customers)<br>• neighbors (affected but not directly served)<br>• building professionals, contractors and labor<br>• materials and equipment suppliers<br>• environmental organizations | Noted: added discussion of policies and stakeholders |
| 4223 | 12 | 0 | | | | Development of standards, which implement knowledge for mitigation, requires the informed consent of the stakeholders. Studies and educational efforts defining the economic, environmental and social impacts are required. These require time and resources to conduct the needed impact studies. | Noted |
| 4224 | 12 | 0 | | | | Approvals of infrastructure projects and urban developments, which support mitigation of climate change, require the informed consent of stakeholders. These also require studies and educational efforts defining the economic, environmental and social impacts. | Noted |
| 4225 | 12 | 0 | | | | In the United States and other democracies, focused attention to improving the efficiency of the regulatory processes is required to reduce the time (often a decade or more) for approvals of urban developments or infrastructure that will reduce greenhouse gas emissions. According to Moving Forward: In-Depth Findings and Recommendations from the Consultative Council (2011), National Institute of Building Sciences, p11 http://nibs.org/client/assets/files/nibs/2011_MovingForward.pdf | Noted |
| 4226 | 12 | 0 | | | | Federal, state and local governments have established a variety of regulations to promote public health, safety and welfare and to protect the environment. Most of these are consistent in intent with sustainability, but many are prescriptive in nature and unsupportive of sustainability in specific situations. Many different regulatory agencies, each with its own procedures, have jurisdiction over different aspects of building and infrastructure projects. | Noted: The impottance of multilevel governance is described in 12.6.1 |
| 4227 | 12 | 0 | | | | Regulatory streamlining is a process, involving project proponents and all cognizant regulatory jurisdictions and stakeholders, to give simultaneous and coordinated attention to meeting the intents (performance requirements) of all regulatory requirements. Long, expensive delays often are imposed on building and infrastructure projects before approvals can be obtained from all regulators. Innovations for sustainability can exacerbate such delays. Modern information technologies, such as BIM, permit efficient sharing of pertinent information and can facilitate streamlining. | Noted |
| 4228 | 12 | 0 | | | | Additional information on regulatory streamlining is available from www.natlpartnerstreamline.org/ . U.S. Executive Order 13274 of September 18, 2002, Environmental Stewardship and Transportation Infrastructure Project Reviews provides federal authority for streamlining. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18827 | 12 | 0 | | | | The linkage between planning tools (Table 12.2) and policies (e.g. Table 12.7) needs to be made, i.e. there should be e.g. a table that details which policies support which planning tools. | Nored: The tables refered got deleted in the rewrite of the chapter for the SOD - the comment is no longer applicable. However, we have drastically changed |
| 18933 | 12 | 0 | | | | General Comment: The TSU is concerned about your chapter's current state and thinks that significant improvements are needed. The TSU is thus submitting a range of comments that may guide the author team in their work on the chapter, the core comments are labelled "Main Comment". | Noted |
| 18934 | 12 | 0 | | | | Main Comment 1: The chapter fails to answer core questions. Further, what has been done so far does not provide a structure to easily do so in the future. At their ZOD feedback the Co-Chairs asked you to answer the following questions:<br>(a) What are current global emissions from urban areas and infrastructure?<br>(b) What emissions are to be expected given current trends? What is the expected extend of the future mitigation challenge?<br>(c) What robust mitigation strategies exist, which are robust – including quantitative information or at least indicators on the order of magnitude?<br>(d) Make emission path dependencies of (to be) built infrastructure more explicit<br><br>This has not been done so far. Following up on these questions, we suggest to also cover the following aspects:<br>(I) Quantification of trends and drivers<br>(II) Extraction of potential data from Chapters 8 and 9<br>(III) GHG emissions or energy demand [reduction] estimates for different urbanization scenarios. | Taken into account: The reframing and rewriting of the chapter have addressed these issues as much as possible and the chapter is in far better shape then before. a,b) Estimated current and projected emissions for human settlements and infrastructure. C) summarized mitigation strategies for cities. D) we have limitation on treating all aspects of path dependencies, given available literature. I) Quantified trends and drivers. II) Section 12.4 extracts data from other chapters as much as posisble. III) Presented scenarios in sction 12.4 |
| 18935 | 12 | 0 | | | | Main Comment 2: The chapter has many redundancies and lacks inter-linkage. In our view this is in part due to the structure of the chapter. Removing redundancies and referencing other sections will improve the flow and coherence of the chapter. | Taken into account: The reframing and rewriting of the chapter have addressed these issues as much as possible and |
| 18936 | 12 | 0 | | | | Main Comment 3: One of our main points of critique from the Co-Chairs on the ZOD was the lack of (quantitative) data. This has in the view of the TSU not sufficiently improved with the FOD. The chapter lacks data, quantitative synthesis of studies and mostly gives single values instead of ranges. Improving this will also allow you to increase the currently very low number of quantitative figures. | Taken into account: The reframing and rewriting of the chapter have addressed these issues as much as possible and the chapter is in far better shape then |
| 18937 | 12 | 0 | | | | Main Comment 4: There needs to be far more synthesis, qualitative and quantitative, in the chapter. See detailed comments to Sections 12.5, 12.6.2.1/.2, 12.6.3.1/.2, 12.6.4.1/.2/.3/.4, 12.7 and 12.8 | Taken into account: The reframing and rewriting of the chapter have addressed these issues as much as possible and |
| 18938 | 12 | 0 | | | | Main Comment 5: The chapter has not started to fulfil its role as integrative chapter in the report. There are no linkages to Chapters 8 and 9 which also deal with infrastructure and urban areas. Also links to other chapters are missing. | Taken into account: The reframing and rewriting of the chapter have addressed these issues as much as possible and |
| 18939 | 12 | 0 | | | | Main Comment 6: Consumption based accounting is well introduced in the chapter – its consistent usage throughout the chapter still has to be implemented. | Taken into account: The reframing and rewriting of the chapter have addressed these issues as much as possible and |
| 18942 | 12 | 0 | | | | The TSU has the impression that thefollowing ZOD Co-Chair critiquhas not yet been taken into account: Ensure that SRREN outcome is taken into account. | Noted: Not explicitly used anything from SREEN, we can look into it further and see how knoledge from SREEN could |
| 18943 | 12 | 0 | | | | The TSU has the impression that thefollowing ZOD Co-Chair critiquhas not yet been taken into account: The carbon footprint of cities needs to be covered in the chapter. | Taken into account: The reframing and rewriting of the chapter have addressed these issues as much as possible and the chapter is in far better shape then |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18944 | 12 | 0 | | | | The TSU has the impression that thefollowing ZOD Co-Chair critiquhas not yet been taken into account: The difference between “urban area” and “city” needs to be defined and consistently applied. | Taken into account: The reframing and rewriting of the chapter have addressed these issues as much as possible and the chapter is in far better shape then |
| 18945 | 12 | 0 | | | | The TSU has the impression that thefollowing ZOD Co-Chair critiquhas not yet been taken into account: UN Habitat has worked on relating emissions to different types of structures, it would be good to take this in the chapter into account. | Noted: The reframing and rewriting of the chapter have addressed these issues as much as possible and the chapter is |
| 18946 | 12 | 0 | | | | The TSU has the impression that thefollowing ZOD Co-Chair critiquhas not yet been taken into account: As urban areas contribute to most emissions this surely needs to be the focus of mitigation efforts and chapter coverage. But rural areas should not be ignored and effects of decentralized (i.e. also rural) availability of energy through renewables and its effects should be covered in the chapter. | Taken into account: The reframing and rewriting of the chapter have addressed these issues as much as possible and the chapter is in far better shape then before. Rural is discussed explicitly but |
| 18947 | 12 | 0 | | | | The TSU has the impression that thefollowing ZOD Co-Chair critiquhas not yet been taken into account: The plan to focus more on scenarios, emissions, taxonomy, etc. has not been put into practice. | Taken into account: The reframing and rewriting of the chapter have addressed these issues as much as possible and |
| 18948 | 12 | 0 | | | | The TSU has the impression that thefollowing ZOD Co-Chair critiquhas not yet been taken into account: o Figures or sketches of figures were not used as planned to guide the process. | Taken into account: The reframing and rewriting of the chapter have addressed these issues as much as possible and |
| 18951 | 12 | 0 | | | | The definition of urban boundaries should be in one place and then only referenced from everywhere else (see e.g. 12.2.3.1, 12.2.3.2). | Accepted: The reframing and rewriting of the chapter have addressed these issues as much as possible and the |
| 18952 | 12 | 0 | | | | The same mitigation options and co-benefits/tradeoffs are discussed throughout the chapter in different context (e.g. spatial planning causing better air quality leading to better health [12.5.1]). Through a central table (e.g. building upon Table 12.1) and a central place where all options are listed (similar to Section 12.4.3) redundancies could be reduced and coherency improved. | Taken into account: The reframing and rewriting of the chapter have addressed these issues, all cobenefit discussion are in 12.8. Reduced redundancies |
| 18953 | 12 | 0 | | | | There should also be only one section discussing UHI, everywhere else there should only be brief references to this section. There need to be linkages from this section to the corresponding WG II chapter(s). | Taken into account: The reframing and rewriting of the chapter have addressed these issues, all UHI discussion are at |
| 18955 | 12 | 0 | | | | The chapter contains a lot of irrelevant information. E.g. Section 12.7 lists many activities without detailing their effects. | Taken into ccount: The section is rewritten. |
| 18956 | 12 | 0 | | | | The task of the chapter is to synthesize. Tables 12.4, 12.5 and 12.6 are not the level on which the chapter can be written. There is a need to condense and synthesize such information in order to make appropriate use of the given space and to be meaningful for the recipients. | Taken into account: The sections are rewritten |
| 18957 | 12 | 0 | | | | The framing of the chapter needs to be improved. It does not become clear why the urbanization is so relevant and why approaching mitigation from this perspective is so crucial. | Taken into account: The chapter is reframes and rewritten and this point is |
| 18958 | 12 | 0 | | | | The chapter has a focus on the limitations of the urban perspective. As other perspectives avoiding the problems of the urban perspective are also taken in the report, this chapter should instead focus on highlighting the opportunities of taking this perspective, such as the range of influence and the pioneer role. | Accepted: Discussed experiences and opportunities in 12.7 |
| 18959 | 12 | 0 | | | | There is no explicit section on policies and it does not become clear how policies relate to the mitigation options and perspectives covered throughout the chapter | Accepted: 12.5 discusses policies and systems integration |
| 18960 | 12 | 0 | | | | The chapter team must become very clear about what the added value of this chapter compared to the Global Energy Assessment (GEA) Chapter 18 is going to be. The GEA has to be referenced, too. | Accepted: Referenced GEA in 12.3 and 12.1 |
| 18961 | 12 | 0 | | | | Please take the following Worldbank reports on Infrastructure & Urbanization in Developing Countries to be found at http://www.infrastructureafrica.org into account. | Accepted |
| 3662 | 12 | 0 | 0 | | | Reduce amount and length of tables to save space. | Taken into account: The SOD is now |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 7607 | 12 | 1 | | 94 | | There is a limited treatment of increased exposure and vulnerability to climate hazards occurred in some areas of the western Mediterranean, in relation to the massive increase in residential building and infrastructure. This has provoked increasing risk territories. For example in areas of the Spanish Mediterranean coast is more likely in 2012 than it had in the late 1989 and 1990. And this has been caused by a massive occupation of land dedicated to housing and infrastructure (soil sealing). An analysis of this can be seen in Olcina (2010) and Olcina, Hernandez, Rico and Martinez (2010). | Rejected: Not directly relevant |
| 5177 | 12 | 1 | | | | Chapter 12 is a useful extension of Chapter 7 (Energy), Chapter 8 (Transport) and Chapter 9 (Buildings) by treating energy, transport and buildings in the urban context in a holistic and integrated way.<br><br>The present draft is an impressive collection of drivers and interdependencies of urban systems, GHG mitigation potentials strategies and their benefits, tradeoffs and spillovers and barriers to implementation.<br><br>However, the chapter contains too many statements of the kind (all taken form the Executive Summary):<br><br>- “A combination of compact urban form, integrated urban structure, high residential and employment density, and mixed land uses, provides a coherent urban model that can lower energy use and carbon emissions.”<br><br>- “As a system, urban areas and human settlements can increase the efficiency of the built environment, infrastructure and energy use beyond what is possible within individual sectors.”<br><br>- “Spatial planning can influence resource use and emissions through spatial development plans, land use, buildings, and the coordination of infrastructure, services and land use.”<br><br>But at the end of the chapter the reader has no clear view of what has been achieved so far and what needs to be done. | The chapter is reframed and rewritten. |
| 2368 | 12 | 1 | 5 | | | Re. how the chapter might be shortened. While section 12.7 is interesting, and should be published somewhere, much of it is based on sourcing of municipal government documents rather than scientific literature, and so perhaps could be cut (in particular the material on p. 45-47; and 50-56). Other potential cuts are given below. | Taken into account: The section is completely rewritten. |
| 16646 | 12 | 10 | | | | Discussions of the definition of “urban,” and discussions of what share of GHGs are in urban areas, as at top and middle of page 10, are a distraction from what the essential purpose of the chapter, which is to understand how policy-directed variation in human settlement patterns and practices could affect GHGs. This material could be omitted.<br><br>Some of the material appearing in the section at bottom page 10 could be re-oriented to the above purpose. | Taken into account: This whole section is rewriten and reframed. |
| 2487 | 12 | 10 | 1 | | | difference | Taken into account: This whole section is rewriten and reframed. The text in |
| 5716 | 12 | 10 | 19 | 10 | 20 | The reference, Bottcher et al (2012) is not included in the list of references at the end of the chapter. | Taken into account: This whole section is rewriten and reframed. The text in question is deleted and comment no |
| 3346 | 12 | 10 | 21 | 10 | 29 | The argument can be made more concisely.The meaning of the last sentence of this paragraph is unclear. | Taken into account: This whole section is rewriten and reframed. The text in question is deleted and comment no |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2489 | 12 | 10 | 27 | | | lower not lesser | Taken into account: This whole section is rewriten and reframed. The text in question is deleted and comment no |
| 5720 | 12 | 10 | 30 | 10 | 49 | The most serious omission among the factors considered to affect CO2 emissions in urban areas, in all the established literature and hence missed by the IPCC Chapter Authors, is the cross-city disparities in the relationship between incomes and housing costs. The “median multiple” is a good proxy here. Cities with higher median multiples also have lower “discretionary incomes” after housing costs. Therefore there is highly likely to be a correlation between policies of strict urban growth containment and reduced CO2 emissions, but the mechanism is not necessarily efficiency gains, in urban form or anything else, but a reduction in household discretionary spending of all kinds. There are equity effects to be considered here. Gibbons, Overman and Resende in “Real Earnings Disparities in Britain” (2011) find that the greatest increases in “proportion of income spent on housing” as urban land prices inflate, is both in the lowest income groups and in the very highest income groups. This is because the highest income groups are paying increasing amounts of money to continue to “buy their way out” of the rationing system – their tennis courts, multiple garages, large gardens, swimming pools, multiple houses, and so on, are costing them quite a lot more, especially if at “premium” locations in the “city”. Meanwhile, the land thus consumed without regard to the intention of the “rationing” process, requires “compensation” via the land market mechanism; lower income earners making do with less and less space, at ever-more inefficient and undesirable locations, for which they still have to pay more and more. Every “attribute” of housing is rationed by price, and the price-rationing of “space” spills over into necessary rationing of quality and location and condition and amenities. I take it that the IPCC chapter authors do not regard it as controversial that urban growth boundaries always result in urban land price inflation. However, what is little understood as yet is that there is no example in the world where “density” has successfully ameliorated the effect on housing affordability. All the “affordable” cities in the annual “Demographia” Reports have minimal urban fringe growth constraint whether regulatory or geographic, and have much lower prices per LARGE lot in new developments than the unaffordable cities have per VERY SMALL lot. | Noted: This is important issue. In the reframed and rewritten chapter, existing text to which comments are made are deleted. But we have included discussions on land value capture issues as new sub section (12.6.4) and discussed housing related issues in 12.3.4 too. We have added small subsection on affordable housing as 12.4.8. |
| 2488 | 12 | 10 | 4 | | | these figures from IEA should be updated to 2010 - they are available | Taken into account: This whole section is rewriten and reframed. The text in question is deleted.. But IEA had not |
| 18782 | 12 | 10 | 4 | 10 | 20 | consider converting to figure | Taken into account: This whole section is rewriten and reframed. The text in question is deleted and comment no longer relevant. But this issue is dealth |
| 2490 | 12 | 10 | 42 | | 47 | too much on comparisons when the metric, the time are not known or made clear - needs to set up common factors and focus on CO2 - there is a need to use the best available data - also important statements are made with no evidence | Taken into account: This whole section is rewriten and reframed. The text in question is deleted and comment no longer relevant here. However, we have |
| 18783 | 12 | 10 | 42 | 10 | 43 | consider converting to figure | Taken into account: This whole section is rewriten and reframed. The text in question is deleted and comment no |
| 12453 | 12 | 10 | 49 | 10 | 49 | The word "developed" is used twice and the sentence do not give a clear meaning. | Taken into account: This whole section is rewriten and reframed. The text in question is deleted and comment no |
| 14704 | 12 | 10 | 7 | 10 | 9 | I do not understand this sentence ? | Taken into account: This whole section is rewriten and reframed. The text in question is deleted and comment no |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17306 | 12 | 11 | | 11 | | Urban GHG inventories are dealt with in several chapters. I would recommend to deal with this issue, in particular with the various methodological approaches and their rationales, in one chapter more comprehensively. Moreover, it should be mentioned that there is no abolutely "true" method, and there are substantial problems with data and quantification (e.g. for individual transport, non-grid energy carriers etc.). Therefore it makes sense to chose a methodology depending on the purpose. If the purpose is primarily monitoring of mitigation achievements, a terriorial approach doesn't make sense for small units, as "imports" of, e.g. electricity play a major role (the boundary effects of trans-border trade of energy , trans-border transport etc. are relatively large for smaller units). | Accepted: but the whole section is rewriten and reframed. The comments are no longer directly relevant. The issues raised in this comments are addressed in 12.3.2 in SOD in detail. |
| 16647 | 12 | 11 | | | | Continuing on page 11, this is another list of what factors might influence emissions but it comes across as an unorganized list with little attempt by the authors to organize the literature, beyond saying “there is little agreement.”<br><br>The paragraph on page 11 from lines 19 to 36 is relevant and helpful, but again needs integration and is secondary to a summary of what is known and not known. | Accepted: but the whole section is rewriten and reframed. The comments are no longer directly relevant. The issues raised in this comments are addressed in 12.3 and 12.3.2 in SOD in detail. |
| 17178 | 12 | 11 | 13 | 11 | 17 | The arguments in the two sentences could seem to be contradictory in some way, since the consumption-based emissions from car travel are likely to be lower in the compact, vertical cities than in the low-rise expansive ones. The paragraph should therefore be made clearer and more nuanced. | Taken into account: This whole section is rewriten and reframed. The comments are no longer directly relevant. |
| 12454 | 12 | 11 | 14 | 11 | 18 | The content of this paragraph is hart to capture, please consider rephrasing to make it more understandable. | Taken into account: This whole section is rewriten and reframed. The comments |
| 5980 | 12 | 11 | 41 | 12 | 4 | Source for this approach? | Accepted: but the whole section is rewriten and reframed. The comments |
| 17575 | 12 | 11 | 43 | 11 | 43 | What is "hard urban space"? | Accepted: but the whole section is rewriten and reframed. The comments |
| 18784 | 12 | 11 | 45 | | | unclear whether this refers to physical dimensions or abstract | Accepted: but the whole section is rewriten and reframed. The comments |
| 15749 | 12 | 11 | | 21 | | Section 12.3 which discusses urban structure, form and infrastructure and section 12.4.3 which discusses urban sectors mitigation potentials for direct and indirect emissions has lot of overlap. Some points are repeated again and again. | Taken into account: This whole section is rewriten and reframed. Overlaps are reduced. |
| 6008 | 12 | 11 | 41 | 12 | 4 | Source/ References for the several definitions and the conclusion are missing. | Taken into account: This whole section is rewriten and reframed. |
| 3347 | 12 | 11 | | | | A good section. But is there a way GHG emissions of cities could be structured such to be useful for later chapters? Would it be reasonable, for example, to look for emissions embedded in infrastructures, infrastructure use emissions, manufacturing and consumption emissions? | Noted: This whole section is rewriten and reframed. However these questions are addressed in subsequent sections in |
| 11152 | 12 | 1103 | | | | NIMBYism - see previous comment | Noted> Table 12.5 is deleted in revised |
| 16650 | 12 | 12 | | | | Page 12 at top: To say that form and structure “determine” energy use and emissions is an overstatement. Empirical studies have struggled to clearly demonstrate causal relationships between urban form and emissions, and those that have been done do not show there are particularly strong relationships. A metastudy of US empirical studies relating urban form to vehicle miles traveled, for example, found so few reliable studies by category of urban form or structure that confidence intervals for estimates could not be constructed; and the elasticities were small, all at less than 0.10 (Ewing and Cervero 2010). In general, the chapter cites just one or two studies on a particular claim, does not discuss their merits, and tends to over-generalize.<br><br>This same section should also lay out the ways in which settlement patterns, urban form and structure, etc are thought to influence GHGs. None of this appears here and it is critical. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8562 | 12 | 12 | | | | SIMPLY INCORRECT, NEEDS TO BE DELETED OR CLARIFIED<br>"The key variable between these forms is travel patterns. A primary indicator of greenhouse gas emissions is vehicle miles travelled (VMT) and commonly, greenhouse gas emissions are related to VMT (Newman and Kenworthy, 1989)."<br>COMMENT: Same issue as Comment #16. The relationship between GHG and VKT is indirect. The fundamental relationship is between fuel consumption and GHG. Where there is more congestion or slower traffic speeds (at urban speeds), there can be much less than a 1:1 relationship between VKT and GHG. At a minimum, this needs to be stated. In the absence of such a caveat, this reference should be deleted. □ | Taken into account: The whole section is rewriten and reframed and these text are deleted. |
| 2491 | 12 | 12 | 10 | | 12 | where is the evidence? | Taken into account: The whole section is rewriten and reframed and these text |
| 5982 | 12 | 12 | 11 | 12 | 12 | This is not an appropriate example for the increased freedom of choice due to greater affluence. The emergence of individual motor car traffic in Europe and the US is not only a result of increased wealth; more important is the construction of large street infrastructures; the offer created the demand here! Cp. your own chapter 12, page 14, line 25! | Taken into account: The whole section is rewriten and reframed and these text are deleted. |
| 2492 | 12 | 12 | 19 | | | informs the private sector | Taken into account: The whole section is rewriten and reframed and these text |
| 2493 | 12 | 12 | 25 | | | There is strong and direct correlation - how strong? | Taken into account: The whole section is rewriten and reframed and these text |
| 18785 | 12 | 12 | 33 | | | leapfrogging too general here, need to specify what is over-jumped | Taken into account: The whole section is rewriten and reframed and these text |
| 2494 | 12 | 12 | 37 | | | VMT is only one key variable - also relates to type of vehicle, efficiency, occupancy | Taken into account: The whole section is rewriten and reframed and these text |
| 17179 | 12 | 12 | 40 | 12 | 45 | Causality between urban spatial characteristics cannot be established through statistical analyses, but has been demonstrated through qualitative studies combined with theoretical analyses explaining the plausibility of such causal relationships. In order to substantiate that residential location is a (contributory) cause of differences in travel behavior between people living in different urban spatial contexts, we must show the basic mechanisms by which the location of dwellings influences travel behavior. Examples showing the rationales on which people base their frequency of participation in out-of-home activities, the location of these activities, the modes of travel used to reach these locations, and the routes followed make up important elements in this endeavor. Research investigating such causal mechanisms between residential location and travel behavior has in particular been carried out by North European researchers, including cases in Scandinavia but also in China. See Næss (2005, 2006, 2009, 2012 a and b). | Taken into account: The whole section is rewriten and reframed and these text are deleted. |
| 18786 | 12 | 12 | 42 | | | explain what causality in two directions; from everything following there only seems to be the causality from structure to traffic. | Noted |
| 5981 | 12 | 12 | 8 | 12 | 9 | Where do you take this simplistic relationship from? One could also argue "the greater the affluence, the higher are private investments" or "the greater the affluence, the more post-materialism"; you do not mention any source for this! | Taken into account: The whole section is rewriten and reframed and these text are deleted. |
| 5983 | 12 | 12 | 5 | 12 | 23 | This paragraph includes little precise or new information; it can be removed and its arguments can be integrated in chapter 12.3.2! | Noted: The whole section is rewriten and reframed and these text are deleted. The comments are no longer directly |
| 6009 | 12 | 12 | 5 | 12 | 23 | Why are these four drivers the important ones? Explanation for "Human behaviour" is not correct in a common sense. Source and references are missing. From a social scientific point, this section is much too short to give a comprehensive overview on drivers of urban structure and form.<br>In addition, a precise definition of the difference between "urban structure" and "urban form" would be necessary. | Noted: The whole section is rewriten and reframed and these text are deleted. The comments are no longer directly relevant. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18030 | 12 | 12 | 8 | 12 | 12 | I think the report should not imply that people having cars and single family homes and freedom of choice is somehow a bad thing. The car has been very beneficial in improving the lives of ordinary people. Its quite natural that people want to live in a single family home. I think that what this section is aiming to say is that the car has made it easier for people that work in urban areas to live in single family housing. Spatial planning and infrastructure needs to provide places that have successful communities where people want to live with a good quality of life. | Noted: The whole section is rewriten and reframed and these text are deleted. The comments are no longer directly relevant. |
| 17186 | 12 | 12 | 24 | 15 | 13 | section 12.3.2 in general: There is a lack of mentioning of the influence on travel behavior and its related CO2 emissions from the location of dwellings as well as (office) workplaces relative to the main metropolitan city center. A host of empirical studies have shown distance to the city center, together with the overall population density within the urbanized are of the city and the metropolitan areas, to be the urban spatial characteristics exerting the strongest influences on transportation energy use and GHG emissions. Strong tendencies among suburbanites to travel longer overall distances and carry out a higher proportion of their travel by car than their inner-city counterparts, among whom walking and biking make up a higher share of the distance traveled) have been found in a large number of cities in different corners of the world, including Paris (Mogridge 1985, Fouchier 1998), London (Mogridge, ibid.), New York and Melbourne (Newman and Kenworthy 1989), San Francisco (Schipper et al., 1994), Austin, Texas (Zhou & Kockelman, 2008), Athens (Milakis, Vlastos and Barbopoulos, 2008), Santiago de Chile (Zegras, 2010), Copenhagen (Næss, 2005, 2006, 2009b and 2011), Oslo (Næss et al., 1995), a number of other Nordic cities (Næss, 2012) and Hangzhou (Næss, 2010). | Noted: The whole section is rewriten and reframed and these text are deleted. The comments are no longer directly relevant. But the land value capture and housing related issues are added in SOD. We have done limited discussion on transport (given there is another chapter on transport in WGIII) here. 12.4 in SOD has addressed accessibility, density, land use, connectivity, transport modes, and characteristics of the low carbon settlements. We look forward to improve these aspects further in next |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17189 | 12 | 12 | 24 | 15 | 13 | In section 12.3.2 there is generally a lack of mentioning of the influence on travel behavior and its related CO2 emissions from the location of dwellings as well as (office) workplaces relative to the main metropolitan city center. A host of empirical studies have shown distance to the city center, together with the overall population density within the urbanized are of the city and the metropolitan areas, to be the urban spatial characteristics exerting the strongest influences on transportation energy use and GHG emissions. Strong tendencies among suburbanites to travel longer overall distances and carry out a higher proportion of their travel by car than their inner-city counterparts, among whom walking and biking make up a higher share of the distance traveled) have been found in a large number of cities in different corners of the world, including Paris (Mogridge 1985, Fouchier 1998), London (Mogridge, ibid.), New York and Melbourne (Newman and Kenworthy 1989), San Francisco (Schipper et al., 1994), Austin, Texas (Zhou & Kockelman, 2008), Athens (Milakis, Vlastos and Barbopoulos, 2008), Santiago de Chile (Zegras, 2010), Copenhagen (Næss, 2005, 2006, 2009b and 2011), Oslo (Næss et al., 1995), a number of other Nordic cities (Næss, 2012) and Hangzhou (Næss, 2010).<br>Similarly, a number of studies have found that employees at suburban workplaces tend to commute by car much more frequently than employees at inner-city workplaces. Cities where lower proportions of car commuters and higher shares of employees traveling by public transit, bicycle or by foot have been found at inner-city than at suburban jobsites include the San Fransisco Bay area (Cervero & Landis, 1992); London and other large British cities (Dasgupta, 1994); the Dutch Randstadt area (Schwanen et al., 2001); Atlanta and Boston (Yang, 2005); and Paris (Aguilera et al., 2009), Oslo (Næss & Sandberg, 1996), Trondheim (Strømmen, 2001) and Copenhagen (Hartoft-Nielsen, 2001b; Næss, 2007). Several studies also show that job decentralization from inner to outer parts of cities and metropolitan areas usually does not contribute to reducing average commuting distances (Næss & Sandberg, 1996; Hartoft-Nielsen, 2001b; Næss, 2007; Strømmen, 2001; Cervero & Landis, 1992; Yang, 2005; Aguilera et al., 2009). Admittedly, according to some studies employment decentralization has reduced commuting times (Gordon et al., 1991; Cervero & Landis, 1992; Giuliano & Small, 1993). This has, however, mostly to do with the generally higher shares of fast modes of travel and higher driving speeds in the suburbs than in the inner city.<br>It is an serious shortcoming of the existing text that the influence of the location of dwellings and workplaces relative to the city center is not mentioned. This must be corrected. | Noted: The whole section is rewriten and reframed and these text are deleted. The comments are no longer directly relevant. But the land value capture and housing related issues are added in SOD. We have done limited discussion on transport (given there is another chapter on transport in WGIII) here. 12.4 in SOD has addressed accessibility, density, land use, connectivity, transport modes, and characteristics of the low carbon settlements. We look forward to improve these aspects further in next round. |
| 10403 | 12 | 12 | 30 | | | The title of this sector is not appropriate. | Taken into account: The whole section is rewriten and reframed and these text are deleted. The comments are no |
| 17114 | 12 | 12 | 37 | | | IPCC 2006 Guidelines refers VKT instead of VMT. | Noted |
| 8563 | 12 | 13 | | | | UNSUPPORTED STATEMENT<br>"An additional consequence of more expansive urban forms is that<br>utility service runs are considerably longer than in more compact forms, thereby significantly<br>increasing direct and embodied energy use and thus greenhouse gas emissions."<br>COMMENT: Embodied energy from high rise and more dense housing tends to be greater than for less dense housing, according to some sources. This comment should be deleted. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8564 | 12 | 13 | | | | RESEARCH REACHING ALTERNATIVE CONCLUSION NOT CITED<br>"There is a tendency in cities for more intensive activities, such as those activities requiring public support, to gravitate towards more continuous routes carrying public transportation, thus forming activity corridors – bands of higher density, more mixed uses (Curtis, C. and Tiwari, R., 2008). This form reduces vehicular generated greenhouse gas emissions by increasing the use of public transportation."<br>COMMENT:<br>Research in Melbourne, where this concept has been in operation in some years indicate no material increase in public transportation ridership along such corridors. See Monash University research at: McCloskly, D., Birrell, R., & Yip, R. (2009), "Making Public Transport Work in Melbourne," People and Place, September. Section 12.3.2.2 (Tendancies toward Linearity) should be expanded to cite the dissenting literature or be deleted. | Noted |
| 17180 | 12 | 13 | 1 | 13 | 14 | There is a general neglect in this paragraph of the influence of densification versus sprawl on the use of non-motorized travel modes. Research in Scandinavian cities has shown that inner-city residents use such modes to a higher extent than suburbanites do, and combined with the generally shorter daily traveling distances of inner-city residents, this leads to considerably higher non-motorized share of total daily traveling distance among residents living close to the city center. In cities like Copenhagen, the share of travel carried out by bike is particularly high among inner-city residents. See Næss (2005 and 2006). Similar patterns were also found in Hangzhou, China (Næss, 2010). | Taken into account: The whole section is rewriten and reframed as section 12.4 and these text are deleted in SOD. The comment is not relevant here now. |
| 12456 | 12 | 13 | 12 | 13 | 14 | Could it be clearified what is included in "utility services"? In addition to grids for electricity, street lightning, gas, water and sewage, telecommunications, also public transportation sytems and roads get longer in less compact urban developments with consequences for emissions from both construction and maintenance. Please consider to include this fact. | Taken into account: The whole section is rewriten and reframed. The same text is reproduced in 12.3.3 and used "utility lines". See 12.18 figure in SOD |
| 14705 | 12 | 13 | 14 | 13 | 14 | On this point, you may cite Bertaud, A. 2002. The spatial organization of cities: Deliberate outcome or unforeseen consequence? World Development Report 2003 Background Paper. | Noted, will be seen in next round |
| 18788 | 12 | 13 | 15 | | | would be good to mention in what regard this is contested | Noted |
| 17181 | 12 | 13 | 25 | 13 | 25 | Norway should be added here, since this is the country where the perhaps strongest shift from urban sprawl to urban densification has taken place. In particular, this shift has been pronounced in Oslo Metropolitan Area. The population density within the continuous urban area of Greater Oslo (pop.: 0.93 mill.) increased by as much as 27% over the period 1985-2011. In spite of some development of dwellings and workplaces on previously undeveloped land in the outer part of the metropolitan area, the number of inhabitants per hectare of urbanized land within the region as a whole (including 1.2 million urban inhabitants in 2011) grew by 7.5 % over the years 2000-2011. See Næss et al., 2011a and b (and also Næss, 2012 with the latest updated figures, presented in a conference paper from the AESOP conference in Ankara this summer). | Noted |
| 18789 | 12 | 13 | 25 | | | "Many ..." - is this possibly even "Most ..." or "All but 2 OECD and many others ..." | Noted : see 12.4.3 in SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5721 | 12 | 13 | 32 | 13 | 37 | "Many of the poorest households, who can least afford high transportation costs, can only obtain access to land on the periphery: the system contributes to a self-perpetuating cycle of poverty."<br>But it was commonly understood 120 years ago, (Peter Hall, "Cities of Tomorrow: An Intellectual History of Urban Planning") that as economies developed and incomes rose, urban land rents rose just as fast, meaning that the rentier class captured most of the gain. Land holdings going back centuries do not have to be particularly large in "rural" terms, to constitute a monopoly holding in what becomes a growing city. The necessity at one time that people walk everywhere, limited the scope for the amount of living space per person, and also rendered it impossible for "conversion" of land from rural to urban uses without the extraction of monopoly rents by the owners of the necessarily limited "supply" of land for conversion.<br>Furthermore, new migrants into the urban economy, with minimal income prospects at least initially, cannot hope to "house" themselves in competition with incumbent residents with already increased income levels. Hence either "informal" housing, multi-family shared housing, or horrifically over-crowded "market" solutions such as the infamous "Dumb-bells" tenements. It was well understood 100 years ago, by proto-urban-planners, social reformers, economists, and politicians, that there was a desperate need to increase "supply" of land in the urban economy so as to ameliorate not just the crisis of public health, but the crisis of social inequality, immobility, and unrest. Marxist solutions had considerable appeal that would only grow unless the "monopoly rent" issue was ameliorated. Hence, while the process of rail-based urban expansion was itself driven by rent-seeking, it had explicit approval from many of those who carried "social" concerns due to the effect that the increase of land supply must have on ameliorating "monopoly rent". The more competition between "developers" involved in urban expansion, the greater the amelioration of the "monopoly rent" effect.<br>The noted proto-urban-planner Ebenezer Howard initially supported the "nationalisation" of land but was persuaded by colleagues who were well versed in classical land economics, that rural land was so cheap compared to urban land that the ability to convert it to urban use with minimised uplift in value, was a better solution. Hence Howard's lifelong advocacy of "Garden cities" with a balance between housing and employment and other activities. Unfortunately, for whatever reason, all such proposals tended to end up as "dormitory suburbs" with the residents travelling in to the existing city daily.<br>The rent-seeking influence of the established city property owing interests is probably grossly under-estimated at all times in historical accounts of the modern city, right up to the present day. The classical land economics urban rent curve slopes up to a city centre. "Dispersion" flattens this land rent curve. William Wheaton (2002) "Commuting, Ricardian Rent, and Housing Price Appreciation in Cities with Dispersed Employment and Mixed Land Use". The ability to convert rural land to urban with minimal "planning gain" results in minimal "discontinuity" in the land rent curve at the urban fringe, which tends to keep the price of land lower throughout the urban area. Cheshire and Mills note in their Introduction to "The Handbook of Regional and Urban Economics" Volume 3 (1999):<br>"…….If we compare communities in the US and UK that are as comparable as possible except for the constraints their systems of land use regulation place on the supply of land, we observe that the price of retail land is up to 100,000 times higher in the most constrained community……"<br>It is noticeable that "housing affordability" analyses such as the Annual Demographia Reports, tend to find quite strong "sorting" characteristics, whereby there is one significant set of cities with median multiples of around 3 | Noted: The whole section is rewriten and reframed and these text are deleted in SOD. The comment is not relevant here now. |
| 18790 | 12 | 13 | 32 | 13 | 37 | A solution that could be possibly be mentioned here are policies facilitation the construction of affordable living spaces (e.g. cooperative/gov't owned rental) | Taken into account: The whole section is rewriten and reframed and these text are deleted in SOD. The comment is not |
| 5519 | 12 | 13 | 38 | | 44 | Bioretention systems for stormwater capture also offer some mitagation potential in addition to other services | Taken into account: The whole section is rewriten and reframed and these text are deleted in SOD. The comment is not |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17182 | 12 | 13 | 38 | 13 | 39 | Regarding urban heat island and tradeoff with compact urban development. This is probably dependent on the type of natural surroundings in which a city is located. Some American studies (e.g. Stone & Rodgers, 2001) have concluded that suburban low-density development increases the urban heat island, compared to higher-density development, since the heat-absorbing surfaces cover a larger total area in low-density urban districts. | Taken into account: The whole section is rewriten and reframed and these text are deleted in SOD. The comment is not relevant here now. See 12.8.1 in SOD |
| 18791 | 12 | 13 | 38 | 13 | 44 | Have only on UHI section, reference WG II from there and have only brief reference from here. | taken into account: The whole section is rewriten and reframed and these text are deleted in SOD. The comment is not |
| 14706 | 12 | 13 | 39 | 13 | 39 | On this point, you may cite Hamin, Elisabeth M., et Nicole Gurran. 2009. « Urban form and climate change: Balancing adaptation and mitigation in the U.S. and Australia ». Habitat International 33 (3) (juillet): 238-245. doi:10.1016/j.habitatint.2008.10.005. | Noted |
| 2495 | 12 | 13 | 4 | | 5 | Explain - cannot exist without minimum levels of support - ref (1994) is very dated | Taken into account: The whole section is rewriten and reframed as section 12.4 and these text are deleted in SOD. The |
| 3349 | 12 | 13 | 43 | | | what is meant by "path"? | Taken into account: The whole section is rewriten and reframed and these text are deleted in SOD. The comment is not |
| 2497 | 12 | 13 | 45 | | | unclear about the point being made here - missing element is the corridor development in cities and the linkages between cities - clusters (many examples in China) and the development of satellite cities (Seoul and Shanghai) | Taken into account: The whole section is rewriten and reframed and these text are deleted in SOD. The comment is not |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5722 | 12 | 13 | 45 | 14 | 2 | Anthony Downs (2007) “A Growth Strategy for the Greater Vancouver Region”:<br><br>".....The cost of land poses a key dilemma for urban planners everywhere who want to concentrate jobs together so they can be best served by public transit. Such concentration raises the costs of land near centers; in fact, it would confer a monopoly advantage on landowners who owned such land and could exploit firms trying to locate there. Now firms want to locate elsewhere to cut their land costs.<br><br>Planned concentration of jobs in a few centers is not consistent with private ownership and control of land. Some type of collective control over that land would be necessary to prevent monopolistic exploitation of land values. In theory, this could be done with high land taxes in such areas and special zoning rules. But adopting those devices is politically difficult in a free enterprise economy.....<br><br>".....A similar but less intensive dilemma concerns land near transit stops, where it would be most efficient to concentrate high-density housing and jobs. That also creates ownership monopolies over such land unless it is specially controlled or taxed. Yet focusing development near transit stops is a key to using more transit....."<br><br>The famous example provided by Curitiba, Brazil, did initially involve large amounts of compulsorily acquired land for “transit oriented development”, although most advocates analyses of Curitiba's wonderfully successful system are silent on this point, which is actually a crucial one. See Jonas Rabinovich, "Curitiba: Towards Sustainable Development" (1992), which at least mentions this reality although without identifying its importance. Curitiba’s planners also had the wisdom to go with buses and busways rather than rail based systems. Buses can pick up passengers anywhere before entering the high-speed busway, which has telling advantages over rail based systems that require “transfers” from other modes. Bus based systems can also be adapted to follow later urban development wherever it proves popular, rather than imposing self-defeating distortions in land market prices with fixed rail routes and strictly “planned” integration of transit and development. Curitiba has had considerable problems under the free market since the original project was completed, with lower income people being "priced out" of the transit-served locations, and further development at these locations being stalled by high land prices. □ | Noted |
| 17183 | 12 | 13 | 45 | 14 | 2 | I do not think the tendency toward linearity can be described as a general trend. In the Scandinavian cities where densification has been a strongly pursued strategy during recent decades, densification has typically more taken place at nodes, often on areas becoming vacant due to industries having moved to lower-cost countries, or due to prior relocation of harbor activities. (See, for example, Næss et al., 2011b). | Noted: The whole section is rewriten and reframed and these text are deleted in SOD. The comment is not relevant here now. |
| 16652 | 12 | 13 | 48 | 14 | 2 | This claim may seem intuitive but the empirical evidence isn't provided here | Noted: The whole section is rewriten and reframed and these text are deleted in SOD. The comment is not relevant |
| 12455 | 12 | 13 | 7 | 13 | 8 | The figure "70 people per km" should be clearified. | Taken into account: The whole section is rewriten and reframed as section 12.4 and these text are deleted in SOD. The |
| 3348 | 12 | 13 | 7 | 13 | 8 | probably: "people per square kilometer" | Taken into account: The whole section is rewriten and reframed as section 12.4 and these text are deleted in SOD. The |
| 18787 | 12 | 13 | 7 | | | "70 people" - put this number in context | Taken into account: The whole section is rewriten and reframed as section 12.4 and these text are deleted in SOD. The |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2496 | 12 | 13 | 8 | | | not kilometre but hectare | Taken into account: The whole section is rewriten and reframed as section 12.4 and these text are deleted in SOD. The |
| 18032 | 12 | 13 | 21 | 13 | 24 | The US National Research Council (2009) report found that "doubling density would only reduce VKT by 5% to 12%, and perhaps by 25% if coupled with higher employment concentrations, significant public transport improvements, mixed uses and other supportive demand management measures." Note however that these measures to achieve more than the 5% to 12% range are very dependent on having a strong local economy and investment in local improvements to public transport and streets and it would be difficult to achieve these conditions more generally in the more residential urban areas. Also a higher densities will increase congestion and crowding and lower vehicle fuel efficiency. Therefore density is a relatively weak lever for reducing vehicle emissions. I think this needs to be made clearer in the text and relates to my comments above that the chapter needs to have more quantification of the evidence and analysis of causation and feasibility of achieving climate mitigation through infrastructure and spatial planning | Noted: |
| 18031 | 12 | 13 | 7 | 13 | 8 | I think the units "70 people per kilometre" are incorrect - should this be 70 people per hectare? | Taken into account: The whole section is rewriten and reframed and these text |
| 6010 | 12 | 13 | | | | Title of the Section should be adapted to the content. Explanation of the term "linearity" does not explicit exist in the text. | Taken into account: The whole section is rewriten and reframed as section 12.4 and these text are deleted in SOD. The |
| 5520 | 12 | 14 | 20 | | | In addition to fine scale- green space included in urban design has been seen as promoting walking- see Center for Neighborhood Technologies- http://www.cnt.org/repository/gi-values-guide.pdf . Other publications by this group would also be pertinent | Noted |
| 2499 | 12 | 14 | 23 | | 29 | unclear what is meant by 'more neutral' | Noted: The whole section is rewriten and reframed and these text are deleted |
| 2500 | 12 | 14 | 31 | | 32 | some figures needed here on proportions of household energy in housing and transport - if they account for over a half - where does the rest go? Differences between cities and those in the global north and south | Noted: The whole section is rewriten and reframed and these text are deleted |
| 2371 | 12 | 14 | 35 | | | Operatonal energy use of buildings also depends on the function of the building and user behaviour. | Noted: The whole section is rewriten and reframed and these text are deleted |
| 5725 | 12 | 14 | 36 | 14 | 41 | The Chapter authors are to be commended for noting the relative inefficiency of high rise buildings. One of the problems we have in criticising a particular type of dwelling, is in identifying the scope for improvement that is related to each type of dwelling rather than trying to encourage a change in the type of dwelling that people choose. Patrick Troy (Australian National University) in “The Perils of Urban Consolidation” (1996) points out the considerable scope for “sustainability” represented by low density living, which in many features has potential that higher density living does not. “Pricing” of the variables that we want to affect, such as water consumption, energy consumption, waste and so on, would be sufficiently effective and would avoid the very serious “unintended consequences” of many popular proscriptive urban planning tools. There is more scope at lower densities, for the use of active and passive solar power, fresh air and sunshine for ventilation and clothes drying, on site power generation, the burning of biomass for heating and cooking, rainwater collection, on-site waste disposal and recycling, on-site food production, and the use of trees for shade. The fact that suburbanites do not yet habitually maximise the sustainability advantages represented by the densities at which they live, is because the incentives to do so are absent.<br><br>Since Troy’s book was published, geothermal heat pumps have been developed, which are an energy-saving “no-brainer” for which the scope is vastly reduced by higher urban densities. □ | Noted: But do we have suffieicnt published literature to support argument? Will be looked again in next round |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11033 | 12 | 14 | 39 | | | The text states: 'Semi-detached and three storey buildings have been shown to be significantly more efficient in terms of operational energy, than single storey, free-standing units, while high rise buildings are the most inefficient, largely because of the use of the elevator (Myors et al., 2005).' This is misleading, as it ignores the benefits of high rise for reducing overall energy use, including in household travel. [Glaeser, E. (2009). Green Cities, Brown Suburbs. City Journal, 19(1) http://www.city-journal.org/2009/19_1_green-cities.html ] This whole paragraph should acknowledge how critical transport is. A minimal recasting could add the following sentence after 'Myors et al. (2005)': 'However, this operational energy requirement may be outweighed by other energy implications of buildings, such as those arising from location – for example, high rise buildings reduce needs for transport.' | Noted: The whole section is rewriten and reframed and these texts are deleted in SOD. |
| 6011 | 12 | 14 | 4 | 14 | 5 | Source is missing. | Noted: The whole section is rewriten and reframed and these text are deleted in SOD. The comment is not relevant |
| 17184 | 12 | 14 | 4 | 14 | 12 | What is written here about polycentricity is not sufficiently nuanced. It is necessary to specify the geographical scale at which polycentric settlement structures are favorable to reducing transport GHG emissions. Studies in the Nordic countries suggest that while at an intra-metropolitan scale a centralized pattern of development will require the least amount of energy for transportation (see, e.g. Næss et al., 1995; Næss, 2011; Næss & Sandberg, 1996; Hartoft-Nielsen, 2001a), decentralized concentration may be the most energy-efficient settlement pattern at a wider regional scale (Næss, 1993). According to Brotchie (1984), a decentralized settlement structure will be the most energy efficient and least transport-requiring one if the level of physical mobility in the society is low. In such a situation, the distance decay will be high, with rationales of distance minimizing distance outweighing those of choosing the best facility. In a highly -mobile society, however, the deterrent of distance will be low, with rationales of choosing the best facility generally dominating over distance minimizing distance (within some threshold of acceptable travel time). If a peripheral settlement is to function in a self-contained way in a high-mobility society, it must be located outside the catchment area of competing centers. Thus, Banister (1992) found that traveling distances were shortest and the proportion of walking highest in the most urbanized of six investigated parishes in the generally densely populated Southern England, while the most rural parish was distinguished by long trips and a high proportion of car driving. If residential development in peripheral rural areas and villages in a high-mobility society is to be compatible with modest average amounts of travel, the distances to the closest cities (and in particular, major metropolitan centers) must therefore most likely be quite long, and longer the stronger is the attraction of the main center (Breheny, 1992). | Noted: The whole section is rewriten and reframed and these text are deleted in SOD. These issues are given careful look in rewritten 12.4 |
| 14709 | 12 | 14 | 43 | 15 | 4 | Is this paragraph really useful ? It is somehow contradicted by the following paragraph. (I do not really understand why is it useful to say that something is true when the scale of observation is local if you write just after that is it actually false when looking at the big picture ?) | Noted: The whole section is rewriten and reframed and these texts are deleted in SOD. Carbon sink discussion are in |
| 17185 | 12 | 14 | 45 | 15 | 4 | An exclusively intra-city focus is completely irrelevant when discussing the carbon sink function of green space, since CO2 emissions are a global and not a local problem. The points made on page 15, lines 5-7 are thus the relevant important ones which should be brought to the front. There are many good reasons for saving intra-urban green areas, but carbon sequestering is hardly one among them (unless the protection of intra-urban green space takes place without any outward urban expansion whatsoever – this would require either that the construction of new buildings came to a halt, or that existing buildings inside the city were replaced with taller ones). | Noted: The whole section is rewriten and reframed and these texts are deleted in SOD. Carbon sink discussion are in 12.8.2 |
| 2498 | 12 | 14 | 5 | | | decentralised or distributed? | Noted: The whole section is rewriten and reframed and these text are deleted |
| 14707 | 12 | 14 | 22 | | | Is there any citation supporting this claim ? | Taken into account: In SOD, these issues are rewritten as 12.4.5 with a |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14710 | 12 | 14 | 42 | | | I wonder if this section is really useful: the carbon sink created by urban spaces has only a marginal effect on the global concentration of GHG in the atmosphere (its impacts are really negligible when compared to any mitigation policy, as it acts on the stock of GHG in the atmosphere, not on the flux, i.e. on emissions; this very fact is actually written in section 12.4.3.6 ! ). I somehow feel including such a section may be confusing for the reader. | Taken into account: Deleted from here and moved to discussions in 12.8.2 |
| 5726 | 12 | 15 | 1 | 15 | 13 | The Chapter Authors are to be commended for their observation that lower density urban development actually co-exists to some extent, with local biospheres, whereas it is higher urban density that is more destructive. But the authors make the mistake of assuming that lower density urban areas are associated with higher amounts of private green space and lower amounts of public green space: "…..In the case of more dispersed forms, small pockets of public green space and large amounts of private green space remain……"<br><br>Actually, the inflated price of urban land consequent on regulations creates major pressures on the public owners of green space, to sell it for development, especially if a decreased urban footprint is a stated policy objective. Limiting the policy-induced "reduction in urban footprint" to PRIVATE space, has the effect that literally halving the private living space per person only reduces the total urban footprint by something like 15% to 25%. In fact the doubling of population on the 30% to 40% of an urban area that actually typically IS "housing", places pressure on the "public" land that is part of the remaining 60% to 70%. Schools, parks, hospitals and public buildings; and space for infrastructure and rights-of-way. If road space is not expanded, the congestion will more than negate the already minimal gain in shorter travel distances.<br><br>Peter Gordon, in "Thinking About Economic Growth: Cities, Networks, Creativity and Supply Chains for Ideas" (2012 – Annals of Regional Science), reiterates a claim he has been making for years, that urban economies find their own balance between agglomeration economies, and associated dis-economies of congestion, land prices, and transport costs. The danger with "forced" agglomerations as opposed to agglomerations that form naturally, is that the dis-economies end up outweighing the economies. But a line of research associated with the effects of the UK's Planning system, suggests that the UK's strict planning and inflated urban land prices actually "price out" potential participants in agglomeration economies. The McKinsey Institute (1998) "Driving Productivity and Growth in the UK Economy" specifically state that they doubt that anything like Silicon Valley could occur anywhere in the UK. Alan W. Evans (Spatial Economics Research Centre, University of Reading) expands on this research in his 2004 book, "Economics and Land Use Planning".<br><br>The result is serious losses of efficiency from agglomeration economies foregone, accompanied by "dispersion" driven not by natural economic balancing mechanisms but by a "pricing out" effect on households and businesses, and worst-case congestion. Social inequities and stresses result from inflated housing costs without any commensurate gain in urban efficiency; in so far as emissions might be reduced, it is the deprivation of households discretionary income that is responsible, usually accompanied by reduced rates of child-bearing household formation.<br><br>The affordability of housing associated with minimal restraint on horizontal urban growth, is also inevitably associated not just with greater consumption of private land per person, but with less cost pressures on developers and public agencies to turn the maximum possible amount of space into "earning" property. The prices of real estate per se tend to confuse us regarding the cost of the "raw" land. City A and City B might have new 3-bedroom homes coming to market with a 100% price difference between them; which is entirely typical if one is growth-constrained and the other is not. But in addition to this, the home in the affordable city will have a quarter | Noted: The whole section is rewriten and reframed and these texts are deleted in SOD. |
| 6012 | 12 | 15 | 10 | 15 | 11 | Sense of the sentence is not correct. Stockholm is a city IN Sweden. The comma suggests that Sweden is a city. | Noted: The whole section is rewriten and reframed and these texts are deleted in SOD. A more structured discussion |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12458 | 12 | 15 | 14 | 15 | 28 | Could some references be given to these important paragraphs? | Noted: The whole section is rewriten and reframed and these texts are deleted in SOD. A more structured discussion |
| 2502 | 12 | 15 | 15 | | 28 | important - to note the decisions made today about the location of development of all sorts influences the energy and CO2 emissions in the future - much better to have efficiency now than try to retrofit it | Accepted |
| 11034 | 12 | 15 | 15 | | | The text's statement 'There is great potential for mitigation through the manipulation of urban structure and form' could be replaced by: 'There is significant longer-run potential for mitigation through changes to urban structure and form (e.g. Ewing et al., 2007; Chapman, 2008).' [Ewing, R., Bartholomew, K., Winkelman, S., Walters, J., & Chen, D. (2007). Growing Cooler. The Evidence on Urban Development and Climate Change. Washington, D.C.: Urban Land Institute http://www.smartgrowthamerica.org/documents/growingcoolerCH1.pdf ; Chapman, R. (2008). Transitioning to low-carbon urban form and transport in New Zealand. Political Science 60(June), 89-98 http://pnz.sagepub.com/content/60/1/89.full.pdf.] | Noted: The whole section is rewriten and reframed and these texts are deleted in SOD. A more structured discussion on sinks is in 12.8.2. |
| 3354 | 12 | 15 | 30 | 16 | 15 | Is a good introduction into a system perspective. But of interest is mainly the bottomline, what it means for GHG emissions, coming thereafter. Hence, this page could possibly deleted. Starting with p.16 l.16 is feasible. | Taken into account: The new chapter outline drastically shortens meta-comments and omits most of the text mentioned here. Figure 12.1, however, is necessary to explain total emissions |
| 5984 | 12 | 15 | 38 | 16 | 8 | A systemic approach should not only refer to physical flows. You should mention the fact that in contrast to the physical system, governance and planning structures, institutions and regulations remain sector-specific today; therefrom emerge challenges of (horizontal) coordination between these sectors | Noted: This section is reframed and rewritten and these text are deleted in the process. Thus the comment is no |
| 14708 | 12 | 15 | 4 | 15 | 4 | Is there any citation supporting this claim? I heard that private green spaces had often a marginal positive effect in keeping nature's biophysical processes intact. But I confess I am not a specialist of this question. | Noted: The whole section is rewriten and reframed and these texts are deleted |
| 17576 | 12 | 15 | 45 | 15 | 45 | "Goods" is not equivalent to resources, products or emissions. Just delete "of goods" and this sentence will work fine. | Noted: This section is reframed and rewritten and these text are deleted in the process. Thus the comment is no |
| 5521 | 12 | 15 | 46 | 16 | 1 | High density populations can allow for more innovative and energy neutral waste management as well- for example co-digestion of food wastes and wastewater for energy recovery, separate collection and anaerobic digestion followed by composting of food and yard debris- this also allows for less frequent pick up and reduced volume of conventional wastes- see Bolzonella et al., 2006, Booker et al, Struvite formation in wastewater treatment plants: opportunities for nutrient recovery, Case study in San Fransisco- www.epa.gov/region9/waste/features/foodtoenergy/wastewater.html | Noted: This section is reframed and rewritten and these text are deleted in the process. Thus the comment is no longer relevant. |
| 18794 | 12 | 15 | 5 | 15 | 7 | Reference missing. | Noted: The whole section is rewriten and reframed and these texts are deleted |
| 2501 | 12 | 15 | 7 | | | evidence? | Noted: The whole section is rewriten and reframed and these texts are deleted |
| 2372 | 12 | 15 | 7 | | | "ecosystems" rather than "biospheres" | Noted: The whole section is rewriten and reframed and these texts are deleted |
| 12457 | 12 | 15 | 8 | 15 | 13 | The paragraph describes the cobenefits of urban green space e.g the access to recreational space and esthetical experiences. This might reduce the need for motorised vehicle transportation to more far away options with GHG mitigation effects in addition to the carbon sink effect. Please consider to reflect this, provided that there is sufficient litterature. | Noted: The whole section is rewriten and reframed and these texts are deleted in SOD. A more structured discussion on sinks is in 12.8.2. |
| 17288 | 12 | 15 | 8 | | 13 | it will be important to make in the future economic assesments of this cobenefits | Noted: The whole section is rewriten and reframed and these texts are deleted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 5727 | 12 | 15 | | | | The view presented here, that urban form can be shaped by regulations, fails to take into account the costs imposed on society via distorted real estate markets. There is a very real danger that the "success" of policies will be interpreted as having occurred via "more efficient urban form" rather than via the mechanism of reduced household discretionary income. It is likely that spending on everything in the household budget, not just spending on travel and energy, is reduced by the inflated housing costs that always result under schemes of regulatory rationing of urban land supply and the creation of quasi-monopoly rent for the owners of land favoured by the "plans". | Noted: The whole section is rewriten and reframed and these texts are deleted in SOD. |
| 6013 | 12 | 15 | 14 | 15 | 28 | The authors regard potentials for mitigation in fast growing, slow growing and stagnant cities. What will happen to shrinking cities? | Noted: The whole section is rewriten and reframed and these texts are deleted |
| 5728 | 12 | 15 | | | | The authors are to be commended for discussing the “systemic” nature of cities and the global economy of which they are a part. It is also important that urban planners take account of the widely disparate path dependent evolution of different cities, so that policies that have succeeded in one particular type of city are not mistakenly applied to other types of city. For example, expecting Detroit to turn into NYC without “Wall Street” being located there, just by imposing mandates on the kind of urban form Detroit is to have, would be the height of stupidity. Yet volumes of advocacy work regarding urban planning today are making assertions this absurd. The term “Manhattanise” or “Manhattanisation” will be found via Google, to be one in common use by politicians and advocates of “sustainable” urban form. | Noted: The whole section is rewriten and reframed and these texts are deleted in SOD. |
| 5985 | 12 | 16 | | 16 | | There is no explanation of this figure. What are numbers 1-6? Why are lines of differing size? What is others in Built Environment? The human settlement sectors are incomplete, urban governance is missing completely. What is the statement of this figure? | Taken into account: The figure is redrawn and relevant information are added in SOD |
| 6014 | 12 | 16 | | | | What are the circles with numbers 1-6 standing for? Why do these several arrows vary in their width? Furthermore, the figure 12.1 is not explained in the text. What is others in Built Environment? This figure is much too complex and incomplete. | Taken into account: The figure is redrawn and relevant information are added in SOD |
| 17577 | 12 | 16 | | | | What do the circled numbers in the figure represent? | Taken into account: The figure is redrawn and relevant information are |
| 12845 | 12 | 16 | | | | In the European Nitrogen Assessment also a chapter was devoted to urban landscapes, titled 'Nitrogen flows and fate in urban landscapes' . IPCC figure 12.1 has the same layout as ENA's figure 12.6. I propose to pay some attention in IPCC chapter 12 to non-GHG's as they use the same methodology and encounter the same problems. Maybe it can be done by producing a new Box, or insert some additional text. I have attached the ENA chapter with interesting material from the city of Paris. | Taken into account: The figure is redrawn and relevant information are added in SOD. But Including a box referring to nigrogen in Paris would be out of scope for this chapter. |
| 16656 | 12 | 16 | 13 | 16 | 22 | This is introductory material that should come in the first few paragraphs of the chapter introduction. | Noted: This section is reframed and rewritten and these text are deleted in the process. Thus the comment is no |
| 6015 | 12 | 16 | 16 | 16 | 22 | Source is missing for the percental values. | Accepted: The source is Allwood et al 2010. But this text is removed in revision |
| 17289 | 12 | 16 | 5 | | 8 | this issue is very important to develop ,for example there is the bilan carbone of ADEME agency that treats CO2 emissions measures with metabolism analysis. | Noted: This section is reframed and rewritten and these text are deleted in the process. Thus the comment is no longer relevant. Bilan Carbon is quoted |
| 11035 | 12 | 17 | | | | suggest delete, and save space | Taken into account: The figure is deleted in rewriting of the section. |
| 6016 | 12 | 17 | | | | Is it possible to classify the "other" (44%) industrial carbon emission into sub-categories?! | Noted: The figure is deleted in rewriting |
| 18659 | 12 | 17 | | | | (Interesting figure on page 17 on global energy and process related CO2 emissions by sector for year 2006. Steel stands for 25% of industrial emissions!<br>Source: Allwood et al, 2010) | Noted: The figure is deleted in rewriting of the section. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3171 | 12 | 17 | 1 | | | doesn't figure 12.2 belong in the industry chapter? It doesn't really seem to be about human settlements centrally. Similarly, the central point of figure 12.1 is hard to understand. The main text says that the figure makes the point that human settlements are "metabolic systems" but the figure just makes a much simpler point (with no units) that material flows are interconnected. Perhaps useful with TSU help to work up one big iconic figure that really nails down how much and where settlements do this metabolic function. | Taken into account: The figure is deleted in rewriting of the section. |
| 17578 | 12 | 17 | 11 | 17 | 11 | While term "urban mining" is unfortunately used inconsistently, the appropriate usage refers to recovering materials from in-use stocks (either actively used stocks or dormant stocks). That is, it does not refer to recycling of discards (i.e., products and materials already leaving in-use stocks). See Klinglmair, M. and J. Fellner. 2010. Urban mining in times of raw material shortage: Exemplified by copper management in Austria during World War I. Journal of Industrial Ecology 14(4): 666-679. | Accepted: Will be taken care in the next round after SOD. |
| 12459 | 12 | 17 | 13 | 17 | 21 | Chinas proportional high share, about half of the global production of steel and cement is here linked to the rapid urbanisation phase in China. However, to put things in perspectiv, it should be mentioned in the text that a significant part of Chinas production of steel and cement is exported, and hence, is not only linked to the rapid utbanisation in CHina. | Noted: While section is rewritten, this text is still in 12.1.5 of SOD. This will be checked in the next round. |
| 2503 | 12 | 17 | 28 | | 29 | note - evidence in several countries - EU, USA (not Japan) of peak car use | Noted: While section is rewritten, this text is still in 12.1.5 of SOD. This will be |
| 18797 | 12 | 18 | 18 | 18 | 23 | Give number estimates | Taken into account: Second sentence of this para has been retained in 12.2.2.4. Some related numders are offered in |
| 12460 | 12 | 18 | 19 | 18 | 19 | Please, clearified whether the figure 1,527,000 km2 is additional or the total urban area in 2030? | Taken into account: this is additional. But the text is removed in rewriting on |
| 2505 | 12 | 18 | 24 | | | several refs missing - Muller et al, Bulkeley et al 2012, Strohbach and Hass, 2012, Chaparro and Tarrodos, 2009 etc…. | Noted |
| 2506 | 12 | 18 | 29 | | 30 | Question about whether the 2C is a 2050 target - it has been downgraded and not agreed | Noted |
| 18798 | 12 | 18 | 41 | | | Reference Chapters 3 and 4 | Noted |
| 18799 | 12 | 18 | 45 | | | "can not be activated" instead of "underestimated" | Noted but the text is deleted in rewriting |
| 2507 | 12 | 18 | 50 | | | What is urban mining - explain | Noted: Will be addressed in next round |
| 2504 | 12 | 18 | 7 | | | rail not rails | Editorial |
| 2509 | 12 | 19 | | 21 | | Generally the section on metabolism is good - maybe make more of the need for consistency and the use of IO/LCA | Noted: but the section has gone through massive restructuring and rewriting. |
| 2510 | 12 | 19 | | 21 | | also need to link the main points together - at present left as individual points - there are strong interrelationships | Noted: but the section has gone through massive restructuring and rewriting. |
| 2508 | 12 | 19 | 12 | | 15 | This sentence is repeated on p23 | Taken into account: The text now is at |
| 18800 | 12 | 19 | 14 | | | Are there LCAs for this? What would be "ideal"? | Noted: The text is in 12.3.8 is SOD. No LCA information provided. |
| 12461 | 12 | 19 | 21 | 19 | 22 | Please consider to link this to what is said in paragraph 12.3.2.4, if appropriate. | Noted |
| 2373 | 12 | 19 | 6 | | | This would be an appropriate place for the Kennedy, Pincetl ..(2011) reference, incorrectly used on p. 27 | Noted |
| 18155 | 12 | 19 | 39 | 19 | 42 | The sentence "material<br>recovery and recycling from waste offers maximum benefit with regard to GHG savings" is not valid as a general statement. It may be true in specific cases, but there are many examples where transport and emissions from the recycling process override the savings from the recycling process. Using recycled materials instead of virgin materials does not imply less emissions as a general rule. | Noted: The comments belong to page 27, not page 19. But the text is deleted in rewriting of the section. |
| 16658 | 12 | 20 | | | | Page 20 lines 5-10 and figure 12.3 – I don't see the relevance. Omit. | Noted: The figure which refers that has been taken off in revising of this section |
| 2374 | 12 | 20 | 1 | 20 | 14 | The material here on international trade might be cut | Noted, but the text has gone massive |
| 10404 | 12 | 20 | 11 | | | The figure cannot prove that the decreasing relationship is linearity.R^2 is too small. The the decreasing relationship maybe nonlimear . | Noted: The figure which refers that has been taken off in revising of this section |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18802 | 12 | 20 | 20 | | | "income main driver of consumer emissions" - check linkage to other chapters also covering this | Noted: Chapter cross linkages will be done in the chapter after SOD. |
| 17579 | 12 | 20 | 30 | 20 | 30 | Why "however"? What is the contrast that is being indicated here? | Noted |
| 10207 | 12 | 20 | 35 | 21 | 2 | What about consumption of goods and services? | Noted: The chapter has gone through massive change from FOD. |
| 11036 | 12 | 20 | 8 | | | The text reads: 'This evidence therefore indicates that the smaller the territorial boundary of a spatial entity, the more important the role of that entity might be in the global system of production and consumption.' However, a better statement would be: 'This evidence indicates that the smaller the territorial boundary of a spatial entity, the more important the role of that entity in terms of the global exchange of emissions responsibility.' | Noted: The figure which refers that has been taken off in revising of this section and the comment is no longer relevant. |
| 15750 | 12 | 20 | 14 | 21 | | Application of compact city and mixed use should be evaluated in the context of environmental externalities which is missing in the discussions. Table 12.X should read as Table 12.1 | Noted: but the section has gone through massive restructuring and rewriting. Compact city and mixed use rlated discussion have been consolidated in 12.4 in SOD. We will furtther pay |
| 17115 | 12 | 20 | 6 | | | The International Local Government GHG Emissions Analysis Protocol (IEAP) is the first effort that provides a detailed explanation of government and community GHG emissions. LGOP is the first national (US) supplement of IEAP and it focuses only government emissions.GPC, developed by ICLEI, C40 and WRi in 2012 presents a more updated vision for community emissions. | Noted, but the text has gone massive transformation and this comment is not relevant.In Gaps of knowledge, we have mentioned that different accounting protocols yield significantly different |
| 2513 | 12 | 21 | | 94 | | the list of mitigation opportunities is not complete - this needs to be addressed | Noted: The table is revised to make a better sense . The table will be relooked |
| 7312 | 12 | 21 | 14 | 22 | 4 | It's not clear what this table is trying to accomplish for an "average" city [as stated in the caption]. Currently, no numbers are given (and it's unclear whether the authors plan to add numbers in subsequent drafts), so only qualitative "items" are listed. Also, what is meant by "average" city--average GDP/cap? average population? Given the diversity of the world's cities, is this meaningful? Would recommend deleting this table in its present form...IF deleted, pls ignore next 2 comments which also pertain to this table. | Rejected: The table is revised to make a better sense . The table will be relooked in next round. |
| 7313 | 12 | 21 | 14 | 22 | 4 | "waste" is missing "co-benefits" of waste management, including protection of human health & the environment, renewable energy benefits | Noted: The table is revised to make a better sense . The table will be relooked |
| 7314 | 12 | 21 | 14 | 22 | 4 | "waste" is also missing "drivers", including waste minimization/recycling, public health [= major driver for waste management, as well as a "co-benefit"] | Noted: The table is revised to make a better sense . The table will be relooked |
| 13243 | 12 | 22 | | | | (mitigation opportunities) : polycentric structure and transport mode relationship is not documented (paragraph 12.4.3.3 is poor). | Noted: The table will be further carefully checked in next round |
| 17580 | 12 | 22 | | | | The abbreviations used in this table should be defined in table notes. "Inside" and "outside" should be explained as these are not standard terminology. | Noted: The table will be further carefully checked in next round |
| 5876 | 12 | 22 | | | | Column 5 / agric./forestry: low carbon buildings will most probably have a higher share of wood instead of steel, aluminum or concrete, so striving for low-C buildings rises demand for wood. Also: the colour coding is not explained. See, for example, Sathre, R. & J. O'Connor (2010). A Synthesis of Research on Wood Products & Greenhouse Gas Impacts. Vancouver, B.C., FPInnovations. TR - 19R, 123 p. and the literature cited therein for examples for carbon-low constructions. | Noted: The table will be further carefully checked in next round |
| 11318 | 12 | 22 | | | | The use of bicycles should be treated as a separate " zero carbon urban transport". It is important to distinguish the use of bicycles, that use no fossil fuels, from other modes of transport that are fuel efficient. This is also to encourage use of bicycle both in urban and peri-urban centres. | Noted: The table will be further carefully checked in next round |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12462 | 12 | 22 | 1 | | | Changing food consumption as a mitigation of GHGs will not only effect the emissions from animals and manure, but also N2O-emissions from agricultural soils and carbon emissions from land use and land use change as the production of animal products occupies extensive land areas. This is stated clearly in WGIII chapter 11. Therefor it is suggested to add the words "emissions from land use and land use change" | Noted: The table is revised to make a better sense . The table will be relooked in next round. |
| 17190 | 12 | 22 | 13 | 22 | 13 | See my comment on the urban heat island above (cf. page 13, lines 38-39). | Noted |
| 5523 | 12 | 22 | 20 | | | Energy for heating is also signficantly reduced in high density developments- for multiple family dwellings | Noted: But the figure is only about |
| 12463 | 12 | 22 | 20 | 23 | 10 | Differences in electricity consumption between countries can not only be explained by urban density. The rate between electricity prices and other energy carriers will also be of importance. Norway has electricity prices, much lower than all other european countries whilst prices for oil and gas are at least at he same level as the rest of Europe. Because of this, electricity is used extensively for heating and industrial purposes which results in a very high per capita consumption of electricity. Similar differences could also be the case in other countries. This should be reflected in the text. Total energy use instead of only from electricity could be more correct. | Accepted: This will be incorporated in the next round |
| 17191 | 12 | 22 | 20 | 23 | 4 | The graph and the text is rather misleading as there is no mentioning of the fact that in some of the countries (especially Norway) nearly all electricity is produced from hydroelectrical power plants, thus resulting in no CO2 emissions. This electricity has traditionally been delivered at a low cost for the consumers, and in Norwegian cities electricity accounts for most space heating as well as other stationary energy use in dwellings as well as commercial buildings. Also, a considerable part of industrial energy use has been from electricity. Also in Sweden and Finland electricity makes up a high proportion of the energy used for the above-mentioned purposes, although not as high shares as in Norway.<br>Moreover, I doubt very much that the figures on urban densities are reliable. According to the graph, Norwegian cities are on average some six time denser than Turkish cities, which is obviously not the case in reality. I suspect that the authors of the graph have calculated densities within administrative borders instead of within the urbanized land. However, any effect of urban density on the need for electricity has nothing to do with whether or not a city municipality includes a lot of nonurban (rural) land within its administrative borders.<br>The text and the graph from page 22, line 20 to page 23, line 4 is thus highly misleading and should be deleted. | Noted: The figure will be given due check and supporting texts will be done carefully in the next round. |
| 2375 | 12 | 22 | 5 | | 19 | There's some repeat here of earlier material | Taken into account: The sections are |
| 17581 | 12 | 22 | 8 | | 8 | What is NMT? | Taken into account: Non motorized |
| 14711 | 12 | 22 | 4 | 26 | 16 | This whole section seems redundant with section 12.3.2 | Taken into account: The section has been rewritten and this redundency is |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5729 | 12 | 22 | | | | The claim that increased urban density involves greater efficiency of energy use in transport, is a controversial one. Newman and Kenworthy's influential work has been critiqued by several authors. For example, see Michael Breheny (1995) "The Compact City and Transport Energy Consumption"; Ray Brindle (1994) "Lies, Damned Lies and Automobile Dependence"; Ray Brindle (1996) "Transport and Urban Form: The Not-So-Vital Link"; Alan W. Evans (1998) "Dr Pangloss Finds His Profession: Sustainability, Transport and Land Use Planning in Britain"; Alan W. Evans (2012) "Planning, Density, Fuel Use and Emissions: a Survey"; Michael Breheny and Ian Gordon (1997) "Densities in the Sustainable City"; Ian Gordon (1997) "Densities, Urban Form and Travel Behaviour"; Ian Gordon (2008) "Density and the Built Environment"; Michael Wegener (1998) "Sustainable urban spatial structures: do we need to rebuild our cities?"; Marcial H. Echenique et al, (2012) "Growing Cities Sustainably: Does Urban Form Really Matter?"; Steve Melia et al (2011) "The Paradox of Intensification"; and Paul Mees (2010) "Density and Transport Mode Choice in Australian, Canadian and US Cities".<br><br>The reduction in urban footprint from increasing the density of housing, is not proportional to the increase in housing density, because typically more than 50% of an urban area is not housing. However road congestion increases in an exponential relationship with housing density. This is because roads on which traffic once flowed freely at crucial times of the day, become "stop-start" and end up carrying FEWER vehicles at those times of day than when housing density was lower. "Spill-back" of traffic occurs onto previously uncongested parts of the network. "Mode shift" is never sufficient to compensate for this effect. Even including Manhattan's level of density in data sets, finds no reversal of the trend to addition of numbers of vehicles in the given road space, as additional population is added. The rate at which vehicles are added merely reduces slightly for each increase in the population in the given space.<br><br>The data on trip times (as opposed to distances) and local air pollution, do not favour higher densities.<br><br>Toronto Board of Trade Paper:<br><br>Barcelona 48.4 minutes (ROUND TRIP)<br>Dallas 53.0<br>Milan 53.4<br>Seattle 55.5<br>Boston 55.8<br>Los Angeles 56.1<br>San Francisco 57.4<br>Chicago 61.4<br>Berlin 63.2<br>Halifax 65.0<br>Sydney 66.0<br>Madrid 66.1<br>Calgary 67.0 | Noted: This section has been restructured and rewritten. All density related discussions have been moved to 12.4 in SOD in 12.4.1 to 12.4.7. We will further look into these issues carefully in the next round. |
| 18034 | 12 | 22 | 11 | 22 | 11 | Newman and Kenworthy 1996 showed a correlation between density and fuel consumption and inferred that lower density cities cause higher fuel consumption. However, an alternative explanation is that for those cities that have cheap travel relative to income, people tend to travel further in order to have more living space, as property prices are lower outside central areas. Thus, lower real transport cost is the cause of lower density rather than higher density being the cause of lower fuel consumption. | Noted: This text is deleted in restructuring and rewriting of this section. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18035 | 12 | 22 | 12 | 22 | 12 | Mitchell et al (2011) This paper was based on case studies which found that the effects of alternative spatial planning policies in the UK such as a more compact or more dispersed pattern would have a relatively small impacts on energy consumption compared to the policy trend over a 30 year period. A more recent paper describes the overall findings of this research:- Echenique Hargreaves Mitchell and Namdeo 2012 Growing Cities Sustainably; Does Urban Form Really Matter? Journal of the American Planning Association Spring 2012, Vol. 78, No. 2 pp. 121-137 . | Noted: The text to which this reference belongs to is deleted in restructuring and rewriting of this section. |
| 2376 | 12 | 23 | | | | The fit in this plot is poor; and the data shown perhaps suggests that cold climate or latitude is the main factor behind electricity use. | Noted: The figure will be given due check and supporting texts will be done |
| 13244 | 12 | 23 | | | | poor regression : we suggest to suppress that figure. | Noted: The figure will be given due check and supporting texts will be done |
| 17582 | 12 | 23 | 13 | 23 | 13 | What is "total settlement forms"? | Taken into account: The phrase doesnot appear in the revised chapter |
| 10405 | 12 | 23 | 4 | | | The sample points in the figure are not distributed symmertrical along the line .So the result is not convinced. | Noted: The figure will be given due check and supporting texts will be done |
| 18803 | 12 | 23 | 7 | 23 | 10 | Already mentioned above, try do reduce reduncancy: Consider shortening here and focussing on ref. to 12.3 | Noted: The texts has gone massive change in rewriting of the section. |
| 5730 | 12 | 23 | | | | Anthony Downs (2007) “A Growth Strategy for the Greater Vancouver Region”:<br><br>".....The cost of land poses a key dilemma for urban planners everywhere who want to concentrate jobs together so they can be best served by public transit. Such concentration raises the costs of land near centers; in fact, it would confer a monopoly advantage on landowners who owned such land and could exploit firms trying to locate there. Now firms want to locate elsewhere to cut their land costs.<br><br>Planned concentration of jobs in a few centers is not consistent with private ownership and control of land. Some type of collective control over that land would be necessary to prevent monopolistic exploitation of land values. In theory, this could be done with high land taxes in such areas and special zoning rules. But adopting those devices is politically difficult in a free enterprise economy.....<br><br>".....A similar but less intensive dilemma concerns land near transit stops, where it would be most efficient to concentrate high-density housing and jobs. That also creates ownership monopolies over such land unless it is specially controlled or taxed. Yet focusing development near transit stops is a key to using more transit....."<br><br>The famous example provided by Curitiba, Brazil, did initially involve large amounts of compulsorily acquired land for “transit oriented development”, although most advocates analyses of Curitiba's wonderfully successful system are silent on this point, which is actually a crucial one. See Jonas Rabinovich, "Curitiba: Towards Sustainable Development" (1992), which at least mentions this reality although without identifying its importance. Curitiba’s planners also had the wisdom to go with buses and busways rather than rail based systems. Buses can pick up passengers anywhere before entering the high-speed busway, which has telling advantages over rail based systems that require “transfers” from other modes. Bus based systems can also be adapted to follow later urban development wherever it proves popular, rather than imposing self-defeating distortions in land market prices with fixed rail routes and strictly “planned” integration of transit and development.<br>Curitiba has had considerable problems under the free market since the original project was completed, with lower income people being "priced out" of the transit-served locations, and further development at these locations being stalled by high land prices. | Noted: The section has been re-written. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6018 | 12 | 24 | 1 | 24 | 11 | Sub-Sub-Chapters could be summarized. Maybe it would be more structured if the authors refer to polycentric structure, finger grain systems and land use mix in section 12.3 and give there a brief overview.<br>--> text would be shortened<br>--> sub-sub-chapters do not appear that short and empty | Taken into account: The whole section is restructured and rewritten. |
| 2377 | 12 | 24 | 1 | 24 | 11 | Could cut given the overlap with 12.3 | Taken into account: The whole section is restructured and rewritten. |
| 17192 | 12 | 24 | 1 | 24 | 4 | See my above comments on polycentricity related to the text on page 14, lines 4-12. Why are, by the way, the same issues as in section 12.3 repeated here on page 24? | Taken into account: The whole section is restructured and rewritten. |
| 6017 | 12 | 24 | 2 | 24 | 2 | Source is missing. This section is not correct. High density does not lead to higher emissions. Higher emission depends on the type of density etc. | Taken into account: The whole section is restructured and rewritten. |
| 2378 | 12 | 24 | 36 | | | These embodied energy percentages seem untypically high (although it depends on climate). Embodied energy in building materials is typically of the order 20 kWh/m2/yr, but can be as high as 100 kWh/m2/yr in some cases, see Sartori and Hestnes (2007) Energy use in the life cycle of conventional and low-energy buildings: A review article Energy and Buildings 39, 249–257. | Noted: These texts are deleted in restructuring and rewriting of the section. |
| 18805 | 12 | 24 | 36 | 24 | 37 | 60%/67% - have figure /table on this? | Noted: These texts are deleted in restructuring and rewriting of the section. |
| 5986 | 12 | 24 | | 24 | | This is wrong. You already state this in chapter 12.3.2.3 with reference to a source from 1995. It is wrong, that high density leads to higher emissions. As you say in other chapters, it depends on the type of density etc. | Taken into account: This is deleted in the rewriting of the chapter. |
| 12585 | 12 | 24 | | | | Urban greenscapes has many co-benefits other than attractiveness and limited C-sequestration. It has health (both mental & physical) benefits, support bio-diversity (thus alignining with goals of CBD), promote social interaction (increase Happiness Index), raise property values, reduces health costs, induce passive cooling, conserve rain water, regulate urban air temperatures and so on.... risks involved are unscientific urban plantation (location, species, spacings), poor planning/design/implementation and inadequate maintenace and management bu urban/civic bodies. | Taken into account: This is moved to 12.8 section of the chapter to be elaborated in the context of co-benefit and other contexts. |
| 5524 | 12 | 24 | | | | As per comments on table, this discussion is appreciated. Water use including reclaimed water, grey water and stormwater systems should be included in this section | Noted: This is moved to 12.8 section of the chapter to be elaborated in the |
| 11714 | 12 | 24 | 28 | 25 | 221 | This section should be coordinated with chapter 9. Percentage of GHG emissions in building sector (line 29-30) is different from chapter 9. Detailed explanation on the effect of building orientation, compactness, and configuration (line 39-41) doesn't appear in chapter 9. The role of building design and urban design should be distinguished and it should be emphasized both roles are important. | Noted: We have deleted this section in restructing and rewriting. We are not discussing buildings any more here but only in the context of integrated urban |
| 17584 | 12 | 25 | 16 | 25 | 20 | This sentence is very long. Delete "due to the high energy use related to the replacement of the building stock compared to the energy use of renovation measures" | Noted: These texts are deleted in restructuring and rewriting of the section. |
| 17193 | 12 | 25 | 22 | 26 | 16 | It seems a bit confusing to place the text of section 12.4.3.8 in a separate part of the chapter from the texts dealing with the impacts of urban structure/form on travel behavior. Moreover, I miss a discussion of the traffic-generating effect of expanding the road capacity in congested urban areas. See Litman, 2011; Noland & Lem, 2002; SACTRA, 1994; Mogridge, 1997; Næss et al., 2001. | Noted: The whole section is restructured and rewritten. |
| 11037 | 12 | 25 | 23 | | | The use of the term 'boundary conditions' in 'Transport generates assorted boundary conditions for social organization…' is unnecessary jargon and should be put more simply. | Taken into account: Removed such word in revised text. |
| 17585 | 12 | 25 | 24 | 25 | 25 | The logic of this claim is unclear. Why does the DISTINCTIVENESS of the amounts of infrastructure for urban transport mean that urban transport must consume VARIED amounts of material and energy? | Rejected. Different types of transport infrastructures demand different ammount of materials per passenger/km. In that sense, public transportation is more efficient in terms of material and energy demand per passenger/km. However among each |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2515 | 12 | 25 | 28 | | 30 | These are US figures - there is huge variability, even in the US - this needs to be brought out - the land take in Dallas versus that in New York. But in many emerging cities the amount of land for streets is about half that in other cities - and the street is used for so many different activities. | Taken into account: The text is deleted in restructuring and rewriting |
| 17583 | 12 | 25 | 3 | 25 | 4 | This sentence is garbled. | Noted: These texts are deleted in restructuring and rewriting of the section. |
| 2379 | 12 | 25 | 41 | | | Presumably the units here are GJ/year. I think the term "most Chinese cities" might be clarified, or is it China on average? Transport energy use in China's largest cities is much higher than 2 GJ/year. For example, in 2005, Beijing was 18.2 GJ/year; Shanghai 15.0 GJ/year. (Source: Sugar, L., C.A. Kennedy, E. Leman, 2012. Greenhouse Gas Emissions from Chinese Cities, Journal of Industrial Ecology, DOI: 10.1111/j.1530-9290.2012.00481.x) | Taken into account: The text is deleted in restructuring and rewriting |
| 18808 | 12 | 25 | 41 | 25 | 42 | If more data can be acquired, please consider having a FIGURE with examples from a multitude of countries indicating the range of energy consumption (similar to Fig.12.4). Ideally have this not only for transport but also other types of energy consumption of urban areas. | Rejected: Data not available |
| 2516 | 12 | 25 | 42 | | 46 | These units are inconsistent and totally meaningless - consistent metrics should be used throughout | Noted |
| 12464 | 12 | 25 | 43 | 25 | 46 | The units used, ton/capita/yr of material- energy input, gas-output are difficult to understand. Also the ton of solid residues and 160+2ton/capita/yr of material stock be explained or clarified | Noted |
| 18810 | 12 | 25 | 45 | | | "160+2" unclear | Noted: The text is deleted |
| 5731 | 12 | 25 | 47 | 26 | 2 | Urban planning has unintended consequences because of the way urban land markets operate. It is far more effective and far less costly to use taxes and fees on the resources and the infrastructure for which less consumption is desired.<br><br>For example, see<br><br>CHESHIRE, Paul, and SHEPPARD, Stephen: "The Welfare Economics of Land Use Planning" (2001)<br><br>CHESHIRE, Paul, and SHEPPARD, Stephen: The introduction of price signals into land use planning decision-making : a proposal (2005)<br><br>CHESHIRE, Paul, and VERMEULEN, Wouter: "Land markets and their regulation: the welfare economics of planning" (2009)<br><br>CHESHIRE, Paul: "Urban land markets and policy failures". (2009)<br><br>CHESHIRE, Paul (2009): "Urban Containment, Housing Affordability and Price Stability: Irreconcilable Goals"<br><br>ANAS and Rhee (2006) “Curbing excess sprawl with congestion tolls<br>and urban boundaries”<br>Anas and Rhee (2006) “When are urban growth boundaries not a second-best to congestion tolls?”<br><br>The distinguished urban economist Edwin S. Mills, in “Truly Smart Smart Growth” (1999) comments that “……governments’ job is to get the prices right…..” not to impose blunt instrument policy restrictions on how and where people are to live. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17308 | 12 | 26 | | 26 | | This chapter, and the chapter on land use planning / spatial planning, ignore the important options local government have to plan for the siting of renewable energy installations and plants. Even with national regulation incentivizing renewables, such as feed-in tariffs, it must be ensured that there are sites available for the installations. In many countries, local governments are in charge of this. | Noted |
| 17586 | 12 | 26 | 15 | 26 | 16 | Awkward sentence structure | Editorial |
| 7498 | 12 | 26 | 17 | 26 | 18 | “Municipal energy utilities can use efficient local electricity and heat generating plants and renewable energy sources such as solar and wind”. Biomass and municipal waste can also be used to generate electricity and supply district heating and hot water. | Accepted |
| 18812 | 12 | 26 | 27 | 26 | 28 | Link to Ch.9 (using rooftops for renewables) | Noted |
| 15463 | 12 | 26 | 33 | 26 | 39 | Additionally, the concept of the Smart Grid is being supplanted by the Networked Energy Web, which is natural progression in the field of ICT. They define it as the convergence of energy efficiency, smart grid, and distributed power generation. In some circles, this network also includes waste management, resource circulation, agriculture, and other material flows. See: http://www.americanprogress.org/wp-content/uploads/2012/08/0709_CleanEnergyWeb2.pdf | Taken into account: The text is deleted in restructuring and rewriting |
| 18813 | 12 | 26 | 37 | 26 | 38 | Link to Ch.8 (electric vehicles as storage system) | Taken into account: The text is deleted in restructuring and rewriting |
| 18815 | 12 | 26 | 42 | 26 | 43 | Link to Ch.10 (sewage treatment) as Ch.10 covers waste | Taken into account: Cross referenced |
| 5525 | 12 | 26 | 43 | 27 | 5 | It is important in this discussion to differentiate between centralized water treatment infrasctructure and decentralized systems. In areas where centralized systems have not been constructed it is doubtful that centralized systems based on a model of using water as a conveyance for wastes makes sense. See Gaulke et al., 2012- and this does not even consider water availability | Accepted: see 12.4.11 of SOD. An elaborate discussions is not possible due to space constraints. |
| 12465 | 12 | 26 | 45 | 26 | 46 | It seems a little unclear how the "oil burned" is related to Water management. Is it used for the operation of diesel engines for pumping and treatment of water/sewage? And does this translate into 3,4 million barrels in m3, tons, GWh or emissions of GHGs and related to the population served and/or the overall GHGs from Mexico City? Please claify. | Taken into account: It is oil burned in conveying water through tankers. The section has been revised and this part of the text has been deleted. |
| 12466 | 12 | 26 | 47 | 26 | 48 | The sentence" Australian Water Industries GHG-emissions have been related up to 76 % to imported electricity use" needs some improvement to be understandable. | Accepted: The text has been revised |
| 17587 | 12 | 26 | 47 | 26 | 48 | Awkward wording: "have been related up to" | Accepted |
| 2340 | 12 | 26 | | | | Water management- Not only urban water supply causes to GHG emission. Countries like Mongolia depend on mining industries. Massive groundwater abstraction is reported because of mining industries. While they do not have comprehensive surveillance system and governance mechanism, mining industry water usages leads to air pollution as well as water pollution (Acidification of water, salinasation, Murcury). Furthermore, land and water bodies are polluted because of gold mining in Mongolia. | Relected: Out of scope of this chapter |
| 2517 | 12 | 27 | | | | the comments on water, energy and carbon - and the linkages are really important | Noted |
| 18816 | 12 | 27 | 10 | 27 | 15 | Concerning "water security" link to Section 12.5 | Noted |
| 18817 | 12 | 27 | 10 | 27 | 15 | Link to Ch.7 (they should [don't know if they actually do] somewhere discuss tension water-energy in detail) | Accepted, the text has been revised |
| 2380 | 12 | 27 | 18 | | | Doesn't the energy intensity of water from tankers vary depending on how far the tanker travels etc., Reference? | Accepted, the section has been revised |
| 17588 | 12 | 27 | 21 | 27 | 21 | Should "abstractions" be "extractions"? | editorial |
| 2381 | 12 | 27 | 35 | | | I don't follow this sentence, and think it may be an incorrect reference (I don't recall us making this point in that paper) | Accepted: The text has been revised |
| 18819 | 12 | 27 | 38 | | | Should read "Figure 12.5" instead of "Figure 1" | Accepted: The figure has been removed. |
| 17589 | 12 | 27 | 39 | 27 | 40 | Some discussion of the impact of waste prevention on GHG emissions should be included. U.S. Environmental Protection Agency and Office of Solid Waste and Emergency Response. 2009. Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices: U.S. Environmental Protection Agency. | Accepted: Cross reference Ch 10 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17590 | 12 | 27 | 40 | 27 | 41 | This statement about the quantity of GHG savings in the US should have a supporting reference. | Accepted: Reference given |
| 18541 | 12 | 27 | | | | Much of the text and data in this section may be more aptly placed in the excursus section on Waste in Chapter 10 - indeed much of the same text already appears there. Please liaise with Ch 10 CLAs on this point. | Accepted. Ch 10 referenced. |
| 17307 | 12 | 28 | | 28 | | Consumption is not specific to urban settlements. Regarding the overall strcuture of the report, I would recommend to treat this as a separate chapter, and, under "human settlements" or "urban issues" deal only with issues specific to urban agglomerations, such as urban planning etc. | Rejected: We have retained food discussions but but rewritten. |
| 17591 | 12 | 28 | | | | There is a word missing in item A in the legend -- "long distance transport SHOULD be avoided" The caption should indicate the date and region depicted in the figure. | Noted: The figure is deleted. |
| 7315 | 12 | 28 | 10 | | | This figure, as presented, is misleading. A broader survey of the waste literature gives very wide ranges for the emissions from various waste management strategies that is not adequately captured in this figure using only numbers from selective literature and, importantly, without the specific assumptions contained in that literature. Most of the literature cited is from various life-cycle analysis (LCA) studies which assume a variety of data inputs and conditions. Moreover, literature which directly measured emissions from various waste management processes is generally missing from this list. I would recommend consulting the AR4.WGIII report.Chapter 10.Waste as a starting point. | Accepted; The figure is deleted |
| 12467 | 12 | 28 | 10 | | | The figure shows that composting has a higher GHG saving potential per tonne of wet waste than anaerobic digestion. This seems to be in contradiction to the common perception that anaerobic digestion is better due its production of biogas which can be used to substitute fossil energy. The value of the nutrients in the restproducts should be more or less the same for both treatments. Please consider to ivestigate this further. | Taken into account: Figure deleted |
| 2518 | 12 | 28 | 14 | | 27 | same is true of the food consumption - perhaps extend these two and come back to them at the end | taken into account; This part is rewritten. |
| 17592 | 12 | 28 | 28 | 28 | 28 | The use of "metabolism" in this sense, while well known in industrial ecology and in some social science communities is not well known elsewhere. It should be explained and also added to the glossary. | Accepted |
| 5526 | 12 | 29 | 12 | | 17 | The previous chapter on forestry and agriculture has good information on emissions associated with different types of diets, showing signfiicantly reduced emissions with limited meat intake, particularly with elimination of meat from ruminants. In addition to the emissions associated with meat, dairy and chickens- it would be helpful to inclue an estimate on the potential contribution that urban and peri urban agriculture could make- here poultry and a range of fruit and vegetables could be produced in significant quantities and this would present a different picture | Noted: but such info is scarce at urban context, see 12.4.12 in SOD |
| 12468 | 12 | 29 | 18 | 29 | 27 | Please consider to make this text and numbers consistant with WGIII chapter 11 p.28 line13 to p.30 line 3 and WGII chapter 19 p.16. which treat these issues more extensively. The effect of diet changes on GHG emissions, land use and food security is empasized clearly in those paragraphs. | Accepted: The text are removed in rewriting |
| 17594 | 12 | 29 | 20 | 29 | 27 | This is an extraordinarily long sentence! | Accepted |
| 11038 | 12 | 29 | 23 | | | Similar baffling use of wording ‘boundary conditions’ – needs translation. | Accepted: Whole text deleted in rewriting |
| 2519 | 12 | 29 | 27 | | | increased | Editorial |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5732 | 12 | 29 | 28 | 31 | 17 | Urban planning has unintended consequences because of the way urban land markets operate. It is far more effective and far less costly to use taxes and fees on the resources and the infrastructure for which less consumption is desired.<br><br>For example, see<br><br>CHESHIRE, Paul, and SHEPPARD, Stephen: "The Welfare Economics of Land Use Planning" (2001)<br><br>CHESHIRE, Paul, and SHEPPARD, Stephen: The introduction of price signals into land use planning decision-making : a proposal (2005)<br><br>CHESHIRE, Paul, and VERMEULEN, Wouter: "Land markets and their regulation: the welfare economics of planning" (2009)<br><br>CHESHIRE, Paul: "Urban land markets and policy failures". (2009)<br><br>CHESHIRE, Paul (2009): "Urban Containment, Housing Affordability and Price Stability: Irreconcilable Goals"<br><br>ANAS and Rhee (2006) “Curbing excess sprawl with congestion tolls<br>and urban boundaries”<br>Anas and Rhee (2006) “When are urban growth boundaries not a second-best to congestion tolls?”<br><br>The distinguished urban economist Edwin S. Mills, in “Truly Smart Smart Growth” (1999) comments that “……governments’ job is to get the prices right…..” not to impose blunt instrument policy restrictions on how and where people are to live. | Accepted: A new subsection on land value capture has been added as 12.6.4 in SOD. |
| 13245 | 12 | 29 | 42 | 29 | 43 | no explicit mention of transport : is it already included in land-use ? Should be clarified | Noted: Perhaps not need for clarifying |
| 12469 | 12 | 29 | 47 | 30 | 1 | Please consider to clearify to which climate target the figure of a 100-340 Gtc equivalents from land based mitigation should contribute. Is it an atmospheric 450 ppm CO2-eq concentration stabilisation or a certain limitation in temperature increase or……? Further, please explain what assumptions are behind such a wide interval. The expression "land based mitigation" should be clearified; is it identical with the "integrated spatial planning" mentioned before? | Noted: Will be relooked in the next round |
| 3357 | 12 | 29 | 47 | 30 | 1 | The reference refers to agriculture and forestry and not spatial planning. The sentence should be removed as it is misleading. | Noted: Will be relooked in the next round |
| 14712 | 12 | 29 | 47 | 29 | 47 | On this point, you may cite Viguié, Vincent, et Stéphane Hallegatte. 2012. « Trade-offs and Synergies in Urban Climate Policies ». Nature Climate Change 2 (5) (mars 4): 334-337. doi:10.1038/nclimate1434. | Noted |
| 18822 | 12 | 29 | 48 | | | Bring "100 to 340 Gtc equivalents" into context, i.e. compare to other numbers and/or detail what scenario is referred to here, as "15-40%" is in the context of some scenario. | Noted: Will be relooked in the next round |
| 17593 | 12 | 29 | 9 | 29 | 9 | I don't understand what "inorganic residues …conforms the major remaining outflows" means. Should "conforms" be "constitutes"? | Accepted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15506 | 12 | 29 | | | | Urban systems: activities, resources, and performance –Add a full sub-chapter on performance and metrics. Suggest adding also a full sub-chapter on tools to support strategies. Without being exhaustive quote initiative like French Bilan Carbone method (with dedicated modules on Services or Buildings for local authorities). Quote also example like Territorial Energy and Climate Plans (TECP). Quote also initiative working on a "resource" based approaches (such as the UNEP GI-REC). In a shorter way underline that on-going initiatives are already working to rank cities performance. | Rejected: But we have reframed and restructured the entire chapter. |
| 11039 | 12 | 30 | 1 | | | Rose et al. needs proper referencing: at present, it is simply 'Rose S.K., H. Ahammad, B. Eickhout, B. Fisher, A. Kurosawa, S. Rao, K. Riahi, and D.P. van Vuuren (2012). Land-based mitigation in climate stabilization.pdf.' | Accepted: This problem will be rectified in the next round |
| 11040 | 12 | 30 | 16 | | | 'A low-carbon future can be achieved by spatial planning to promote new technologies to create new urban form (Crawford and French, 2008a).' needs explaining or deleting. | Taken into account: The text has been deleted in SOD while rewriting |
| 6019 | 12 | 30 | 23 | 30 | 28 | What land tools are meant? What are land tools for example? Source for the statement is missing. | Taken into account: The text has been deleted in SOD while rewriting |
| 17596 | 12 | 30 | 23 | 30 | 28 | This paragraph needs copyediting. | Taken into account: The text has been deleted in SOD while rewriting |
| 11311 | 12 | 30 | 42 | 31 | 17 | As is, this subsection on 'implementation instruments' focuses nearly exclusively on regulatory approaches, with scant discussion of programmatic approaches. The set of implementation instruments associated with brownfields redevelopment as an approach to densification should be cited here. See, for example, UN-Habitat. 2012. 'Urban patterns for a green economy: leveraging density'. Page 51 and 76-80. (Document available for download at www.unhabitat.org, under 'publications'.) | Taken into account: The table has been deleted and text has got written of the who section. |
| 12470 | 12 | 30 | 48 | 30 | 48 | Please change "table 1" to "table 12.2" | Taken into account: The table has been |
| 18823 | 12 | 30 | 48 | | | "Table 12.2" instead of "Table 1" | Taken into account: The table has been |
| 17595 | 12 | 30 | 6 | 30 | 6 | What is binomial relation density? | Taken into account: The text has been deleted in SOD while rewriting |
| 2341 | 12 | 30 | | 59 | | Some points in the Urban climate change mitigation: experiences and opportunities and under the 12.5.2 Urban strategies for mitigation can be merged by avoiding repetition. | Taken into account: The texts are rewritten in this section and this has |
| 3657 | 12 | 31 | 17 | 31 | 38 | Pages with lot of space not used can be filled. | Noted |
| 11310 | 12 | 31 | 8 | 31 | 13 | To this list of 'more flexible approaches' to land use regulations should be added mixed-use zoning. | Taken into account: The text has been deleted in SOD while rewriting |
| 13246 | 12 | 32 | | | | Appert (2005) can be quoted with the discussion on Green Belt policies (London Green Belt case study) : Appert, M. (2005). L'art du grand écart: maîtriser la mobilité dans la région métropolitaine de Londres. Mappemonde, 78(2), 1–18. | Noted: The table referred has been deleted in SOD while rewriting. The setion has been reframed and rewritten. |
| 17194 | 12 | 32 | | 32 | | In the table under 'Mixed Use Zones', the text says: 'Mixed use areas, especially dense areas, are likely to shorten auto trips and encourage pedestrian and bicycle trips'. This is dubious if it refers to mixed use in suburban neighborhoods, especially if the mix involves some sort of 'jobs-housing balance' in a suburban local district.. Most auto trips from suburban neighborhoods go to destinations outside the neighborhood, and the reduced auto use for local employees at workplaces interspersed in a suburban residential neighborhood will often be far outweighed by increased auto usage among the non-local employees. See Næss, 2011 for a discussion. | Noted: The table referred has been deleted in SOD while rewriting. The setion has been reframed and rewritten. |
| 2382 | 12 | 33 | | | | The term Greenbelt is also used outside the UK, e.g., in Canada | Noted: The table referred has been deleted in SOD while rewriting. The |
| 17597 | 12 | 33 | | | | What are TND and TOD? | Noted: The table referred has been deleted in SOD while rewriting. The |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17195 | 12 | 33 | | 33 | | Regarding the text in the table under 'greenbelt' and 'urban growth boundaries': The effect of these measures in encouraging densification instead of urban sprawl, and the resulting contribution to reducing traveling distances, auto usage and energy use for transport, should be mentioned. For evidence about the effect of greenbelts/growth boundaries on urban population density, see Næss et al (2011b) concerning Oslo. Portland, Oregon provides another example. For evidence about the effect of overall urban density on travel behavior and energy use, see Newman & Kenworthy (1989, 1999), Næss et al. (1996) and Lefevbre (2010). | Noted: The table referred has been deleted in SOD while rewriting. The setion has been reframed and rewritten. |
| 11312 | 12 | 33 | | | | Suggest to add a new row on 'brownfields redevelopment', as distinct from land-readjustment. See, for example, UN-Habitat. 2012. 'Urban patterns for a green economy: leveraging density'. Page 51 and 76-80. (Document available for download at www.unhabitat.org, under 'publications'.) | Noted: The table referred has been deleted in SOD while rewriting. The setion has been reframed and rewritten. |
| 11313 | 12 | 33 | | | | In the row entitled 'design-oriented codes', please spell out and briefly define TND and TOD, and briefly define Transect Zoning, SmartCode and Urban Village. | Noted: The table referred has been deleted in SOD while rewriting. The |
| 3658 | 12 | 35 | 1 | 35 | 38 | Pages with lot of space not used can be filled. | Noted |
| 17304 | 12 | 36 | | 41 | | and chapter 15.8.: Moreover, I would recommend to use the way of structuring according to modes of governance as suggested in Alber and Kern (2008) (which is cited several times, but not correctly). These governance modes can be applied both for national in relation to local governments, and local governments in relation to citizens and the local commercial sector. | Noted: The whole section is restructured and rewritten. |
| 17598 | 12 | 36 | 14 | 36 | 15 | Why is the DISSIMILARITY of land markets a reason why the real estate sector may be a good platform? | Noted: The text referred has been deleted in SOD while rewriting. The |
| 5987 | 12 | 36 | 2 | 36 | 5 | In many countries, national governments support climate change mitigation through spatial planning (cp. Your own chapter 12.7). In Germany, for example, with KlimaMORO, the federal government has supported a nationwide model program for climate change mitigation through spatial planning. This programme is now the base for a number of follow-up programmes, for example KLIMOPASS in the state of Baden-Württemberg. The idea that governments are sceptical about spatial planning contribution to mitigation is therefore too generalized and not valid for large parts of the world. | Noted: The text referred has not claimed that gov is sceptical about it. |
| 6020 | 12 | 36 | 2 | 36 | 5 | National governments support in many countries climate change mitigation and adaptation strategies through spatial planning (see your own chapter 12.7 and your given examples). E.g. in Germany, the government supported a nationwide model program dealing with mitigation and adaptation strategies, called KlimaMORO. Many national follow-up programs are based on KlimaMoro, for example the KLIMOPASS project in the state Baden-Wuerttemberg. | Noted: The texts has gone massive change in rewriting of the section. |
| 11043 | 12 | 36 | 23 | | | The text states: 'Market-based land policies aiming at compact urbanization are likely to be effective tools in emission mitigation.' This is one-sided. Suggested text: 'Both market-based and strong regulatory land policies aiming at compact urbanization are likely to be important tools in emission mitigation.' | Noted: The text referred has been deleted in SOD while rewriting. The setion has been reframed and rewritten. |
| 18828 | 12 | 36 | 23 | 36 | 24 | This claim should be substantiated by a reference. | Noted: The text referred has been deleted in SOD while rewriting. The |
| 11042 | 12 | 36 | 9 | | | The text states; 'Local mitigation strategies generally are instructed by the regional or national policies, which again are directed by international agreements (i.e. UNFCCC, Kyoto protocol) for reducing GHG emissions.' This may be true in some countries, but in others quite the reverse holds, e.g. in the USA and New Zealand, where national policies tend to be weaker than local policies. Suggested replacement text: 'Local mitigation strategies may be instructed by regional or national policies, in turn directed by international agreements (i.e. UNFCCC, Kyoto protocol) for reducing GHG emissions. However, in some countries, local strategies may have critical demonstration effects where national policies are weak.' | Noted: The text referred has been deleted in SOD while rewriting. The setion has been reframed and rewritten. |
| 15751 | 12 | 36 | | | | Most of the urbanisation is taking place in the developing countries. Local agencies play an important role in implementation of urban planning policies. Most of the cities in developing countries are associated with weak data base and governance deficit. | Noted |
| 16354 | 12 | 37 | 10 | 37 | 10 | The reference Robinson et al 2006 is missing | Noted: The reference referred has been deleted in SOD while rewriting. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17599 | 12 | 37 | 19 | 37 | 26 | The discussion of citizen participation sounds like conventional wisdom. It is my impression that the research literature in environmental psychology and sociology reports more complicated (and less optimistic) results. See Dietz, T. and P. C. Stern. 2002. New Tools for Environmental Protection: Education, Information, and Voluntary Measures. Washington, DC: National Academy Press. | Noted: To be looked more carefully in the next round but see 12.6.5 in SOD |
| 5988 | 12 | 37 | 20 | 37 | 21 | Public awareness is certainly an additional advantage for the implementation of mitigation measures. However, environmental sociology has shown that awareness for environmental issues becomes relevant for the behaviour of people only when other incentives, particularly economic incentives, trigger these. Solely awareness is not sufficient to acheive behavioural change. Cf. the low-cost-theory by Diekmann/ Preisendörfer 1998: Umweltbewusstsein und Umweltverhalten in Low- und High-Cost-Situationen: Eine empirische Überprüfung der Low-Cost-Hypothese. In: Zeitschrift für Soziologie 27: 438-453) | Noted |
| 17600 | 12 | 37 | | 38 | | Be careful in the use of the term "states." In the European Union, "states" generally refers to member states, i.e., national governments. In many other countries, the relevant term is provinces. | Taken into account: Checked |
| 3359 | 12 | 38 | 29 | | | the full reference is "F. Creutzig, A. Thomas, D. M. Kammen, E. Deakin (2012)<br>Transport Demand Management in Beijing, China: Progress and Challenges<br>In Low Carbon Transport in Asia: Capturing Climate and Development Co-benefits, edited by E. Zusman, A. Srinivasan, and S. Dhakal (Earthscan, London, 2012) ISBN 9781844079148." Currently, the co-authors are not mentioned. | Noted: The reference has been deleted in SOD while rewriting of text. |
| 15467 | 12 | 38 | 31 | 38 | 43 | Specifically, for the Asian context, CITYNET was created by UNESCAP, UNDP, and UN-HABITAT to create a network among cities in the Asia-Pacific . Today, it is comprised of 126 members see ref: http://www.citynet-ap.org/about/who-we-are/organisational-structure/ | Noted: The comment is no more relevant in revised text |
| 17602 | 12 | 38 | 33 | 38 | 33 | Is the United States Mayors Climate Protection Agreement an NGO or an agreement? | Noted: The comment is no more |
| 17603 | 12 | 38 | 38 | 38 | 38 | "regroups"?? | Noted: The comment is no more |
| 17601 | 12 | 38 | 5 | 38 | 7 | Note that New Jersey has withdrawn from the consortium. The sentence should be updated. (Other states may also have withdrawn too.) | Noted: Comments not relevant in revised text |
| 11314 | 12 | 38 | 8 | 38 | 29 | For a discussion of the different governance modalities mentioned here as applied to multi-level climate governance, with case studies in 3 countries, see Kehew, Robert et al. 2013. "Formulating and implemetning climate change laws and policies in the Philippines, Mexico (Chiapas), and South Africa: A local government perspective". Local Environment: The International Journal of Justice and Sustainability". Forthcoming. (An earlier version of this paper appears as Kehew, Robert et al. 2012. "Urban climate governance in the Philippines, Mexico and South Africa: National- and State-Level Laws and Policies", in Otto-Zimmermann, Konrad, ed. 2012. Resilient Cities 2: Cities and Adaptation to Climate Change: Proceedings of the Global Forum 2011. Dordrecht: Springer, 305-316.) | Noted |
| 17107 | 12 | 38 | 33 | 38 | 33 | While US Climate Protection Agreement was intrumental on the way to COP15 in Copenhagen in 2009, there has not been major progress since then. In fact, Local Government Climate ROadmap started as a global collaboration of all global city networks in 2007 andis the hube for global climate advocacy of local governments. www.iclei.org/climate-roadmap and the Global Cities Covenant on Climate - the Mexico City Pact, adopted in 2010 and and been signed by more than 250 cities is a much more innovative, new, systematic, global and strategic initiative. www.mexicocitypact.org | Noted: The reference referred has been deleted in SOD while rewriting. |
| 17108 | 12 | 38 | 33 | 38 | 34 | ICLEI was established in 1990 (since you give date for all organizations). ICLEI not only serve fr strategies but develop tooll, leads dtrafting of protocols, implements capacity building programmes and leads global advocacy. ICLEi is also the focal point for local governments and local authoritieis constituency to the UNFCCC and the only LG that has an observer status at the IPCC. | Noted: but not very contexual comments |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17109 | 12 | 38 | 34 | 28 | 35 | World Mayors Council on Climate Change (world at the beginning is missing in the text) was established in 2005, not in 2009. It is a network of mayors, not cities. A more correct explanations is: Alliance of committed local government leaders concerned about the impacts of climate change on local communities and global ecosystems, economy and society advocating for enhanced engagement of local governments as governmental stakeholders in multilateral efforts addressing climate change and related issues of global sustainability. | Noted: The relevant text has been deleted in SOD while rewriting. |
| 17309 | 12 | 39 | | 41 | | There are more options availabale how national governments can stimulate and support local mitigation action than financing, See Alber and Kern (2008) for the other options. | Accepted: See table in 12.6.3 in SOD we have not cited this reference though |
| 5989 | 12 | 39 | 17 | 39 | 20 | There is no reason to advertise here for specific companies! Delete the examples! | Accepted |
| 5990 | 12 | 39 | 24 | 39 | 34 | From IPCC I expect a critical approach towards economic networks as the WBCSD, the WEF etc. Climate change may be an issue there, but too often it does not go beyond talks about mitigation; an assessment on these networks' actual contribution would be more appropriate! | Accepted: The section has been rewritten and there is no longer WBCSD and WEF reerences. |
| 17604 | 12 | 39 | 41 | 39 | 41 | Expenditures on what? | Noted: This text is now in 12.6.3. The clarification will be made in the next |
| 17111 | 12 | 39 | 10 | 39 | 10 | It is worthwhile to mention carbonn Cities Climate Registry as the response of local governments to measurable, reportable, verifiable climate action, which contains climate information of more tha 170 cities that control community GHG emissions of more than 1.2 GtCO2e as of Julxy 2012. 2012 Annual Report contains important tables, graphs, conclusions based on the information provided by 51 cities as of November 2011. It can be imprortant to use this information as an input to the report. I recommend to include this report in the References list as well. Www.citiesclimateregistry.org | Rejected: The comment is not relevant in revised text |
| 17113 | 12 | 39 | 10 | 39 | 10 | There is no mention about the global climate advocacy of local governmets. This is mainly led by Local Government Climate Roadmap. Recognition of local governments as "governmental stakeholder" in pata 7 of Cancun Decisions is one of the key outcomes . | Noted but we have made consolidated discussion on multilevel governance in 12.6.1 |
| 17110 | 12 | 39 | 4 | 39 | 5 | Global Protocol is not a tool, it aims to guide all softwares in a consistent manner. This Protocol provides requirements and guidance for cities on preparing and publicly reporting a GHG emission inventory. The primary goal is to provide a standardized step-by-step approach to help cities quantify their GHG emissions in order to manage and reduce their GHG impacts. Reference is not provided in the References list as well. | Noted: The comment is no more relevant in revised text |
| 2383 | 12 | 39 | | | | Not scientific literature - could be cut | Accepted: The section structure and texts are revised and rewritten |
| 2384 | 12 | 39 | | | | Not scientific literature - could be cut | Accepted: The section structure and texts are revised and rewritten, see |
| 3360 | 12 | 40 | 24 | 40 | 26 | One sentence on land value capture is a little short, given that is the most important instrument for highly successful public transit schemes in Tokyo or Singapure, and having huge potential for China/India. Rob Cervero could be cited here. | Accepted: We have a new sub section on value capture in SOD now |
| 2385 | 12 | 40 | 30 | 40 | 21 | The text here is more about emissions targets than financing; it could be cut | Accepted: The section has been |
| 10028 | 12 | 40 | 32 | 40 | 33 | "Heat pump" should be included into options for which EU funding can be applied, as described in (Silvia et al, 2011, page3 etc).<br><br><Reference><br>[1]Silvia Rezessy, Polo Betroldi (2010). Financing Energy Efficiency: Forging the link between financing and project implementation. Available at: http://ec.europa.eu/energy/efficiency/doc/financing_energy_efficiency.pdf | Accepted: The section has been restructured and rewritten, not longer relevant |
| 17605 | 12 | 40 | 42 | 40 | 42 | Portland Maine or Portland Oregon? | Accepted: The section has been restructured and rewritten, not longer |
| 10406 | 12 | 40 | 6 | | | Compared to 12.6.4.2 and 12.6.4.3,title 12.6.4.1 seems not to be the same level with the other two. | Accepted: The section has been |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17136 | 12 | 41 | 16 | | | DELETE: modal shift to public transport<br>REVISE TO: well harmonized multi-modal transport. | Accepted: The section has been restructured and rewritten, not longer relevant |
| 11315 | 12 | 41 | 22 | 42 | 13 | For a survey of some 14 climate finance sources from a perspective of accessibility by cities, see CDIA. 2012. "International financing options for city climate change interventions", especially page 10. This analysis concluded that, from a city perspective, access was 'difficult' for 12 of these 14 sources, and 'moderately difficult' for the remaining 2 sources surveyed. | Noted: will be given consoderation in the next round |
| 11787 | 12 | 41 | 3 | 41 | 6 | Delete. This description has no relation with finace. | Accepted: The section has been restructured and rewritten, not longer |
| 15507 | 12 | 41 | 31 | 41 | 40 | Develop constraints and opportunities with the on-going schemes but explain how can/will Urban-CDM and Urban NAMAs can play a great role in mitigation (many recent reports on these issues such as the Urban NAMA's UNEP report in June 2012). | Noted: The section has been re-written. |
| 2523 | 12 | 41 | 34 | | 36 | Need the latest figures on CDM - there has been an increase in the number of transport projects and others | Rejected: The comment is not relevant |
| 13700 | 12 | 41 | 38 | 41 | 38 | Add after "…OECD 2010": "Some of the methodological obstacles to energy efficiency projects in the building sector are discussed by Michaelowa et al. (2009). Sippel and Michaelowa (2012) show why municipalities have not been able to participating in the CDM in a significant way". Reference Michaelowa, A.; Hayashi, D.; Marr, M. (2009): Challenges for energy efficiency improvement under the CDM—the case of energy-efficient lighting, in: Energy Efficiency, 2, 4, p. 353-367; Sippel. M.; Michaelowa, A. (2012): Do global greenhouse gas emissions markets promote low-carbon cities in developing countries? Lessons learnt from the Clean Development Mechanism, in: Local Environment, forthcoming | Rejected: The comment is not relevant in revised text |
| 18834 | 12 | 42 | 25 | | | Consider adding here that consumer emissions are often not accounted for (see Section 12.4) | Rejected: The comment is not relevant |
| 5991 | 12 | 42 | 31 | 42 | 32 | What is meant by "strong political leadership"? This term is confusing and not based on any framework that could explain what exactly is meant here! | Accepted: The phrase is deleted in the text while rewriting |
| 2524 | 12 | 42 | 31 | | | Leadership issues are important - mentioned later, but introduce here - also education, information and involvement so that outcomes of actions are closer to expectations | Noted: the phrase is deleted in the text while rewriting |
| 5528 | 12 | 42 | 31 | | 34 | Look at Seattle, WA and San Francisco, CA for waste management innovations | Noted: But the comment is not relevant in revised text anymore |
| 10029 | 12 | 42 | 37 | 42 | 39 | This part should be deleted completely. Tokyo cap & trade program is currently under the special measure for the Great East Japan Earthquake, which allows CO2 emission increase caused by home generation, which means the program is not implemented under normal condition. Therefore, Tokyo cap & trade program is not considered as a good example of cap & trade policy. | Noted: The comment is not relevant in revised text anymore. The related text is deleted. |
| 2386 | 12 | 43 | 2 | | | Perhaps too political here; straying from science - could be cut | Accepted: Taken care in revised text |
| 6022 | 12 | 43 | | 59 | | The authors describe this section as an assessment of urban climate change mitigation experience and their effectiveness in reducing GHG emission. They summarize the various urban mitigation action plans and describe the different types of mitigations srategies very well. Regarding my opinion of an assessment, there is a final sub-chapter missing. In this sub-chapter, you can conclude the issues of the different strategies and their reliablility in mitigation of CO2. Furthermore, an outlook can state junctions (efforts to address GHG emissions) in climate change mitigation, that could be important in the future regading the diverse stratgy plan and that have to be considered in the authors' view.<br>The brief assessment paragraph could create a smoother transition to section 12.8. | Noted: The section has been completely rewritten. Isssues of reliability has been addressed in the revised text with the statement that the achievibility of target remains uncertain. |
| 5992 | 12 | 43 | | 94 | | Why don't you give information about the actual progress in GHG reduction that was achieved by the programs you mention? | Accepted: see 12.7.4 in the revised text |
| 2544 | 12 | 44 | 15 | 44 | 15 | "feasibility of plans, rhetoric versus the ability to implement" is highly subjective and uncertain | Accepted: phrase and related text has not appreared in the in the revised text |
| 18837 | 12 | 44 | 19 | 44 | 31 | Consider turning this paragraph into a figure. | Noted |
| 2545 | 12 | 44 | 27 | 44 | 31 | Needs referencing | Noted: The text of entre section has |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2525 | 12 | 44 | 37 | | | Hamburg | Editorial |
| 2526 | 12 | 44 | 44 | | 46 | Need to be bolder here - 36% is not enough - in developed cities we should be looking at 80% reductions in CO2 | Rejected: not relevant for the text |
| 2543 | 12 | 44 | 5 | 44 | 11 | Needs referencing | Noted: But the section has been |
| 2542 | 12 | 44 | 7 | 44 | 7 | "Non-obligatory commitments" is not a clear term. If enacted by law they are mandatory. | Noted: 12.7.1 in revised text has used this term. We will explore further in next |
| 17112 | 12 | 44 | 19 | 44 | 32 | In 2009, ICLEI and City of Copenhagen released Copenhagen World Catalogoue of Local Climate Commitments which captured moer than 3000 commitments of local governments worlwide. This was followed by carbonn Cities Climate Registry which as of July 2012 captures more than 700 actions, 300 commitments and 250 GHg inventories of more than 170 cities. | Noted: Useful info but text and section is re-done and these detail info is no longer there in the revised text |
| 17606 | 12 | 45 | | | | Figure is difficult to read in black & white. | Noted: Figure deleted |
| 2546 | 12 | 45 | | | | Mitigation graph should present also baselines where available | Noted: Figure deleted |
| 2529 | 12 | 45 | 11 | | 16 | Where are the largest cities - from India, China and SE Asia and S America? | Noted: Since related figure is deleted in SOD, this figure caption is no longer |
| 2528 | 12 | 45 | 17 | | | Note that this figure is only about 5% of the total urban population | Noted: Since related figure is deleted in SOD, this figure caption is no longer |
| 17608 | 12 | 45 | 17 | 45 | 17 | Population in what year? | Noted: Since related figure is deleted in SOD, this figure caption is no longer |
| 11788 | 12 | 45 | 18 | | | With regard to No.80, this sentence is not needed. | Accepted: Removed |
| 2547 | 12 | 45 | 18 | 46 | 21 | This part could show more e.g. a taxonomy table of actions pledged or conducted by cities, showing what a mayor can do in practice | Noted: The entire section is restructured and rewritten, we have not been able to do texonomy table but see revised text at |
| 2527 | 12 | 45 | 2 | | | This is a key point that needs expansion and to be in conclusions - there is very little monitoring of outcomes - this is central to any target achievement, namely that progress must be monitored and actions strengthened if targets are not met | Accepted: In Executive summary, we have reflected this in SOD |
| 2530 | 12 | 45 | 25 | | 26 | Question as why Delhi should have a reduction target - there has to be growth of CO2 emissions in the developing cities - but less than trend following - it is the developed cities that must make the major contributions - this central point is not made - otherwise the Chapter is taking a very developed country perspective | Noted: its is not implied here who should cut how much. The meaning here is that clear target is needed to check the goal, progress and achievement.... |
| 10407 | 12 | 45 | 4 | | | The figure plotted is based on the investigation which there are only 12 Asian cities,among them ,11 are Japansese, one in Thailand.This kind of investigation cannot be representive. | Accepted: Removed |
| 17607 | 12 | 45 | 9 | 45 | 9 | What website? | Noted: Since related figure is deleted in SOD, this figure caption is no longer |
| 2531 | 12 | 46 | 10 | | 15 | Unclear - the meaning of this section | Noted |
| 17310 | 12 | 46 | 15 | 46 | 15 | Wall fall profits accounted only for some 50% of the GHG emissions reductions in eastern Germany, as substantiated e.g. in<br>Joachim Schleich, Wolfgang Eichhammer, Ulla Boede, Frank Gagelmann, Eberhard Jochem, Barbara Schlomann & Hans-Joachim Ziesing: "Greenhouse gas reductions in Germany—lucky strike or hard work?" Climate Policy Volume 1, Issue 3, 2001. pages 363-380. They say "a diverse set of policies also had a significant effect on the reduction of greenhouse gases" which, for some major cities such as Dresden, amounted to some 50% already in the nineties. | Noted: will be looked into in the next round |
| 3659 | 12 | 46 | 22 | 46 | 38 | Pages with lot of space not used can be filled. | Editorial |
| 18839 | 12 | 47 | | | | Box 12.1 is too detailed. Cap-and-Trade should not be explained here but referenced from the policy chapter where it is introduced. | Noted: The box is deleted in line with restructuring and rewriting of the section. |
| 11789 | 12 | 47 | 2 | 47 | 45 | Refering to only Tokyo city's climate actions in the box isn't appropriate under discussing the policy including treatment of the new energy mix and climate change policy in Japan. Box 12.1 should be deleted all. | Noted: The box is deleted in line with the restructuring and rewriting of the section. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17609 | 12 | 47 | 45 | 47 | 45 | What is "eco-driving"? | Noted: The text is deleted in line with restructuring and rewriting of the section. |
| 10030 | 12 | 47 | | | | This part should be deleted completely. Tokyo cap & trade program is currently under the special measure for the Great East Japan Earthquake, which allows CO2 emission increase caused by home generation, which means the program is not implemented under normal condition. Therefore, Tokyo cap & trade program is not considered as a good example of cap & trade policy. | Noted: The box is deleted in line with restructuring and rewriting of the section. |
| 2548 | 12 | 48 | | | | Needs better geographical balance | Noted: The table is deleted in line with restructuring and rewriting of the section. |
| 2532 | 12 | 48 | 12 | | 13 | Not sure that any city has taken an aggressive agenda - some like Freiburg have followed a consistent pathway over a period of time - political, business and local support. | Noted: The text is deleted in line with restructuring and rewriting of the section. |
| 18840 | 12 | 48 | 3 | | | Should read "Table 12.3" instead of "Table 12.7.1" | Editorial |
| 17618 | 12 | 49 | | 58 | | This section needs substantial revision and editing. The sentence structure and grammar needs correction. The content appears to have been taken verbatim from reports prepared by other entities -- probably the cities themselves. And, most important, the content is primarily composed of earnest and or promotional statements of intent, rather than dispassionate description and analysis. The section could also use subheadings. | Accepted: The section has been restructured and rewritten |
| 10408 | 12 | 49 | 2 | | | The content of this section is too much,which should be shorten.And this meets the need of the excutive summary.Table12.7 is enough. | Accepted: The section has been restructured and rewritten |
| 15508 | 12 | 49 | 2 | | | Mitigation strategies of urban climate change plans - Territorial Energy and Climate Plans can be included in this sub-chapter | Noted: The section has been restructured and rewritten |
| 19006 | 12 | 5 | 41 | 5 | 42 | The text says, 'While spatial planning can influence energy use and emissions, there are limited quantitative assessments of the emissions savings through spatial planning strategies'. Due to the very different urban contexts (city size, geographical setting, affluence level, dominant culture, social cohesion/segregation etc.), it should not at all be an aim to develop general figures for savings potentials. Rather, examples form different cities could be mentioned, leaving it up to the users of the information to assess whether the context of the example is sufficiently similar to the planning context at hand. (See Næss, 2004 and Næss & Strand, 2012 for more elaborate discussion.) | Noted. This comment actually refers to Ch.12. |
| 3332 | 12 | 5 | | 57 | | Many sentences start with "there are" or similar constructions. Such constructions can often be deleted by finding an appropriate verb, shortening sentences and clarifying content. | Noted |
| 3336 | 12 | 5 | | 6 | | The Executive Summary could be shortened by 1 paragraph, reducing its lenght to 1 page. There are a few statements that containt redundant messages. | Accepted: It is rewritten. However, text is crossing 1 page and it will be |
| 3331 | 12 | 5 | | 72 | | The FOD is well written and contains many valuable parts. I see options for shortening as follows: Reduce some redundancy between 12.3 and 12.4 (see below for details); reduce table overviews, e.g. delete the L.A. and Chicago examples (both US!). A valuable contribution would be to design a table that specifies the differences of human settlements across different world regions, and accordingly the different solution strategies in spatial plannning. | Noted: The entire chapter is reframed, rewritten and streamlined. |
| 3335 | 12 | 5 | 11 | 5 | 14 | Is the first part of the statement still true when GHG emissions from aviation are allocated to urban inhabitants? 12.4.2.2. indicates that inclusion of consumption-based emissions leads to a reversal of the statement. So perhaps, the statement should relate to "direct emissions", to avoid possible misunderstandings. | Noted: The text is deleted in subsequent revision. |
| 18772 | 12 | 5 | 11 | | | "When normalized by ..." to be deleted, as "per capita" is enough. | Noted: The text is deleted in subsequent |
| 2369 | 12 | 5 | 14 | | | While I agree that there is a need for a standardized methodology for city-level accounting, some recognition of recent efforts such as the global protocol (as per p.39, line 5) might be made | Noted: The text is deleted in subsequent revision. |
| 3333 | 12 | 5 | 2 | 5 | 3 | A bold statement. Is there evidence that in some quantitative way, urbanization is more importantn in structuring human settlements than say income or demographics? | Noted: The text is deleted in subsequent revision. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2261 | 12 | 5 | 2 | 69 | 33 | There is no evidence that emissions of greenhouse gases hav any harmful effect on the climate. .This information is thus not a cause for concern so the whole Chapter is unnecessary. It is also surprising that while the supposed, unproven theory relies on changes in the atmospheric concentioin of greenhouse gases. you seem here to be exclusively concerned with emissions. which are not necessarily related to concentrations | rejected |
| 5997 | 12 | 5 | 2 | 5 | 3 | Statement is far too general and e.g. for German/ European cities it is not correct. The recent decades in European human settlement are characterised by suburbanization trends and only for the last decade re-urbanization tendencies can be observed (see figure in Champion, T. (2001). Urbanization, suburbanization, counterurbanization and reubranization, In Hadnbook of Urban Studies Ed, R. Paddison (Sage, London), p.147 ). | Noted: The text is deleted in subsequent revision. |
| 17172 | 12 | 5 | 20 | 5 | 20 | 'Intra-urban centralization of specialized jobs' should be added | Noted: The text is deleted in subsequent revision. A bit refined statement exist in SOD executive summary in later |
| 18773 | 12 | 5 | 24 | | | "lock-in": in line 39 "difficulty to change" talks about the same - bring this together | Noted: The text is deleted in subsequent |
| 5998 | 12 | 5 | 34 | 5 | 34 | To add: Not only coordination of infrastructure can influence resource use and emission. Furthermore, the degree of interconnectedness of infrastructure systems affects them. | Taken into account: The text is deleted in subsequent revision. However, importantce of connectivity is mentioed |
| 3334 | 12 | 5 | 4 | 5 | 5 | "global economy" = GNP?/GDP? Number of transactions? | Noted: The text is deleted in subsequent |
| 17174 | 12 | 5 | 44 | 5 | 45 | The text says, 'Governance of mitigation in settlements benefits from a poly-centric and multilevel governance approach'. I do not agree. In many metropolitan areas, competitions between municipalities leads to a more sprawling and car-based development than what could be obtained through a legally binding regional planning regime. See, for example, Næss et al., 2011 a and b. | Rejected: We have not used polycenrtic word in revised version but we stand-by that multi-level governance and institutional arrangements are required to move human settlements towards the principles of low carbon development |
| 18774 | 12 | 5 | 44 | | | There are also examples for the opposite with local governance being hindered by national laws or by things they want to do being beyond their jurisdiction. | Noted: The tone of our statement is different in revised text. We meant that, given the way urban areas are goverened now, multi-level governance |
| 18771 | 12 | 5 | 5 | | | "global economic goods and services" instead of "global exonomy" | Noted: The text is deleted in subsequent |
| 17611 | 12 | 50 | | | | What is CCHP? | Noted: The table is deleted in line with restructuring and rewriting of the section. |
| 17631 | 12 | 50 | | 51 | | This table duplicates the text and is summarized to some extent in table 12.7. Table 12.4 can be deleted to meet length requirements of the chapter. | Noted: The table is deleted in line with restructuring and rewriting of the section. |
| 17610 | 12 | 50 | 13 | 50 | 14 | Incomplete sentence. | Noted: The section has been |
| 17612 | 12 | 51 | | | | "Seeking to address landlord/tenant issues" is not a "challenge". | Noted: The table is deleted in line with restructuring and rewriting of the section. |
| 17615 | 12 | 51 | | 53 | | Parallel phrasing should be used through columns. | Noted: The table is deleted in line with restructuring and rewriting of the section. |
| 17632 | 12 | 51 | | 53 | | This table duplicates the text and is summarized to some extent in table 12.7. Table 12.5 can be deleted to meet length requirements of the chapter. | Noted: The table is deleted in line with restructuring and rewriting of the section. |
| 17614 | 12 | 51 | 10 | 51 | 11 | Sentence syntax needs fixing. | Editorial |
| 17613 | 12 | 51 | 2 | 51 | 2 | Verb missing | Editorial |
| 17616 | 12 | 51 | 2 | 51 | 4 | This sort of exhortation does not fit in an IPCC chapter | Noted: The section has been |
| 17633 | 12 | 53 | | 54 | | This table duplicates the text and is summarized to some extent in table 12.7. Table 12.6 can be deleted to meet length requirements of the chapter. | Noted: The table is deleted in line with restructuring and rewriting of the section. |
| 17617 | 12 | 54 | 11 | 54 | 11 | What is BMA? | Accepted: deleted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11316 | 12 | 54 | 2 | 55 | 7 | It would seem appropriate to consolidate this paragraph on the use of financing instruments by local governments with material presented in the earlier sub-section 12.6.4, on 'financing urban mitigation'. Additionally, for the two funds citied (in Bangkok and Toronto), it would seem appropriate to briefly mention the sources from which these funds were capitalized. | Noted: The chapter and sections are restructured and rewritten. |
| 2535 | 12 | 55 | | | | Tokyo - this repeats Box 12.1 | Noted: The sentences to which this comment belongs got deleted in |
| 17619 | 12 | 55 | 33 | 55 | 34 | How will the plan ensure this? | Noted: The sentences to which this comment belongs got deleted in |
| 17620 | 12 | 55 | 38 | 55 | 38 | What document? | Noted: The sentences to which this comment belongs got deleted in |
| 10031 | 12 | 55 | 8 | 55 | 15 | This part should be deleted completely. Tokyo cap & trade program is currently under the special measure for the Great East Japan Earthquake, which allows CO2 emission increase caused by home generation, which means the program is not implemented under normal condition. Therefore, Tokyo cap & trade program is not considered as a good example of cap & trade policy. | Noted: The reference to Tokyo's Cap and Trade got deleted in reframing and rewriting of the entire section |
| 17623 | 12 | 56 | 25 | 56 | 35 | Is Darfur a city? | Noted: The sentences to which this comment belongs got deleted in |
| 17621 | 12 | 56 | 4 | 56 | 4 | "This will be done by reducing energy use in buildings…" How? | Noted: The sentences to which this comment belongs got deleted in |
| 6021 | 12 | 56 | 8 | 56 | 8 | First time the authors mention Victoria-Gasteiz, add the country in which this city lies. Is it Spain? | Noted: The sentences to which this comment belongs got deleted in |
| 17622 | 12 | 56 | 8 | 56 | 8 | Indicate in what country Vitoria-Gasteiz is located. | Noted: The sentences to which this comment belongs got deleted in |
| 17624 | 12 | 58 | 9 | 58 | 10 | What does this mean?? | Noted: The sentences to which this comment belongs got deleted in |
| 17625 | 12 | 59 | 1 | 59 | 12 | Definition of terms (e.g., resource decoupling) should not occur at the very end of the chapter. | Noted: The sentences to which this comment belongs got deleted in |
| 18846 | 12 | 59 | 13 | 59 | 17 | Consider moving the issues of "payment for ecosystem services" to other policies. | Noted: The sentences to which this comment belongs got deleted in |
| 17627 | 12 | 59 | 18 | 59 | 18 | Evidence of what? | Noted: The sentences to which this comment belongs got deleted in |
| 17628 | 12 | 59 | 28 | 59 | 28 | Why does payment for ecosystem services have a potential for green jobs? Many prominent approaches to payment for ecosystems have little in the way of a labor component, e.g., purchasing development rights from a land owner. | Noted: The sentences to which this comment belongs got deleted in reframing and rewriting of the entire |
| 11317 | 12 | 59 | 3 | 59 | 5 | For another emerging economy, sub-national example of an attempt at 'decoupling resource utilization and economic growth', see discussion of the 'developmental green economy strategy for Gauteng, South Africa', in UN-Habitat. 2012. "Urban patterns for a green economy: clustering for competitiveness", pages 38-42. (Available for download at www.unhabitat.org, under 'publications'.) | Noted: The sentences to which this comment belongs got deleted in reframing and rewriting of the entire section. |
| 14713 | 12 | 59 | 37 | 59 | 37 | On this point, you may cite Viguié, Vincent, et Stéphane Hallegatte. 2012. « Trade-offs and Synergies in Urban Climate Policies ». Nature Climate Change 2 (5) (mars 4): 334-337. doi:10.1038/nclimate1434. | Noted: Will be considered in the next round |
| 18847 | 12 | 59 | 42 | | | Reference section on UHI. | Noted: The entire section is reframed |
| 17626 | 12 | 59 | 9 | 59 | 12 | This is a truism and thus not interesting. | Noted: The sentences to which this comment belongs got deleted in |
| 9184 | 12 | 6 | 1 | 6 | 4 | Good summary - I agree | Noted |
| 5993 | 12 | 60 | | 60 | | There neither a reference or explanation of this figure in the text, nor is the figure understandable. | Noted: The figure to which this comment belongs got deleted in reframing and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2536 | 12 | 60 | | | | Density conundrum - explain this - complexity in urban decision making is not addressed as most decisions have trade offs embedded in them - the example given here is not such a good one as it would be possible to devise strategies that both meet mitigation and adaptation needs | Noted: The sentence to which this comment belongs got deleted in reframing and rewriting of the entire |
| 10208 | 12 | 60 | | | | not referred to in the text e.g. p 60, l 7 | Noted: The figure to which this comment belongs got deleted in reframing and |
| 6024 | 12 | 60 | 18 | 60 | 21 | Figure 12.7: This figure is not understandable. Context to the text above? | Noted: The figure to which this comment belongs got deleted in reframing and |
| 6023 | 12 | 60 | 2 | 60 | 3 | Source is missing. | Noted: The sentences to which this comment belongs got deleted in |
| 10410 | 12 | 60 | 20 | | | The figure 's meaning is not clear which bring troubles for readers to read.More literature explain should be added. | Noted: The figure to which this comment belongs got deleted in reframing and |
| 17196 | 12 | 60 | 22 | 61 | 13 | On pages 60-61 about synergies and conflicts between mitigation and adaptation measures in urban planning, the following should be mentioned: A very effective way of combining the adaptation strategy of local rainwater management and the mitigation strategy of densification could be to significantly reduce the asphalted traffic areas and use the land thus released partly as building sites and partly to establish vegetation, canals and basins. In addition to reducing the need for outward urban expansion and the associated likelihood of increased car driving, such a strategy would induce people to change from car to public and non-motorized modes of travel (see, e.g., Cairns et al., 2002). | Noted: The sentences to which this comment belongs got deleted in reframing and rewriting of the entire section. |
| 14714 | 12 | 60 | 24 | 60 | 24 | On this point, you may cite Hamin, Elisabeth M., et Nicole Gurran. 2009. « Urban form and climate change: Balancing adaptation and mitigation in the U.S. and Australia ». Habitat International 33 (3) (juillet): 238-245. doi:10.1016/j.habitatint.2008.10.005. | Noted: The section has been revised |
| 10409 | 12 | 60 | 9 | 60 | 14 | There are reference for middle-income cities and wealthy cities,but no reference for poor cities,does the author forget to mention the reference or just subjectively make the opinion? | Noted: The sentences to which this comment belongs got deleted in |
| 4268 | 12 | 60 | | | | There is no discussion of health co-benefits including from reduced air pollution, increased active travel and improved mental health from improved urban design | Taken into account: Some aspects of air pollution related health effect has been cited in the context of UHI and trees. We have not looked into sectoral issue (such as transport and buildings) in this chapter. We will see this issue further in |
| 3660 | 12 | 61 | 13 | 61 | 38 | Pages with lot of space not used can be filled. | Editorial |
| 2537 | 12 | 61 | 2 | | 4 | Repetition | Noted: The section has been revised |
| 18850 | 12 | 61 | 4 | | | You probably want to reference a different Table than "Table 1" here, probably "Table 12.8" | Accepted. Indeed 12.8 is the correct |
| 14715 | 12 | 61 | 6 | 61 | 6 | You could add that mainstreaming climate policies in other urban policies may help minimize these trade-offs: cf. Viguié, Vincent, et Stéphane Hallegatte. 2012. « Trade-offs and Synergies in Urban Climate Policies ». Nature Climate Change 2 (5) (mars 4): 334-337. doi:10.1038/nclimate1434. | Accepted: Will be taken care in the next round after SOD. |
| 2538 | 12 | 61 | 7 | | 13 | Too negative | Noted: The sentences to which this comment belong got deleted in |
| 6025 | 12 | 62 | | 65 | | The table extends to more than one page. It would be easier to read, if you could add the head line of the six columns to each page. Then, there is no need to page back. | Noted: The table got deleted in the rewriting of this section |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17197 | 12 | 62 | | | | Regarding the characterization of the promotion of urban agriculture in the right hand column of the second row: Why is this considered a win-win situation? I think this claim is rather unfounded. What is actually the advantage of having agriculture inside the city instead or just outside the urbanized area? If urban agriculture takes place inside the city, new buildings must be constructed elsewhere, resulting in encroachments on exurban farmland or natural areas. Moreover, such outward urban expansion will increase traveling distances and automobile dependence, cf. my earlier comments on this. (For a discussion, see, for example, Næss, 2006, chapter 12.6.) | Noted: the table is deleted in rewriting of this section. |
| 5225 | 12 | 62 | 1 | | | The suggestion that promotion of tourism, would be a probable co-benefit in urban mitigating emissions is very much in conflict with almost all that is said in chapter 10 about the inevitable strong growth of tourism's emissions and its current unsustainable development path. Please remove this example or replace with e.g. 'leisure activities'. Most larger urban areas tend to promote long haul inbound tourism, which has a carbon footprint up to an order of magnitude larger than average tourism trips per trip or tourist-night. | Noted: The table got deleted in the rewriting of this section |
| 3361 | 12 | 65 | | | | The following reference could be added, bolstering the case for very high co-benefits in commuting time, air pollution and noise reduction for urban transport measures: "F. Creutzig, D. He (2009)<br>Climate change mitigation and co-benefits of feasible transport demand policies in Beijing<br>Transportation Research D 14: 120-131" | Noted: The table got deleted in the rewriting of this section |
| 3661 | 12 | 65 | 1 | 65 | 38 | Pages with lot of space not used can be filled. | Editorial |
| 10209 | 12 | 66 | 15 | 66 | 17 | Could UHI lead to reduced neef for heating buildings wintertime at higher latitudes/ in cold regions? Related: reflecting roofs or absorbing roofs at higher latidudes? The first reduces UHI and radiative forcing (summertime) while the second may reduce the need for heating (wintertime) | Noted: It will be addressed in next round, after SOD. |
| 12471 | 12 | 66 | 23 | 66 | 25 | The figure 44 Gt CO2-ekv is of significant size, the same magnitude as the annual global emissions of GHGs. There are newer publications indicating significant uncertainty and conflicting views. The same researcher indicated in a newer publication an interval of 25-150 Gt of CO2 (Akbari et al March 2012) while there are also questions about the effect of white roofs and other urban serfaces (Jacobson, Mark Z., John E. Ten Hoeve, 2012). Please consider to check also there references. | Noted: It will be addressed in next round, after SOD. |
| 14716 | 12 | 66 | 26 | 66 | 26 | You could add that uncertainty around this figure is great. | Noted: Any reference suggestions? |
| 15752 | 12 | 66 | | | | Urban heat island phenomenon is linked to variation in urban form, densities, land cover types. The current studies done by Oke and Stewart (2010, 2011) which is very crucial to better understanding of UHI and mitigation approaches. But these studies does not find any mention in the chapter. UHI is also llinked to the climate type as well. | Noted: but the section is rewritten. However, if this reference look at urban form etc directly with mitigation, we will consider in final version. |
| 17198 | 12 | 66 | 1 | 67 | 20 | The text seems to take for granted that the urban heat island is always a problem for health and a contributor to high energy use for cooling. But for cities in cool climates, the urban heat island may reduce the need for space heating in winter, while the need for cooling during summer will be very low regardless of the urban heat island. This should perhaps be mentioned.<br>Moreover, the fact that some studies have found low-density urban development to aggravate the urban heat island (e.g. Stone & Rogers, 2001) should be mentioned. In the case of Tokyo: is it the density or the fact that the city is very large with many million inhabitants that causes its high heat island effect? Would the heat island effect have been lower if all the millions of Tokyo had been distributed over a sprawling and low-density urban structure? | Noted: It will be addressed in next round, after SOD. |
| 6941 | 12 | 66 | 34 | 66 | 35 | Rewrite first part of this statement to reflect that temperature changes are an expression of a changing climate, they are not CAUSED by climate change. | Noted: The section is rewritten |
| 2540 | 12 | 67 | 38 | | 44 | This is duplicates on p68 (1-8) and different figures used | Noted but no seemingly contradictory. |
| 17629 | 12 | 67 | 5 | 67 | 5 | How is heat discharged to the ground and how does this relate to urban heat island impacts? This is not obvious to the nonspecialist. | Noted: The sentence to which this comment belongs got deleted in |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6942 | 12 | 67 | 11 | 67 | 17 | Section on UHI: Please coordinate and ensure consistency with WGI, Chapter 2 and others. Strongly suggest to refer to WGI AR5 Chapter 2 (and 12/14?) here whenever appropriate. Parts of this section stray into the WGI area of expertise and thus might overlap with the assessment provided by WGI AR5. This should be avoided to not generate duplication and/or inconsistencies. | Noted: This section is rewritten and will harmonized with other WG. |
| 17199 | 12 | 67 | 21 | 69 | 7 | See my comments on the discussion of this issue on page 14. Narrowing the scope to the intra-city scale is irrelevant when discussing the carbon sink function of green space, since CO2 emissions are a global and not a local problem. | Noted |
| 14717 | 12 | 67 | 21 | | | This section seems redundant with section 12.4.3.6. This section is also strange, because the first paragraphs seem to contradict the paragraph beginning line 30 page 68. | Section 12.4.3.6 does not exist now. There is growing research that demonstrates the importance of urban green spaces as carbon sinks. There is no real conflict between the paragraph on page 68 and the first para of the section on page 67. The paragraph starting line 30 on page 68 merely highlights the need to take into account the carbon costs incurred in establishing and maintaining urban green spaces, concluding that green roofs and urban forests may therefore only compensate for the C expenditure incurred during planting, installation and establishment a |
| 5531 | 12 | 68 | 30 | | 34 | See above comment- use of grey water for irrigation, use of residuals based soil amendments or soils for soil and fertility and these concerns are largely accounted for- reuse of tree prunnings as a soil amendment would limit C loses as well | Noted: will be further looked into in the next round after SOD |
| 12472 | 12 | 69 | 11 | 69 | 11 | UNEP, World Bank and UN Habitat has recognized a pilot protocol for community scale greenhouse gas emissions, developed by C40, ICLEI, WRI and partners May 2012. Please consider to include this reference. | Accepted: There are some initiative to standardize inventory of cities which we will reference and illuciadates in the next |
| 2541 | 12 | 69 | 27 | | 33 | This is the first time that spatial and urban planning have been included in IPCC - it is important that this Chapter has some very clear messages that are positive and demonstrate the heterogeneity between cities - the co-benefits argument is important, as is the difference in interpretation of CO2 reduction between cities, the importance of leadership and participatory processes, good examples of practice, the need for mandatory and voluntary agreements, the lack of monitoring and data, the scale of change required, the lack of progress in reducing CO2, the links between energy consumption and CO2, the time scale necessary for changing the urban environment and many other issues. The authors should look at the OECD (2012) Report on Compact Cities - http://www.oecd-ilibrary.org/urban-rural-and-regional-development/compact-city-policies_9789264167865-en | Noted |
| 17630 | 12 | 69 | 3 | 69 | 7 | A discussion of landfills as carbon sinks should be included here. See, for example, Barlaz, M. A. 2006. Forest products decomposition in municipal solid waste landfills. Waste Management 26(4): 321-333. and Micales, J. A. and K. E. Skog. 1997. The decomposition of forest products in landfills. International Biodeterioration & Biodegradation 39(2–3): 145-158. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6026 | 12 | 69 | | | | There are many more "gaps in knowledge".<br>What is about "a general definition of urban areas"? The authors themselves used several different definitions in this chapter without refering to each other and any source.<br>What is about the policy-science-interface?<br>... the practical implementation of mitigation/ adaptation strategies?<br>... the gap between what sience is working on and the need for decision-making.<br>...<br>Maybe, it would be more usefull, if each sub-section ends with its own conclusion. In this sub-section you could mention specific gaps in knowledge and give an outlook e.g. what to be in-depth researched. | Noted |
| 5994 | 12 | 69 | 8 | 69 | 11 | Is this a joke? This is not a paragraph. Either discuss the major points of chapter 12 or delete this chapter! | Taken into account: this section is now |
| 2479 | 12 | 7 | | | | First part not well written - difficult to read - lack of structure - littered with errors - needs more cohesion | Taken into account: The section is |
| 2512 | 12 | 7 | | 94 | | throughout the Chapter it is unclear as to whether the focus is on energy or carbon or something else - nothing is really said about energy mix and the importance of clean energy - the authors need to address this in the introduction | Taken into account: The section is rewritten and streamlined. Scope and focus clarified. |
| 16649 | 12 | 7 | 1 | 8 | 50 | Page 7 to 8: This section starts the chapter off on the wrong foot and could be elimimated. “Urbanization” should be distinguished from population and economic growth. I am really not sure it makes sense to discuss urbanization at all; it might instead be better to say the chapter focused on policies in the urban context because it is in that context that government services and regulations play an important role, and because most population will be concentrated there. I don’t see the need to go on for pages about the share of GHGs in urban areas, and I find it misleading to imply that urban areas cause” GHGs. The chapter should start by introducing hypotheses about how variations in urban structure and settlement patterns might affect GHGs, and discuss the difficulties in research establishing causal relationships.<br><br>Page 7, line 1. Modify sentence to read “This chapter assesses the mitigation potential of POLICIES TO INFLUENCE THE FORM AND STRUCTURE OF human settlements” (insertion in caps). | Noted: The chapter and this section has gone through reframing and rewriting, but not in a way suggested in this comment. |
| 12451 | 12 | 7 | 11 | 7 | 19 | Please consider to include some figures/examples of per capita emissions for cities/urban areas with different densities, transportation demands and solutions for transportation, with emissions allocated to the areas they are produced. This would be useful to illustrate the potential effect of different choices for development. | Noted: The text in this section has been rewritten. |
| 3339 | 12 | 7 | 14 | 7 | 16 | probably meant "in developed countries". | Noted: The text is deleted in rewriting of |
| 17574 | 12 | 7 | 14 | 7 | 14 | What does it mean to normalize data by "total urban population"? Doesn't that become per capita analysis? If so, why are both "total urban population" and "per capita" listed here? | Noted: The text is deleted in rewriting of the section. The comment is no more |
| 12452 | 12 | 7 | 15 | 7 | 16 | The sentence indicates that the per capita urban emissions are only a fraction of the national averages. This seems less consistant with the information in line 10 "if emissions are allocated to the places where they are produced urban areas are producing 60-80 % of global emissions" and line 46 " in 2009 over half of the worlds population is urban". Please consider to rephrase. | Noted: The text is deleted in rewriting of the section. The comment is no more relevant. |
| 2370 | 12 | 7 | 15 | | | Only in developed countries are per capita emissions lower than for countries (as per exec. summary). Perhaps change the term "a fraction" as it may imply "much smaller" which is not the case. | Noted: The text is deleted in rewriting of the section. The comment is no more |
| 18775 | 12 | 7 | 15 | 7 | 16 | Not in developing countries! | Noted: The text is deleted in rewriting of the section. The comment is no more |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6000 | 12 | 7 | 18 | 7 | 18 | The authors often write about infrastructure. It would be helpful to explain what they have meant by infrastructure (e.g. to give a common definition for the section) and above all which infrastructures (energy, water, transportation, communication ...) are particularly affecting the GHG. | Taken into account: First line of the second pragraph of revised intro section mentions the meaning/scope of infrastructure. In this chapter, infrastructures are broadly defined as those services and built-up structures that provide water, energy, food, shelter (construction materials) |
| 5968 | 12 | 7 | 2 | 7 | 4 | The distinction between mitigation and adaptation is not appropriate any more. Especially in cities, both is necessary and can hardly be distinguished from each other. | Taken into account: Ch 12 is about mitigation and we have some consideration to adaptation in Section 12.8 though UHI discussions. We will benefit from cross referencing and |
| 5969 | 12 | 7 | 20 | 7 | 22 | Besides the spatial form, the institutional framing and political setting and incentives of urban settlements are immediately connected and have both a major effect on transportation and travel behaviour. | Taken into account: The section is rewritten and streamlined. |
| 3340 | 12 | 7 | 23 | | | one "that" too much | Editorial |
| 18776 | 12 | 7 | 24 | | | also in line 27 "aerosols" - this is redundant in my view | Taken into accounted: the text is deleted |
| 11032 | 12 | 7 | 25 | | | The text states: 'The urban built environment is a significant forcing function on the weather-climate system because it is a heat source, a poor storage system for water, an impediment to atmospheric motion, and a source of aerosols'. Only aerosol emissions, among these, is likely to affect the climate system significantly, but GHG emissions certainly do. Suggest reword: 'The urban built environment is a significant forcing function on the weather-climate system because it is a heat, GHG and aerosol source, a poor storage system for water, and an impediment to atmospheric motion.' | Taken into account: The section is rewritten and streamlined. The text is deleted and comment no longer relevant. |
| 5715 | 12 | 7 | 25 | 7 | 27 | Low density urban areas, as in the case of the suburbs of many U.S. cities, will tend to not have the characteristics attributed here to "the urban built environment", i.e. "……a significant forcing function on the weather-climate system because it is a heat source, a poor storage system for water, an impediment to atmospheric motion, and a source of aerosols…..". There seems to be a lack of established literature making the case for the many potential gains that are of necessity associated with low density living rather than high density living. The foregoing points are among these. Patrick Troy (Australian National University) is the author of works on this subject, condensed into his 1996 book "The Perils of Urban Consolidation".12 | Taken into account: The section is rewritten and streamlined. The text is deleted and comment no longer relevant. |
| 18777 | 12 | 7 | 37 | | | "create" sounds planned - there are also many non-planned, right? | Taken into account: The section is rewritten and streamlined and this text is |
| 3341 | 12 | 7 | 45 | | | "urban to rural" --> "rural to urban" | Taken into account: The section is rewritten and streamlined and this text is |
| 17175 | 12 | 7 | 45 | 7 | 45 | Typing error - 'urban to rural migration' should be changed to 'rural to urban migration'. | Taken into account: The section is rewritten and streamlined and this text is |
| 3337 | 12 | 7 | 6 | 7 | 6 | delete "continue" (does not make sense either logically nor grammatically) | Editorial |
| 3338 | 12 | 7 | 7 | | | "of" missing | Editorial |
| 5999 | 12 | 7 | 7 | 7 | 7 | Source for statement "90% of the global economy" must be added. | Taken into account: Source added in |
| 18028 | 12 | 7 | 11 | 7 | 12 | The statement "a few wealthy cities contributing to a majority of the emissions is not backed up with evidence. Does this mean the consumption of the people in a "few wealthy cities" produces more consumption based emissions of the rest of the world population? Its a very vague statement because the terms "few" and "wealthy" are not defined | Noted: The text is deleted on subsequent revision of section. |
| 18029 | 12 | 7 | 16 | 7 | 16 | "Per capita GHG emissions are a fraction of national averages." GHG emissions per capita in cities are generally less than the national average but using the words "a fraction of" gives readers the impression that they are very small compared to the national average. This statement should be revised and state the percentage range of how much less than the national average. | Noted: The text is deleted on subsequent revision of section. |

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| 17200 | 12 | 70 | 1 | 94 | 22 | The literature referred to in my comments is listed below and might, to the extent you find it relevant, be included in the reference list of the report.<br>Aguiléra, A.; Wenglenski, S. & Proulhac, L. (2009): “Employment suburbanisation, reverse commuting and travel behaviour by residents of the central city in the Paris metropolitan area.” Transportation Research A, Vol. 43, pp. 685-691.<br>Banister, D. (1992): Energy use, transport and settlement patterns. In M. Breheny, ed., Sustainable Development and Urban Form, pp. 160–181. London: Pion Limited.<br>Breheny, M. (1995): The compact city and transport energy consumption. Transactions of the Institute of British Geographers, Vol. 20, pp. 81–101.<br>Brotchie, J. F. (1984): Technological change and urban form. Environment and Planning A, Vol. 16, pp. 583–596.<br>Cairns, C.; Atkins, S. & Goodwin, P. (2002): “Disappearing Traffic? The Story So Far.” Proceedings of the Institution of Civil Engineers; Municipal Engineer, Vo. 151, Issue 1, March 2002, pp. 13-22<br>Cervero, R. & Landis, J. (1992): “Suburbanization of jobs and the journey to work: A submarket analysis of commuting in the San Francisco bay area.” Journal of Advanced Transportation, Vol. 26, pp. 275–297.<br>Dasgupta, M. (1994): Urban travel demand and policy impacts. Paper presented at the course “Byens miljø- og trafikkpolitikk” at Norwegian Institute of Technology, Trondheim, January 10-12, 1994.<br>Fouchier, V. (1998): ”Urban density and mobility in Ile-de France Region.” In Ministerio de Fomento: Proceedings of the Eighth Conference on Urban and Regional Research, Madrid, 8-11 June 1998, pp. 285-300. Madrid: UN/ECE-HPB and Ministerio de Fomento.<br>Giuliano, G. & Small, K. A. (1993): “Is the journey to work explained by urban structure?” Urban Studies, Vol. 30, pp. 1485-1500.<br>Gordon, P., Richardson H. W. &Jun, M.-J. (1991): “The commuting paradox: evidence from the top twenty.” Journal of the American Planning Association, Vol. 57, pp. 416-420.<br>Hartoft-Nielsen, P. (2001a): Boliglokalisering og transportadfærd. (Residential location and travel behaviour.) Hørsholm: Danish Forest and Landscape Research Institute.<br>Hartoft-Nielsen, P. (2001b): Arbejdspladslokalisering og transportadfærd. (Workplace location and travel behavior.) Hørsholm: Forskningscenteret for skov og landskab.<br>Lefévre, B. (2010): “Urban transport energy consumption: determinants and strategies for its reduction. An analysis of the literature.” Sapiens, Vol. 2, pp. 1-17.<br>Litman, T. (2011): Generated Traffic and Induced Travel. Implications for Transport Planning. Victoria Transport Policy Institute, Victoria.<br>Milakis, D.; Vlastos, T. & Barbopoplos, N. (2008): “Relationships between Urban Form and Travel Behaviour in Athens, Greece. A Comparison with Western European and North American Results.” European Journal of Transport Infrastructure Research, Vol. 8, pp. 201-215.<br>Mogridge, M. H. J. (1985): ”Transport, Land Use and Energy Interaction.” Urban Studies, Vol. 22, pp. 481-492.<br>Mogridge, M. J. H. (1997): The self-defeating nature of urban road capacity policy. A review of theories, disputes and available evidence. In Transport Policy, Vol. 4, pp. 5-23.<br>Næss, P. (1993): “Transportation Energy in Swedish Towns and Regions.” Scandinavian Housing & Planning Research, Vol. 10, pp. 187-206. | Noted |
| 6001 | 12 | 8 | 1 | 8 | 6 | Source for the numbers in the last sentences of this paragraph is missing. Although, I assume it is the same as in the statement of line 46 page 7. | Taken into account: UN data, source added |
| 10401 | 12 | 8 | 1 | 8 | 6 | It seems that the author forget to add the corresponding reference. | Taken into account: UN data, source |
| 18764 | 12 | 8 | 1 | 8 | 6 | Reference missing, i.e. no reference at all. "urban areas are projected to absorb the entire world’s population growth while the rural population is expected to start declining in about a decade" is also in (United Nations, 2010a), which is sited in the sentence before. Did not confirm about the rest mentioned in that paragraph. | Taken into account: UN data, source added |
| 6002 | 12 | 8 | 12 | 8 | 12 | There is a more recent publication with data online available at http://esa.un.org/unpd/wup/index.htm (see United Nations Population Division, 2011). | Taken into account: Latest date used in revised texts about population. |
| 2480 | 12 | 8 | 18 | | | Needs some comment on ageing - and differences between cites - old and young | Note: The text is deleted in rewriting of section. Comment is no more relevent |

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| 7497 | 12 | 8 | 2 | 8 | 6 | "By 2050, urban population is projected to increase by 84 percent to 6.3 billion, from 3.4 billion in 2009, with growth concentrating in Asia (+ 1.7 billion), Africa (+ 0.8 billion) and Latin America and the Caribbean (+ 0.2 billion). Despite high level of uncertainty of these projections it is clear that the urban areas will become increasingly central in the climate debate". Increased urbanization will probably lead to increased slums. Slum dwellers may be dependent on biomass fuels for cooking and heating. Therefore it is important to have initiatives for improved biomas stoves and better ventilation and improved kitchen practices etc. | Rejected: Not significant comment |
| 5970 | 12 | 8 | 21 | 8 | 21 | The reclassification is an important hint. However, you do not mention anywhere, that the growth of small and middle-size cities is the most important driver of urbanization, particularly in developing countries. This is important because in these cities, capacities for controlled growth and therefore for climate change mitigation are often missing (cp. on this point also your remarks on fast growing cities in chapter 12, page 15, line 21). | Taken into account: The text is deleted in rewriting of section. Comment is no more relevent but we have not discounted the important role of small |
| 2481 | 12 | 8 | 25 | | | In the developing... | Comment not clear |
| 2482 | 12 | 8 | 25 | | | How can urban become an economic driver? | Taken into account: The text of this section is rearranged and deleted in the rewriting of section. Comment is no |
| 5971 | 12 | 8 | 26 | 8 | 27 | Instead of "expansion" write "change" or "development of the world's economy": Expansion is a term referring to an overcome growth-paradigm. | Taken into account: The text of this section is rearranged and deleted in the rewriting of section. Comment is no |
| 5972 | 12 | 8 | 29 | 8 | 32 | This sounds like multi-national cooperations make decisions that are independent from urban growth. This is wrong, it is a bi-directional relationship between investment decisions and urban development. Also, Sassen ignores in her theoretic framework on "World Cities" that many small and middle-size cities are increasingly becomming important! | Taken into account: The text of this section is deleted in the rewriting of section. Comment is no more relevent |
| 3342 | 12 | 8 | 34 | | | How can an adjective be used as a subject? | Editorial |
| 18778 | 12 | 8 | 34 | | | "... private investment." suggest to add types of settlements and their structure | Taken into account: The text of this section is deleted in the rewriting of |
| 5973 | 12 | 8 | 36 | 8 | 16 | Old source! | Taken into account: The text of this section is deleted in the rewriting of |
| 5717 | 12 | 8 | 38 | 8 | 43 | "Global" Real Estate investment tends to be strongest in "Central Business Districts", where the Real Estate market can have a dynamic of its own, especially if the city concerned is a "Global city" (regarding which Saskia Sassen's work is familiar) or a "Superstar City" (Gyourko, Mayer and Sinai 2006). Price volatility and hence potential for capital gains can be higher, but cyclical downside losses are also higher. Nicholas and Scherbina (2012) "Real Estate Prices During the Roaring Twenties and the Great Depression" analyse the unique magnitude of the Manhattan Real Estate market in particular. Economic rent seeking surrounding "urban planning" and "public" investments tends to be high, often claiming "sustainability" as the policy basis. Gordon and Richardson (1997) "Are Compact Cities a Desirable Planning Goal"?<br>The dispersed city discussed by Gordon and Richardson (op. cit.) presents very much lower opportunity for capital gain and rent-seeking, especially if its land prices are kept low and stable by the absence of constraints on the conversion of non-urban land beyond the fringe, to urban. Los Angeles is an example of a city that is "dispersed" but has very high and volatile urban land prices.<br>The next point made in the IPCC Draft is a good one, regarding specialised buildings and infrastructure for particular industries, and this would be tend to be less associated with the above kind of speculation and rent seeking in the local urban economy. However, the location of high-profile growth industries per se is frequently surrounded by political sweeteners and "gaming". □ | Taken into account: The text of this section is deleted in the rewriting of section. Comment is no more relevent |
| 5975 | 12 | 8 | 46 | 8 | 49 | This single-household trend may be correct for some cities where international capital and technology companies are present, but this is not a general trend for all urban areas. Especially workers in the second (industry) and third sector (low qualification services), often live in shared flats on very little space. | Taken into account: The text of this section is deleted in the rewriting of section. Comment is no more relevent |

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| 5718 | 12 | 8 | 46 | 8 | 49 | "…….international capital is changing urban form through the influx of an international workforce who often prefer single family housing……" This preference is frequently something about which there is limited choice in their countries of origin. But the reverse is also true, at least temporarily until the immigrants involved become financially established. The very much higher density "housing" that is associated with "Global" cities is frequently occupied to a disproportionate extent by recent immigrants who are accustomed to higher densities or worse living conditions, while the citizens of the already-developed nations have a preference against high density "housing" that results in them being under-represented in the "Global" city. It has been noted by many commentators that large numbers of long-term unemployed in the UK will not move to London in search of work, while there are no lack of immigrants from outside the country altogether who are locating in London and taking up the opportunities of employment. The role of housing preference is probably strong, especially considering the steep marginal incentives involved in the difference between being employed in London and paying one's own way for "housing", or being on welfare elsewhere and provided relatively superior "public" housing. | Taken into account: The text of this section is deleted in the rewriting of section. Comment is no more relevent |
| 4229 | 12 | 8 | 25 | 8 | 36 | This section briefly acknowledges the importance of the private sector and market-based economy in the health and growth of cities. Considering the importance of the topic to the sustainability of human settlements, it deserves deeper attention and guidance to the audience of AR5 on how to encourage economic success for cities. | Taken into account: The section is rewritten and streamlined and this text is deleted and the comment is no longer relevant. |
| 6003 | 12 | 8 | | | | It is unclear, how urban governance and institutions are connected to international capital. This section contains an explanation about changes in urban shapes caused by globalization, resources and international capital. Urban governance and institutions and their linkage to the three changes is not mentioned. I would recommend renaming the title of this section. | Taken into account: The section is rewritten and streamlined and this text is deleted and the comment is no longer relevant. |
| 16645 | 12 | 9 | | | | The chapter is not well-organized as to the nature of the evidence connecting urbanization to GHGs. Studies are cited but there is no critical discussion of this literature (e.g., page 9 at bottom citing O'Neill). | Noted: This whole chapter and sections are rewriten and reframed in SOD |
| 16648 | 12 | 9 | 1 | 9 | 49 | I am not sure what value this section provides to the rest of the chapter and perhaps it could be cut | Taken into account: This whole section is rewriten and reframed. Comment is |
| 2483 | 12 | 9 | 11 | | | increasingly | Rejected: Although text is deleted in rewriting, such phemenon is evident in published literature.. But it is on |
| 17176 | 12 | 9 | 11 | 9 | 11 | The text says: 'urban areas are increasing less compact'. 'on average' should be inserted between 'are' and 'increasingly' (and the latter word should be spelled this way). In some countries (e.g. Norway and Sweden), cities are actually becoming more compact, both in terms of buildings but also in terms of jobs and population. See Næss et al., 2011 a and b. | Noted: To be done in next round |
| 2484 | 12 | 9 | 14 | | 17 | No mention throughout of the rivers and estauries - and the potential problems of sea surges and flooding of rivers - many of the great cities are port cities - susceptibility to flooding - large literature on this | Taken into account: This whole section is rewriten and reframed. The text in question is deleted. Comment is no |
| 18780 | 12 | 9 | 18 | | | "turn of the" this might be misunderstood, write "to the 20th century" | Taken into account; The word has not |
| 5977 | 12 | 9 | 23 | 9 | 25 | Vague listing of possible factors, not all of them "increase the quality of life". This is a non-scientific assessment, what is meant by "increase the quality of life"? The source is from 1988, this is a quarter century! Paradigms and trends have changed since then towards an integration of ecology and economy! | Taken into account; The word has not appreared in SOD |
| 6005 | 12 | 9 | 24 | 9 | 24 | Which "other" are meant in the list of the results of GHG emission? Delete "others" and close the list with "and education". | Taken into account: This whole section is rewriten and reframed. The text in question is deleted. Comment is no |
| 3343 | 12 | 9 | 25 | | | Relationships between GHG emissions and QoL are complex, intertemporal, etc. Better to leave this topic to e.g. chapter 3, and delete this half sentence. | Taken into account: This whole section is rewriten and reframed. The text in question is deleted. Comment is no |

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| 18781 | 12 | 9 | 25 | | | detail what approach (consumption, production) is taken - or is it so general that the approach is not relevant? | Taken into account: This whole section is rewriten and reframed. The text in question is deleted. Comment is no |
| 5719 | 12 | 9 | 29 | 9 | 33 | The chapter authors are to be commended for their recognition of these realities. Sir Peter Hall, Prof Patrick Troy, Dr Ray Brindle and others have criticised the misguided “physical determinism” that drives much urban planning “education” and policy. | Noted |
| 5976 | 12 | 9 | 3 | 9 | 6 | Who defines it that way? Source? | Taken into account: This whole section is rewriten and reframed. The text in question is deleted. Comment is no |
| 6004 | 12 | 9 | 3 | 9 | 6 | Source for the definition of mega cities and the numbers in this paragraph is missing. | Taken into account: This whole section is rewriten and reframed. The text in question is deleted. Comment is no |
| 6006 | 12 | 9 | 35 | 9 | 36 | This sentence is far too general. Maybe the authors could mention a few factors that determine the speed, scale and location of urbanisation. The reference of this sentence regarding the whole section is missing. Furthermore, the readers ask themself about which factors are the experts speaking. | Taken into account: This whole section is rewriten and reframed. The text in question is deleted. Comment is no |
| 5978 | 12 | 9 | 36 | 9 | 36 | Too vague, no source! | Taken into account: This whole section is rewriten and reframed. The text in question is deleted. Comment is no |
| 18779 | 12 | 9 | 4 | | | Give als percentage for megacities as done for other city types below | Taken into account: This whole section is rewriten and reframed. In the new |
| 2485 | 12 | 9 | 41 | | | relationships | Taken into account: This whole section is rewriten and reframed. The text in question is deleted. Comment is no |
| 3344 | 12 | 9 | 41 | 9 | 43 | How is the carbon content of biomass accounted for in these studies? Which countries did this study include? | Taken into account: This whole section is rewriten and reframed. The text in question is deleted. Comment is no more relevant here . This is a global |
| 17177 | 12 | 9 | 41 | 9 | 48 | The distinctions between urban structure, urban form and urban infrastructure are in no way commonly agreed on and seem to be to be a bit strange. But I understand the necessity of clarifying what is meant here in this chapter. It should, however, be mentioned that there are no generally agreed definitions of these terms and that they are used by different authors to encompass different aspects of the built environment. | Taken into account: This whole section is rewriten and reframed. The text in question is deleted. |
| 5979 | 12 | 9 | 44 | 9 | 44 | This is not true in cases where urbanisation takes place in the form of densification and decreased mobility distances! Cp. Your own chapter 12, page 13, lines 21-24 | Taken into account: This whole section is rewriten and reframed. The text in |
| 3345 | 12 | 9 | 44 | 9 | 47 | This sounds important but it is difficult to understand what is actually meant. Can it be rephrased and clarified? | Taken into account: This whole section is rewriten and reframed. The text in |
| 6007 | 12 | 9 | 44 | 9 | 44 | This statement is not correct. See your own chapter 12, page 13, l.21-24. | Taken into account: This whole section is rewriten and reframed. The text in |
| 2486 | 12 | 9 | 45 | | 48 | unclear | Taken into account: This whole section is rewriten and reframed. The text in |
| 15748 | 12 | 9 | | | | There is no accepted universal definition of urban area. It keeps varying with different countries. The medium and small towns are also increasing in developing countries. They do not find any mention in the chapter. | Taken into account: Intro section have mentioned that there is no concensus in |
| 10402 | 12 | 9 | 34 | | | The title of this sector is not appropriate. | Taken into account: The text of this section is deleted in the rewriting of |
| 8840 | 13 | | | | | This is an addition, due to a serious omission in the text, to my comments reviewing Chapter 13 sent on 11 September 2009 and received with a confirmation number 259 | Noted |

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| 11215 | 13 | | | | | This chapter gives no treatment to human rights in any detail (other than the brief mention in a confined context at page 29 of 92). The only specific section on rights relate to intellectual property rights. I could not find any reference to the REDD+ *safeguards* under the 2010 Cancun agreements and international obligations (though other aspects of this UNFCCC agreement are dealt with in some detail)? This appears to be a serious omission in this chapter that requires correction (though there is brief note of MDB safeguards these are quite distinct as they do not form part of an international treaty). Also no reference to recent recommendations of the Human Rights Council in relation to Human Rights.<br><br>Needs a specific sub-section on human rights in this chapter. Such a new section would do well to cite Fergus Makay's paper on REDD and the Saramaka case: http://www.forestpeoples.org/sites/fpp/files/publication/2010/08/surinamesaramakaandreddjudgmentmar09eng.pdf | Taken into account - combined with comment #2931 |
| 6986 | 13 | | | | | To me, “environmental effectiveness” means, did the policy reduce global emissions or limit concentrations? “Sustainable development” is a much richer concept, involving values. “Precaution” also can only be interpreted in terms of values (risk aversion), something I wouldn’t associate with “environmental effectiveness.”<br><br>The term, “aggregate economic performance,” in every day language, implies something like GDP growth, whereas you mean it to be more directly related to welfare/wellbeing. There are other terms you might use, like net national welfare. I would have thought that “sustainable development” and “precaution” would be more appropriately placed here.<br><br>Finally, I don’t understand why “fairness” would come under “institutional feasibility.” I would have thought that “enforcement” would be a more relevant consideration. | Noted; these comments apply to 13.2, not to 13.3. They will be addressed along with similar comments in 13.2. |
| 6989 | 13 | | | | | Top row: You say that Kyoto establishes a compliance procedure, including consequences for non-compliance. But for that to be binding, it must be agreed in an amendment, and there is no amendment. I don’t think Kyoto should be mentioned in this row.<br><br>I think the word “mandatory” should be explained. Obviously, participation in an agreement is not mandatory, so even if the word “mandatory” appears in a treaty, there remains a strong element of volunteerism. Also, I was confused about the distinction between a ”mandatory compliance system” (top row) and enforcement of “mandatory” obligations subject to “self-enforcement.” If Kyoto had a compliance amendment, it would operate as a self-enforcing agreement.<br><br>I also didn’t see how “mandatory” could apply to Copenhagen (row three). Not even being a treaty, Copenhagen is weaker than Kyoto. | taken into account. The table needs to be read in conjunction with the paragraph that precedes it, which spells out the meaning of bindingness. That paragraph has been revised to specify the meaning of mandatory - that it refers to the nature of the obligation actors undertake rather than whether they have choice or not whether to participate. |

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| 3474 | 13 | | | | | One of the elements that I was expecting and is lacking from this chapter is the discussion concerning political feasibility of agreements. A large body of literature has numerically assessed the effects of different allocations/international participation to agreements and what they would imply in terms of redistribution and of international transfers. I know part of this will be in the section, still do be developed, on Performance Assessment. Still I would have expected this as a criteria discussed in 13.2.2 (there is something in line 43, page 13, but I believe some more discussion would really be beneficial).<br>For a detailed discussion on equity and sustainable development the reader is referred to Chapter 4. But Chapter 4 will provide the ethical and theoretical background, while some more discussion should be devoted here to issues like: what different allocation/schemes might imply for different regions of the world? are there schemes that hurt less more vulnerable countries while implying reasonable international transfers? What are the main regional obstacles to negotiations (e.g., across many models and under many allocation rules, MENA, Transition Economies and China are almost always major losers from climate change policy)? | Taken into account - this issue has now been throughly addressed in the revised Section 13.13 and in the discussion of instituaional feasibility in Section 13.2.2.4 |
| 3475 | 13 | | | | | Although a lot of new stuff is going on (see european project LIMITS and associated publications) most models have been running C&C schemes for a long time and this should be mentioned somewhere in this chapter. Meyer, A. & Hanmbock, R., 2004. Contraction and convergence. In Proceedings of the Institution of Civil Engineers–Engineering Sustainability. pagg 189–192. □ | Rejected - the suggested body of literature was assessed in AR4, new literature should be included, but no new references provided |
| 13195 | 13 | | | | | Sometimes Cancun is written is Spanish (Cancún) and other times is written without the stress. I suggest taking a unique writing criterion. | Editorial - copyedit to be completed prior to publication |
| 3727 | 13 | | | | | there is a lot of repetition between sections | Noted |
| 3728 | 13 | | | | | the discussion is still very unfocussed at this stage, very few implications are drawn from the literature, just a bunch of random and often overly brief summaries | Noted |
| 3729 | 13 | | | | | too much parochial self-citation by the authors, not enough reference to the broader literature | Noted |
| 3756 | 13 | | | | | see Biermann | Rejected - Biermann articles are cited but comment not specific about which |
| 8090 | 13 | | | | | This is a very good chapter. I have only a couple small comments. | Noted |
| 14344 | 13 | | | | | This figure contains various agreements and "forms of cooperation." The bubble on NAMAs and NAPAs seems out of place here. These describe one the one hand a broad array of nationally appropriate mitigatio actions (a loose category that includes any activity and is not necessarily related to initiatives or agreements), and on the other national adaptation plans of action, which are actual plans, again not initiatives or agreements. These do not belong here. | Taken into account in revision of Figure 13.1. |
| 18684 | 13 | | | | | Concepts, principles, etc. are defined at length, which is great, but are not used much in the remainder of the chapter. | Noted |
| 18697 | 13 | | | | | The chapter sets out to "survey and synthesize the scholarly literature". While I think it already does a good job, I believe the *synthesis* aspect needs to be strengthened to avoid producing a (however useful) commented reference list. | Noted |
| 2580 | 13 | | | | | The role of subnational and local governments in addressing Sustainable Development issues, notably climate change, has been increasingly recognized by the UM System. For instance, the Rio+20 final declaration has 23 matches to "subnationals" (initial draft had just a couple) | Noted - subnational and local actions are already depicted in Figure 13.1, mentioned in 13.3, and discussed in |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15382 | 13 | | | | | International chapter needs to recognize the limits on national policy discussed in Ch 6 and Ch 15 – international policy can't be more than the coordination of national policies, and is subject to the same influences that make national policies inefficient. The discussion of capacity building is so bland and uncritical to be hardly worth including. But since the topic cannot be avoided, I strongly recommend being both specific and critical. Some forms of capacity building, such as education and scientific exchange, are unexceptional. But a discussion of other forms of capacity building – support for planning, policy making and enforcement, and creation of government agencies, for example, must differentiate what kind of capacity is being built, by whom, and how. Easterly's work (The White Man's Burden: Why the West's Efforts to Aid the Rest of the World Have Done So Much Ill and So Little Good, 2006.) is particularly relevant here, because much of the $2.3 Trillion in development aid whose failures he documents went for precisely this kind of centralized capacity building and planning rather than on the ground efforts to encourage entrepreneurial activity and address the immediate causes of poverty. | Taken into account - Section 13.10 has been heavily revised and additional literature on interactions of national and international policy has been included where appropriate |
| 13633 | 13 | | | | | See Comparing Climate Commitments: A Model-Based Analysis of the Copenhagen Accord, by W. McKibbin, A. Morris, and P. Wilcoxen, Climate Change Economics, Vol. 2, No. 2 (2011) 79-103. | Taken into account - reference has been assessed |
| 13638 | 13 | | | | | Example: Achieving Comparable Efforts through Carbon Price Agreements, with W. McKibbin and P. Wilcoxen, Viewpoints, The Harvard Project on International Climate Agreements, Harvard University Kennedy School, December 2009. | Taken into account - reference has been assessed |
| 13645 | 13 | | | | | The OECD also has tools, such as the Climate change expert group (formerly the Annex I expert group). | Rejected - the level of detail suggested |
| 7499 | 13 | | | | | No comments. | Noted |
| 7370 | 13 | | | | | There is a lot of repetitive text, particularly in the introductory parts of each section. | Noted |
| 2941 | 13 | | | | | This is a very interesting and revealing chapter. I am pleased to see these topics discussed in AR5, and can only hope that they inspire political action in the form of more effective international agreements to mitigate climate change. | Noted |
| 9970 | 13 | | | | | This section is duplicated with chapter 16. Financing instruments mentioned in this section are almost repteated in chapter 16. Maybe authors from these two chapters have to communicate. | Taken into account - overlap with Ch. 16 eliminated and cross-references made. |
| 3730 | 13 | | | | | this section covers one of the most important and promising areas of climate governnace that has emerged since the last IPCC report, and deserves much more elaboration. | Within the space limits, this section has been strengthened |
| 5917 | 13 | | | | | It may be useful to provide a table of international initiatives similar to Table 14.9, there may be limited assessment but it gives an idea of what is being done / available in various parts of the world. | Taken into account - a new tabel is now included |
| 11321 | 13 | | | | | The report may take note that UNDP and UNEP are only two of many UN programmes addressing climate-based issues. A bit mis-leading to leave readers thinking otherwise. | Accepted - text revised. |
| 12974 | 13 | | | | | Please check with Ch. 16 possible overlaps. | Taken into account - overlap eliminated and cross-references made |
| 6049 | 13 | | | | | Is there any literature that discusseshow these mechanisms are set up and/or evaluates how well they are working? | Taken into account - the (scarce) peer-reviewed literature evaluating these mechanisms has now been |
| 6051 | 13 | | | | | Could this section be re-organized to more explicitly use the evaluation criteria listed in line 3? | There are no criteria in line 3. |
| 6052 | 13 | | | | | This section might make more sense as an introduction to section 13.11. It seems to repeat some of the material in the previous sections. | Taken into account - section deleted and relevant material shifted into the |
| 7374 | 13 | | | | | This section should perhaps incorporate more of the policy ideas arising from the UNSG High Level Advisory Group on Climate Finance - such as an international transaction tax, taxes on international transport, and assessed contributions from developed countries.<br>http://www.un.org/wcm/content/site/climatechange/pages/financeadvisorygroup/pid/13300 | Accepted - AGF report now quoted with a list of instruments suggested. |
| 14668 | 13 | | | | | I do not understand why this section is in this chapter. There needs to be a stronger connection to the material in this section to the design, implementation, and/or success of international agreements/international efforts to combat climate change. | This section was included because of a plenary approved bullet. We have tried to strengthen the link with other sections |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6053 | 13 | | | | | I would like to see a discussion of some of the literature that analyses the performance of PPPs. In addition to the sources listed in the first paragraph of this section, see also Biermann et al. 2007 (in Peter Glasbergen's book PARTNERSHIPS, GOVERNANCE AND SUSTAINABLE DEVELOPMENT. | Within space limits more recent literature by the same group of authos has been included. |
| 6054 | 13 | | | | | This section could also draw on literature that analyzes private sector governance. What are the governance issues raised (e.g. accountability issues)? | Additional literature on governance issues of the private sector are cited |
| 18357 | 13 | | | | | When the section is being developed for the Second Order Draft, authors clearly need to think in how far the previously discussed assessment criteria in addition to environmental effectiveness (i.e. aggregate economic performance, distributional and social impacts, and institutional feasibility) will be addressed. It is also not clear in how far the section will compile the insights from the rest of the chapter and e.g. discuss the different negotiation components (such as capacity building, technology transfer and finance etc). Also, the assessment of different burden sharing proposals should be based on the relevant discussions in Chapters 3 and 4 (which introduce equity principles underlying the UNFCCC and their translation into burden sharing regimes). | Taken into account - new text prepared |
| 18694 | 13 | | | | | The Introduction of the chapter (13.1) promised an evaluation "according to [the] criteria developed in section 13.2". This is indeed important to make section 13.2 meaningful, and this promise is not yet delivered upon in 13.13 (I realize that parts of the chapter are still missing, but it is also completely absent from the subsections that are present). | Taken into account - new text prepared |
| 10927 | 13 | | | | | The following two papers are relevant here: Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908.; Velders, G.J.M., Andersen, S.O., Daniel, J.S., Fahey, D.W., M.McFarland, 2009. The importance of the Montreal Protocol in protecting climate. Proceedings of the National Academy of Sciences 104, 4814-4819. | Taken into account - references included in 13.13<br><br>Also taken into account in 13.8. First reference is now cited. Second reference is interesting though it is not clear where |
| 7375 | 13 | | | | | The sub-sections appear to be focused on the mitigation-target elements of the UNFCCC and KP (and the function of the CDM). As both provide for a much more holistic mitigation response to climate change it would be desirable to include overview of how these institutions have supported (or not) e.g. financial and technology transfer to achieve mitigation actions - particularly outside the context of the CDM. | Taken into account - new text prepared |
| 18436 | 13 | | | 49 | | I think the summary should include a brief performance assessment on policy and institutions, especially regarding UNFCCC. Could be a suggestion for the second draft, considering that the authors are saying that that work is incomplete | Taken into account - new text prepared |
| 8778 | 13 | | | | | See the report of the CDM Policy Dialogue for an assessment of the performance of the CDM and recommendations for change. http://www.cdmpolicydialogue.org/ | Taken into account - the CDM policy diagloue is mentioned as an institution but its reports are not peer-reviewed; however the peer-reviewed references |
| 14670 | 13 | | | | | This assessment of Cancun is focused only on environmental outcome. First, it assumes compliance (and there is a long literature, much of which is referenced here, raising questions about that). Second, it ignores effeciency, cost-effectiveness, and equity. | Taken into account - Included more literature on costs-efficiency. |
| 8099 | 13 | | | | | Same comment as number 7 above | Taken into Account - Is addressed in |
| 11347 | 13 | | | | | It may be worth mentioning somewhere - either in the financing section or here in the assessment section - the problems of fraud and trade practices issues that can (and do) arise in private/voluntary schemes and which have particularly negative impacts on their efficacy and on consumer and investor confidence | Taken into account - new text prepared |
| 3753 | 13 | | | | | add a column on causal mechanisms, and indicate which types are complementary and which interfere with one another, and which have no interative effects | Rejected. The comment was not understood by the authors. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18685 | 13 | | | | | Suggestion: the relations between the different terms that are defined in this section (principles inform goals, goals are fleshed out in targets, targets are implemented in policies, criteria are fleshed out in metrics, policies are evaluated according to metrics, ...) could be visualized in a diagram to make these basic concepts clearer. | Taken into account. The text has been rephrased to make clear what is the differences bewteen principles and criteria, and a more detailed explanation on goals, targets and metrics has been |
| 3173 | 13 | | | | | section 13.2.1: cross reference to the discussion in chapter 6 of international cooperation and transformational pathways. Chapter 6 makes a very important point that echoes the argument here about the need for participation. A cross reference would make this point much stronger and tie WG3 together more fully. | Accepted. Text in section 13.2.1.3 makes now reference to the point raised by the referee (section 6.3.6 International Strategies and Stabilization |
| 6030 | 13 | | | | | The chapter focuses on climate change as a commons issue but there are many scholars who approach their research from an alternative framing that emphasizes how climate change is embedded in the neoliberal global political economy, which in turn raises different types of challenges in terms of international cooperation. Could this be added as an alternative framing in the chapter to better reflect the literature? | Rejected. No scientific evidence/publication provided to support changes suggested by the reviewer. Commentator should provide a clearer |
| 2163 | 13 | | | | | From my point of view, one important approach to overcome undersupply of public goods should be included: the matching approach first suggested by Joel Guttman (1978), American Economic Review. This approach has been also highlighted by Scott Barrett (1990), Oxford Eview of Economic Policy. Recently there have been several papers analyzing this approach and applying it in the global public good / climate change mitigation context (Boadway et al 2007, Cornes at al 2011 etc.). | Accepted. Text has been revised to include the suggested matching literature under 13.2.1.1. after the mention on the role of prices to internalize "extrenal costs" since |
| 3740 | 13 | | | | | why these principles? How about other global principles, like sovereignty, human rights, respect for IPRs, WTO liberalization? | Accepted. Section 13.2.1.2 to 4 and 13.2.2. will be fully revised. |
| 12976 | 13 | | | | | It is not clear why "high cost-effectiveness may have negative impact on sustainable development if cost effectiveness is calculated on a short time horizon". The authors should expand on that or cancel the statement.<br><br>I think this is the right place to introduce the literature on the trade-off between efficiency and equity.<br><br>Given a mitigation target, the highest possible level of efficiency minimizes aggregate abatement costs. Equity can be achieved by means of transfers (Coase, 1960).<br>However, in the absence or in the impossibility to distribute the efficiency gains in an equitable way, efficiency might require some regions to bear a large fraction of the costs. If those regions are poor, efficiency might have impact on sustainable development.<br><br>Most IAM study global mitigation policies assuming an efficient distribution of abatement effort. However, this often implies a disproportionate cost for developing countries (in case of a carbon tax) or an unfeasible transfer scheme (global cap-and-trade). In the impossibility to redistribute efficiency gains, equity and development considerations might push towards less efficient distributions of abatement effort.<br><br>Unfortunately the trade-off between equity and efficiency is not well reflected in the estimates of mitigation costs.<br><br>I have recently done work with Massimo Tavoni on this issue and our paper is forthcoming on Energy Economics: http://dx.doi.org/10.1016/j.eneco.2012.02.005. | Accepted. The text " if cost effectiveness is calculated on a short time horizon" was eliminated because it was not clear. Section 13.2.1..3 was moved to 13.2.2.5. More explanation on efficiency equity trade-off was added. |
| 6032 | 13 | | | | | The sub-parts of this section are imbalanced with the discussions of environmental effectiveness and institutional feasibility much more detailed than the discussions of aggregate economic performance and distributional and social impacts. | Accepted. Text was better balanced, as suggested. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3741 | 13 | | | | | what are the legitimacy of these principles? Who says they are legimate? What are the warrants? | Taken into account.These are principles discussed in the literature. Legitimacy is one of the criteria for the evaluation of the principles as stated in section |
| 12979 | 13 | | | | | The paragraph is not crystal clear. | Editorial-copedit to be completed prior to |
| 14343 | 13 | | | | | There are links between the "sub-criteria" - in particular between participation and flexibility. Because of the range of national circumstances, policy processes, legal institutions, etc… an institutional structure, to be feasible, will not only need to take into accoun flexibility to adapt to new information or changes, but also flexibility in terms of participation for the multiple actors involved. See Bodansky, Daniel, "The Durban Platform Negotiations: Goals and Options," Belfer Center Policy Brief, July 2012. | Taken into account. The suggested article is not peer reviewed literature. The link between Participation and Fexibility is now aknowledged. Not enough specific literature was found. Furthermore, the sentence on links |
| 3174 | 13 | | | | | 13.2.2.4: institutional feasibility should be unpaved a bit to include domestic politics. That's not just "compliance" but more generally all the work by scholars that has looked at how domestic political forces constrain (and sometimes vice-versa) the feasibility of international agreements. There's a big discussion of so-called "domestic politics" in the international relations literature in the Hafner-Burton et al (2012, American Journal of International Law) review article. Political science has done a ton of work in this area. Similarly, Lee Lane and others have been trying to get the IAM community to look at how institutional factors constrain (and make impossible) some climate goals—though that work has focused on the the "new instiitionalism" and "institutional economics" and I'm not sure if any of Lee's stuff has been published. | Accepted. An explicit reference to domestic policies and the literature on "two-level games" was introduced. Hafner-Burton et al (2012, American Journal of International Law) review article was added, as well as another more economic article by Kroll and SHogren (2008). Lee Lane (unclear) |
| 18696 | 13 | | | | | On the structure: section 13.3 seems unneccesarily brief, especially compared to later sections (e.g. 13.4 which gives rich details on the Kyoto Protocol, or 13.9 which is a nice introduction to the literature). 13.3 would benefit from more information on how the reported results were found. | Noted - but no specific text is proposed here, and 13.3 is intended to be brief because more detailed discussions are |
| 18698 | 13 | | | | | I'm missing a discussion of the literature on dynamic games and repeated games, both for the context of climate treaties. Examples are found in Dutta PK, Radner R (2004) Self-enforcing climate-change treaties. Proc Natl Acad Sci USA 101:5174–9; Dutta PK, Radner R (2006) A game-theoretic approach to global warming. Adv Math Econ 8:135–153; Rubio SJ, Casino B (2005) Self-enforcing international environmental agreements with a stock pollutant. Span Econ Rev 7:89–109; Rubio SJ, Ulph A (2007) An infinite-horizon model of dynamic membership of international environmental agreements. J Environ Econ Manage 54:296–310, Asheim GB, Froyn CB, Hovi J, Menz FC (2006) Regional versus global cooperation for climate control. J Environ Econ Manage 51:93–109; Froyn CB, Hovi J (2008) A climate agreement with full participation. Econ Lett 99:317–319; Asheim GB, Holtsmark B (2009) Renegotiation-proof climate agreements with full participation: Conditions for Pareto-efficiency. Environ Resour Econ 43:519–533; Weikard HP, Dellink R, van Ierland E (2010) Renegotiations in the greenhouse. Environ Resour Econ 45:573–596; Heitzig, J., Lessmann, K., Zou, Y. (2011): "Self-enforcing strategies to deter free-riding in the climate change mitigation game and other repeated public good games." Proceedings of the National Academy of Sciences (PNAS), 108, 38, 15739-15744 | Accepted by adding both text and numerous references (several of those provided by this comment, and others as well). |
| 11335 | 13 | | | | | This section seems particularly weak. In the introduction we are promised a review of lessons to be learned from climate and non-climate international agreements but instead, the introductory section focuses on a tour of game theory and a confusing discussion of IEAs and MEAs - the difference between which is not explained. The following subsections then focus most of their analysis back on the climate regime with little to no idenitifcation of lessons that might be learned from other regimes | Taken into account in revisions to 13.3, to clarify and strengthen the lessons learned from past practice and from theory. |
| 3747 | 13 | | | | | what are the implications for effective governance from this section? | Accepted by adding both text and |
| 18365 | 13 | | | | | The discussion could expand more on the importance of transfers in the context of establishing participation. | Accepted by adding both text and references on the role of transfers, in theory and in practice, including in |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18687 | 13 | | | | | Section 13.4 picks up terms from 13.3, e.g. participation. The chapter can be improved by relating the two discussions to each other. | accepted. As of 2 December unable to do however, requries more coordination across the sections than we have been |
| 14653 | 13 | | | | | This sub-section seems abbreviated. Are there really only three elements of international cooperation -- legal form, participation/burden-sharing, and flexibility? Could an alternative way of framing this be: legal form, objectives, and implementation? In this latter formulation, one could envision more discussion of elements than just flexibility, e.g., policy surveillance, compliance incentives, etc. In addition, see comments on flexibility section. | Taken into account. Section reorganised and the nature of this discussion clarified. Additional element introduced (goals, actions and metrics), to be drafted.. Emphasised that this is not an |
| 18688 | 13 | | | | | This section picks up participation from 13.3 as a basic element, but not, for example, compliance. Either the role of compliance or its omittance needs some explanation. | accepted. As of 2 December unable to do however, requries more coordination across the sections than we have been |
| 3754 | 13 | | | | | does participation relate only to states, or to non-state actors as well? | Taken into account - text revised to mean participation can be by states or |
| 18689 | 13 | | | | | How does this discussion of participation relate to section 13.3.1? How can participation in climate architectures be interpreted in the light of the findings presented in 13.3.1? | accepted. As of 2 December unable to do however, requries more coordination across the sections than we have been |
| 14654 | 13 | | | | | This sub-section has an excessive focus on the CDM. Performance of international emission trading would also be useful to understand. It would also be important to note that international emission trading can be quite extensive (e.g., under the ETS) even though it is not formally through a KP Article 17 provision. It would also be useful to discuss the role of land use emissions under KP and REDD+ under post-KP agreements. It is also not clear how the CDM facilitates an international agreement. Does it serve as a stepping stone for developing countries to do more? Does it undermine environmental performance by lowering the price of carbon in developed countries (and risks bringing so-called anyway tons into Annex I countries)? Put another way, why is this an important element of an international agreement? I understand it for legal form and for participation/burden-sharing, but the case is not made clearly here. | taken into account. Section reframed (see response to #522) to take into account other forms of flexibility. Nevertheless, the literature on existing flexibility mechanisms is overwhelmingly on the CDM. Text introduced to expalin this. |
| 18686 | 13 | | | | | Discuss flexibility mechanisms with respect to "aggregate economic performance" and "institutional feasibility" as defined in 13.2. | Rejected - this evaluation is carried out in section 13.13 |
| 12985 | 13 | | | | | This is a long sub-section on CDM. Is CDM covered elsewhere in the AR5? If yes, please check if there are overlaps. My feeling is that this is not the chapter where the pros and cons of CDM should be discussed. In this chapter I expect to see a discussion of how CDM affects international cooperation or how CDM-type tools are treated by different regional policy initiatives. | rejected. A division of labour concerning where in AR5 the CDM is discussed has already been established. |
| 14655 | 13 | | | | | Are there lessons from the arms control treaty literature that would be relevant for a discussion of the governance challenges facing SRM? | rejected - space limits preclude a discussion. |
| 14340 | 13 | | | | | Generally, this section appears to not fully address the literature on criteria for design of international cooperation and governance of geoengineering; see literature mentioned above, e.g. - Bodle, Ralph, “International governance of geoengineering: Rationale, functions and forum”, in: William C.G. Burns and A. Strauss, (eds.), Climate Change Geoengineering: Legal, Political and Philosophical Perspectives, Cambridge: Cambridge University Press (submitted February 2011; in press);<br>- Lin A.C., International Legal Regimes & Principles Relevant to Geoengineering (in press). In: W.C.G. Burns and A. Strauss, (eds.), Climate Change Geoengineering: Legal, Political and Philosophical Perspectives. Cambridge: Cambridge University Press, Cambridge (submitted 2011, in press); | Noted. Commenter contacted for copies of the papers which are not yet published. (Not yet received). |
| 3755 | 13 | | | | | see Zurn, somehow this section belongs at the end. See comment 7, 12. | Reject - comment not clear enough to establish what changes it recommends |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12986 | 13 | | | | | CDR and SRM are very different. CDR should not be mentioned in this section. CDR is an emission abatement technology which suffers from all sorts of coordination problems as any other mitigation option because it is costly. SRM can instead provide local benefits and can be relatively inexpensive. CDR supplies a public good, some forms of SRM provide a private good. | Taken into account. Including CDR and SRM in the same subsection follows the treatment in chapter 6, section 9. Also included because they produce some similar challenges for international |
| 11340 | 13 | | | | | What si the justification for a subsection on SRM in a section on climaet oplicy architectures? And why is SRM given special prominence when other options are not discussed. | noted. Section reorganized, and place of SRM clarified as a consequence. Explanation of discussion also |
| 6040 | 13 | | | | | There are some other multilateral options that could be discussed such as mini-lateralism (e.g. moving discussions to for a like the G20) and/or creating clubs. | accepted. Notion of minilateralism included in revised section. |
| 16344 | 13 | | | | | Kyoto 2 http://www.kyoto2.org/ provides a simple alternative approach which is well researched and would be useful to draw attention of policy makers to. Kyoto (Tickell) 2008 ZED Books. Here is the simple explanation from the website.<br>Kyoto2 is a global framework for a Climate Treaty to limit emissions of greenhouse gases to a level that would prevent dangerous interference with the Earth's climate system, while generating enormous economic, social and environmental benefits. It is thus a delivery mechanism for the objective and principles of the Climate Convention (UNFCCC).<br>Greenhouse gases are global pollutants and can only be regulated under a global emissions cap. As a genuinely global system Kyoto2 applies the cap without regard to national boundaries, dispensing with national emissions targets, national allocations and the 'territorial accounting' that characterizes the Kyoto Protocol.<br>Permits to produce CO2 or other greenhouse gases are sold up to the cap by global auction using a Uniform Price Sealed Bid system subject to reserve and ceiling prices. The secure carbon price signal stimulates long term investments in a low carbon future. Any permits sold above the cap are clawed back in subsequent years and the extra money raised is invested to reduce future demand for fossil fuels.<br>Greenhouse gas emissions are regulated 'upstream' - at or close to where fossil fuels are produced, and at the source of other greenhouse gas emissions such as CO2 from calcinating lime in cement kilns - because this is where emissions are most reliably and inexpensively controlled.<br>The market mechanism is supplemented by direct regulation aimed at overcoming market failures, or where a market system would create unnecessary cost. Demanding efficiency standards are set for all energy consuming sectors, from housing to transport, industrial machinery and domestic appliances. Most of the powerful industrial greenhouse gases or PIGGs used in industry and refrigeration are phased out following the example of the Montreal Protocol.<br>The funds raised at auction - of the order of $1 trillion per year - are invested in solving the problems of climate change, with an emphasis on the needs of poor countries, poor people and those most adversely impacted, including to:<br>bring about a worldwide clean energy revolution and a prosperous low-carbon global economy through investments in energy research and development, energy efficiency, and the deployment of renewable energy infrastructure; I meet developing country costs of complying with the standards and regulations set out in [5] above via a 'Multilateral Fund';<br>finance developing country adaptation to climate change, and responses to climate-related health challenges and emergency needs;<br>conserve and sequester carbon within the biosphere - soils, peatlands, forests and other ecosystems - and reduce land-based emissions of other greenhouse gases including methane and nitrous oxide, while boosting soil fertility and water retention;<br>research low-cost, reversible and environmentally benign geo-engineering options that could in extremis halt a 'runaway greenhouse effect'.<br>Reducing emissions by cap and carbon price alone would require such a high carbon price as to cause hardship and economic pain. By contrast Kyoto2 uses three mutually supportive mechanisms: the cap-and-trade market; direct regulation; and the investment programme. Working together these can rapidly reduce emissions | Taken into account - text revised to concede that all the approaches discussed preclude the emergence of a supranational authority as proposed in the arguments by Tickell (2008). The Tickell text is cited. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6039 | 13 | | | | | Is there much literature on this approach? What are the advantages and disadvantages? | rejected. The space for this discussiuon woudl be 13.13. This subsection (13.4.3.2, the commenter was asked for |
| 6044 | 13 | | | | | There is unevenness in this section where some agreements and institutions are discussed in extensive detail while others are merely mentioned without any consideration for their advantages/disadvantages or significance (e.g. Section 13.5.1.4) | Accepted, a new sub-section outlining dis/advantages of different architectures included |
| 7371 | 13 | | | | | This section is structured very strangely- it may be better to organise the elements of agreements under headings (e.g. the UNFCCC, the Kyoto Protocol), rather than listing parts in an ad-hoc manner. | Taken into account - further sub-headings included to organise the text. To improve the structure, new subsection added titled “Advantages and |
| 8098 | 13 | | | | | Suggest adding reference to the Clean Energy Ministerial following the MEF discussion | Accepted - text revised and new |
| 18366 | 13 | | | | | The assessment in this section would benefit from a closer linkage to Figure 13.1 and the related discussion in section 13.3. | In Section 13.5, Taken into account - new column to be added to Figure 13.1<br><br>In Section 13.9, Taken into account - |
| 11342 | 13 | | | | | Thsi section mixes treaty bodies and fora with non-treaty bodies and national initiatives. There is confusion between this and the following three subsections. | Accepted - unnumbered subheadings added to clarify structure of sub-sections |
| 18691 | 13 | | | | | I suggest to include an evualutation/interpretation of the past and future role of the listed coalitions. As it is, this section only enumerates the coalitions, which has little value by itself. | Taken into account - evalutation of dis/advantages in new 13.5.1.2 |
| 11344 | 13 | | | | | transanational' initiatives are better described as 'transnational arrangements'. And how are city-level schemes and the California scheme 'transnational'? | Rejected - proposed wording does not seem an improvement, and the initiatives mentioned have international dimensions; e.g. the California system is |
| 15726 | 13 | | | | | I wouldn't mention details on the WCI or the EU-ETS or other schemes here as this is anyway part of chapter 15, there is risk of overlap. Instead I would give a brief overview of the dynamics since Copenhagen regarding the emergence of cap-and trade schemes (AUS, SKorea, China…) and the danger that a fragmented international Carbon Market outside the UNFCCC may emerge. It would be important to mention the "framework for various mitigation approaches, including opportunities for using markets" as was considered to be established in the Durban Climate Conference. De Sepibus, Sterk and Tuerk, 2012, assess the possible roles of such a framework.: Top-down, Bottom-up or In-between: How Can a UNFCCC Framework for Market-Based Approaches Ensure Environmental Integrity and Market Coherence? NCCR Working Paper No 2012/31| July 2012 | Taken into account: refer to section where other national systems are described |
| 6046 | 13 | | | | | Why focus on WCI when RGGI is operational and arguably more prominent? | Taken into account: refer to section where other national systems are |
| 12923 | 13 | | | | | I would rather focus this section on issues like: incentives; has EU ETS led to mitigation and innovation?; the allocation process; concerns of competiveness and carbon leakage; dynamics of the carbon price; changes for 2013-2020 and linkages wth other carbon markets. I can provided references if needed. | Rejected - outside the scope of the chapter. It deals only with the interlinkages to international cooperation |
| 12987 | 13 | | | | | Any information on the actual emission reductions obtained by these regional initiatives? | Rejected - outside the scope of the chapter. It deals only with the interlinkages to international cooperation |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12988 | 13 | | | | | I think the key question in this section should be: why do we observe many regional and sub-regional initiatives when theory says that free-riding should prevail (as mentioned in the first sections of the chapter)? Why should the EU, California, or other local initiatives start reducing emissions when the impact on global concentrations is negligible?<br><br>I can see three possible answers (but I am sure there is more in the literature):<br>- proactive behavior: they anticipate that some form of global regulation will be implemented in the near future;<br>- domestic political reasons and/or self-promotion of a "green" brand;<br>- experimenting solutions and building institutions at local level that will lower the cost of building global institutions.<br><br>Is there a literature that addresses these issues? This would be the right place to mention it. | Taken into account. Will coordinate with Chapters 14 and 15 as they are not particularly relevant to Chapter 13. |
| 7372 | 13 | | | | | Indicative information on the linking of the EU-ETS and the Australian Carbon Pricing Scheme should be included here. Details are available here: http://www.climatechange.gov.au/en/media/whats-new/linking-ets.aspx | Rejected. The linking is not to commence until 2018. No peer reviewed literature on this initiative. |
| 11345 | 13 | | | | | Mention should now be made of the Australia- EU linkage arrangements | Rejected. The linking is not to commence until 2018. No peer reviewed |
| 18361 | 13 | | | | | The treatment of trade and embedded emissions is a very sensitive issue and a clear vision of its coverage should be developed in cooperation with Chapters 4, 5 and 14. | Taken into account: discussion has been moved to the beginning of section 13.8; the discussion has been slightly expanded and appropriate cross- |
| 11346 | 13 | | | | | There is a striking omission of discussion of the work in the IMO. For a summary see Rayfuse, R., 'Climate Change and the Law of the Sea' in Rayfuse, R. and Scott S. V. (eds.), International Law in the Era of Climate Change (Edward Elgar, 2012) page 166 | Taken into account: additional reference have been cited and the part on the IMO has been expanded slightly. |
| 14667 | 13 | | | | | Note that MEF Leaders agreed to double R&D by 2015 at the L'Aquila summit in 2009 | Taken into account - text revised by adding suggested information plus reference at end of first paragraph in |
| 18358 | 13 | | | | | Please link this discussion to the relevant sections in Chapter 3 (3.12.6) and 16 (16.5) to sharpen chapter specific focus and avoid redundancies. | Taken into account - cross-cut references to chapters 3 and 16 added. |
| 15383 | 13 | | | | | This is good, it states the difficulties adequately. Principles, beyond net benefits, are vacuous and not helpful for determining the existence or stability of an agreement. They are associated with criteria: environmental effectiveness, cost-effectiveness, distributional considerations, and institutional feasibility. Lots of words to get to a commonsense list, could just take from Chapter 3 which develops them clearly | Taken into account. A statement on procedural justice was added (in addition to distributive justice, that was already in the text). That follows chapter 3 |
| 4232 | 13 | | | | | The distinction between these two sections seems artificial to me. Moreover, the material in the two sections is not sufficiently different to warrant two sections. As it is, some of it is repetitive. I would recommend combining the two sections into one section concerning linkage. Also, it is surprising that there is not more mention of the New Zealand system which is an example of a national system linked (totally) to the international system. | Rejected - Cannot merge the two sections because they are plenary-approved |
| 4235 | 13 | | | | | This section needs to be rewritten. It contains significant mis-statements as detailed below. | Taken into account - Section 6 has been |
| 15388 | 13 | | | | | This is really weak. It needs a correlation of international systems with national policies – in a mosaic world, national policies define what any agreement will coordinate. Different countries – different institutions – different policies. This is what sinks the global cap and trade ideal. Needs to be more carefully coordinated with national chapter – and eliminate massive repetition with regional. | Taken into account. Will coordinate with Chapters 14 and 15. |
| 15392 | 13 | | | | | The WTO section is good. | Noted: Thank you! |
| 15390 | 13 | | | | | This needs to be coordinated with investment chapter. | Taken into account - for later inter- |
| 15393 | 13 | | | | | IP section is good. | Noted |

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| 11329 | 13 | | | | | The introductory paragraph suggests 5 topics to be surveyed in the chapter but the Executive Summary only addresses 4. Heading for 'the performance of climate policies and institutions? | Accepted - text revised |
| 11681 | 13 | 0 | | | | Overall, it is a very comprehensive survey and synthesis report on the international cooperations on climate change, finished by well-known scholars in this field, the report is very objective with careful citations, and the report structure is well organized with clarity. I only have some minor comments as follows. | Noted |
| 4231 | 13 | 0 | | | | Subject to the specific comments below, I thought the chapter was organized appropriately and written well. The works cited and the comments made reflect the literature as I know it. As such, the chapter provides a good summary statement of the literature for anyone interested in this subject. Also, I did not read sections 13.2 and 13.13, the latter of which is incomplete. | Noted |
| 16950 | 13 | 0 | | | | It is many years since I worked directly on global architecture issues. I was also asked opportunity to comment verbally on this chapter at the IPCC Washington meeting. Of my remarks there I will only underline the following.<br>The chapter really must address the apparent tension between the theoretical conclusions of the second paragraph:<br>("… as a result there is very little incentive for firms and individuals (and countries) to reduce emissions in the absence of international cooperation (High Agreement, Robust Evidence, Very High Confidence)").<br>which seems to contrast with the reality that MOST of the chapter appears to be about organisations, individuals (and countries) doing just that.<br>The chapter could consider two main explanations of this apparent paradox.<br>The first is that motivations and indeed the economics of climate change action are far more complex than assumed. In particular, they involve all three Domains of human decision-making and economic processes (Grubb, Hourcade and Neuhoff), and there are clear potentials for "win-win" opportunities in both the First and Third domains (and even potentially in the second, if more subtle views of pricing, including subsidy removal and market stabilisation, are considered).<br>The second (and somewhat related) is that the simpler versions of the international theories assume that States are unitary economic actors operating a world of purely Second Domain economic processes, and that emission reductions can be separated from other activities and international relations. These seem to be highly questionable assumptions.<br>Consequently, I incline to take the empirical evidence of the chapter more seriously than the theoretical statements of the Exec Sum 2nd paragraph, in which I would certainty dispute the level of confidence ascribed.<br>Certainly, I believe the chapter has to take far more systematic account of the different kinds of actions that countries are undertaking, to illuminate which are proceeding unilaterally / regionally, and which are seriously impeded. A reasonable hypothesis from the Three Domains perspective is that is easiest to pursue Pillar 1 actions (regulatory and engagement approaches) unilaterally, that Pillar 3 actions (innovation for infrastructure and innovation) could be done unilaterally particularly by larger countries but that more often some level of sub-global international cooperation is likely to be helpful; and that Pillar 2 actions (pricing) are likely to be most difficult unilaterally. The fact that the EU ETS was adopted in the context of the Kyoto Protocol would seem to mean that this does not disprove such a view (See comments on that section).<br>For details see Grubb, Hourcade and Neuhoff, Planetary Economics: the Three Domains of Sustainable Energy Development, Taylor & Francis forthcoming (Chapters 1 – 5 submitted, others in draft available on request).<br>A reference that may be of interest for its consideration of regime design interactions with possible US-EU participation is B.Lee and M.Grubb, "US in the World: the challenge of global warming", chapter in Robin Niblett (ed), America and a Changed World: A Question of Leadership, Wiley-Blackwell (2009); also published as a Chatham House Energy, Environment and Development Programme Paper 09/02, Royal Institute of International Affairs, London 2009. | Taken into account in the substantial revisions of 13.5 and 13.13. The confidence statements in the executive summary will be revised in the next round in concordance with the text. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14256 | 13 | 0 | | | | I would be happy to provide additional comments if I had time (so, please let me know if the deadline is extended or if one can provide comments later/to later revisions). | Noted |
| 13545 | 13 | 0 | | | | Taking on the challenge of integrating an assessment of multilateral governance and instruments with emerging transnational and sub-national governance dynamics is a worthy endeavor for this chapter. Naturally given the balance of the literature and longer history of the multilateral approach, the chapter focuses significantly more in this area. However, too often when the chapter turns towards the alternative forms of international cooperation, the analysis appears to treat these alternative forms in the same way as multilateral governance when they are in fact very different institutional forms. The analysis of linkage, effectiveness, participation, compliance, feasibility, etc look very different in the transnational arena then they do in the multilateral arena. The holistic analysis of International Cooperation that is a strength of this chapter could be enhanced by providing additional analysis of the alternatives on their own merits and from standpoints relevant to the different governance dynamics characteristic of this different institutional form. Much of this literature is already cited, but could be drawn upon more extensively (Bulkeley 2005; Bulkeley et al 2012; Hoffmann 2011; Pattberg 2010; Bernstein et al 2010). Bulkeley 2005 citation: Bulkeley, Harriet. 2005. Reconfiguring Environmental Governance: Towards a Politics of Scales and Networks. Political Geography 24(8): 875–902.<br><br>An arguably more controversial suggestion that follows from this point, is to seek greater balance between the analysis of transnational and multilateral cooperation in discussions of possible architectures for the global response to climate change. Given that two decades of focus on multilateral negotiations has given us lots of experience with the challenges inherent in multilateral approaches, it may be time to focus more of our energies and advice about the design of institutions to the alternative forms of cooperation. | Noted - the suggested literature is covered by the text and Section 13.13 on performance evaluation (including evalution in term of institutional feasiblity) is now included |
| 13649 | 13 | 0 | | | | In this chapter the use of terms such as Robust Evidence and High Confidence is not an accurate statement as many assessments are quite subjective. It is however possible to use terms such as High Agreement, | Rejected - no scientific evidence/publication provided to support |
| 13650 | 13 | 0 | | | | subjective. | Rejected - comment unclear |
| 13653 | 13 | 0 | | | | Extensive re-writing of the chapter is required to reflect more accurately the role of the state. The chapter also inaccurately seeks to portray that the thrust of climate action is moving away from a negotiated binding climate treaty between states to a nebulous partnership of private sector players. It confuses proposals with the actual functioning arrangements. Nominal partnerships, like network of cities, are confused with serious working arrangements that make any serious dent on emission reduction. | Taken into account - covered in Section 13.13 |
| 18350 | 13 | 0 | | | | General comment: Chapter 13 could be improved through a sharpening of key findings and better integration across the different chapter sections. The TSU is thus submitting a range of questions that can guide the author team in focusing their discussions in the relevant sections. | Noted, this comment does not suggest a specific revision, but key findings are being continuously revised as the draft |

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| 18351 | 13 | 0 | | | | Guiding question: What has been achieved to date to solve the climate change/global commons problem, why has so little been achieved (i.e. identify barriers more clearly). It would be helpful to explain to what extent game theory explains the achievements and failures of climate policy (e.g. has been more or less achieved than projected by the Nash equilibrium?) | In Section 13.1, Taken into account - text revised in 13.1 with additional material<br><br>In Section 13.3, Additional text has been added on game-theoretic models and their lessons for participation, on empirical experience with actual participation, on options for improving participation and effectiveness in the future, and on the methodological difficulty of evaluating actual effectiveness compared to unobserved counterfactual scenarios.<br><br>In Section 13.13, Taken into account - |
| 18352 | 13 | 0 | | | | Guiding question: Which options may potentially be relevant for negotiators in the context of the UNFCCC process and what are the implications: a) keeping the process running, b) linking to national policies, c) focusing on climate finance only? In this context, could you clearly assess the role of different negotiation components, such as capacity building, technology transfer and finance (with a better linkage to Chapter 16) etc., and provide insights of their empirical relevance? This section can be written in policy neutral way because you explore simply the available options. | Taken into account through the creation of a new table (13.2) that updates AR4 Table 13.2. This table will be continuously updated through the next draft. |
| 18353 | 13 | 0 | | | | While sections 13.1-13.7 read very well and provide a good overview of the existing literature, the overlap between 13.3 and 13.4 could be reduced and the sections more closely linked. Also, section 13.3.1 should be clearer about the role of transfers in the context of achieving participation. | In Section 13.5, Taken into account - in new section 13.5.1.4<br><br>In Section 13.6, Rejected - not relevant here<br><br>In Section 13.8, Taken into account. |
| 18354 | 13 | 0 | | | | Sections 13.8-13.13 on the other hand still require quite substantial work to provide an in-depth assessment of the literature and need to be more closely linked. | Noted |
| 18355 | 13 | 0 | | | | Overall, game theoretical perspectives and discussions could be enhanced in the chapter and may be used more to organize the different themes. In this context, it is noted that from a game-theoretical point of view SRM (section 13.4.2) is an exceptionally interesting example but it has to become clearer to the reader why it has been selected and may be better discussed in another section. | Taken into account - combined with comment 18351 |
| 18356 | 13 | 0 | | | | Please check if the impacts of the financial crisis on the UNFCCC process can be described based on the available literature. Also, the issue of environmental rent taxation and its linkage to Chapter 16 should deserve some attention. | Taken into account - new text relating the financial crisis to the operations of the G20 included in 13.13.1.4. Other |
| 18364 | 13 | 0 | | | | The chapter could aim to inprove its linkage to Chapter 2 by more clearly addressing regulatory uncertainty. | In Section 13.2, Taken into account. A very short mentions (and reference) to regulatory uncertainty was introduced at |
| 4724 | 13 | 0 | | | | Generally, I think this chapter would benefit by having more discussion of the importance of ensuring an "effective" future climate agreement, i.e., one that leads to a lowering of emissions relative to what they would have been otherwise. Perhaps this is related to the compliance points but I think more attention to the importance of causing changes in emissions, even if there is low compliance, would seem important to a chapter on international agreements. | Taken into account - covered in the significantly revised Section 13.13 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4725 | 13 | 0 | | | | This chapter might also note the need for an effective climate change agreement to include some process for incorporation and response to new scientific findings. Without the ability to incorporate new science, the agreement will not foster the adaptive management that will undoubtedly be necessary to address the climate change challenge in the years ahead. | Taken into account - covered in Section 13.2 |
| 4726 | 13 | 0 | | | | This chapter might also note the need for an effective climate change agreement to include some process for incorporation and response to new scientific findings. Without the ability to incorporate new science, the agreement will not foster the adaptive management that will undoubtedly be necessary to address the climate change challenge in the years ahead. | Taken into account - combined with comment 4725 |
| 18660 | 13 | 0 | | | | Well-written and a joy to read<br><br>Excellent overview and clear conclusions<br><br>+ a complete draft!<br><br>Presents and defines the problem plus describes different efforts made<br>to handle | Noted |
| 18664 | 13 | 0 | | | | IPR is discussed in chapter 15, shouldn't it be included here (if included at all)?<br>DISCUSSED ON page 41 and onwards | Taken into account - covered in Section 13.9 |
| 9039 | 13 | 0 | | | | The chapter tends to argue that the existing multilateral policy regime for climate change under the UNFCCC is not effective in addressing climate change mitigation. The chapter seems to assume that the UNFCCC itself is flawed in terms of its design and architecture and hence there is a need for other arrangements to be designed. It therefore disregards the possibility and thus its treatment is not comprehensive that perhaps the failure of the UNFCCC as a regime is due to the lack of political will to fully implement it rather than to its design per se. | Taken into account - combined with comment 18351 |
| 9040 | 13 | 0 | | | | There are multiple instances of inaccurate characterizations of the Copenhagen Accord as being on the same political and legal footing as the UNFCCC COP16 Cancun Agreements. They are not the same as the Copenhagen Accordwas not adopted by the UNFCCC COP. Accurate characterization as the legal nature of the instrument is important because the chapter discusses international cooperation issues. | Taken into account - covered in Section 13.2 and 13.5 |
| 9041 | 13 | 0 | | | | The chapter can be commended for its treatment of the interlinkages between climate policy and other policy areas, particularly with respect to trade and intellectual property, which is good, but does so in a way that does not fully reflect developing country concerns with respect to the use of unilateral trade measures and to the barriers that IPRs may pose. On IPRs, for example, it emphasizes that strong IP enforcement regimes would have beneficial effects on technological investment but does not present alternative views on this issue. | Rejected – no scientific evidence/publication provided to support changes suggested by the reviewer |
| 9042 | 13 | 0 | | | | The chapter does not adequately survey and recognize the existingUNFCCC provisions regarding climate change-related technology transfer and climate finance as the policy jumping off point for discussions on international cooperation in these areas. | Rejected – no scientific evidence/publication provided to support changes suggested by the reviewer |
| 11586 | 13 | 0 | | | | All through the chapter there is a consistent statement that international cooperation is needed to mtigate climate change. While stating that there is uniform mixing of GHGs there is need to state that the impacts are not uniform and its those countries that are least able, and have not contributed to the problem, with little or no adaptive capacity that bear the brunt of the adverse effects of climate change. | Taken into account - text revised throughtout chapter |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16174 | 13 | 0 | | | | Recommend moving section 13.5 before 13.2. The "Framing concepts" are highly abstract and presented in technical terms specific to the authors' disciplines such that, while they are valuable, it is likely to be difficult for non-specialists to easily read, understand and engage with the material. By sequencing the framing concepts after the discussion of current agreements and institutions readers will be well positioned to deepen their understanding of the theoretical research and to apply it to climate change. | Rejected - we believe the current organization to flow logically |
| 16175 | 13 | 0 | | | | Human rights agreements and instruments are increasingly relevant to international climate change arrangements, and so warrant mention here. The widely-subscribed UN Charter and Universal Declaration of Human Rights (U.N.G.A. Res. 217A (III) U.N. Doc. A/810 (Dec. 10, 1948) provide the basis for claims by indigenous peoples and small island states that reduction of GHG emissions is a legal obligation. Three UN Human Rights Council resolutions (Resolution 7/23 (2008), Resolution 10/4 (2009), and Resolution 18/22 (2012) addressed the link between continued GHG emissions and human rights. Whether human rights consitute a legally binding obligation on states to minimize climate change is controversial. (Wolfgang Sachs. 2006. Human Rights and Climate Change in Interactions between Global Change and Human Health. 349 Pontifical Academy of Sciences 349; Lavanya Rajamani. The Increasing Currency and Relevance of Rights-Based Perspectives in the International Negotiations on Climate Change J Environmental Law (2010) 22(3): 391-429.) There has also been extensive discussion of the human rights effects of climate change agreements and policies (for example, the consequences of the promotion of biofuels), which should be mentioned. Many other sources are available in the literature on this topic, should it be agreed that it ought to be included in the next draft. | Taken into account - combined with comment 2931 |
| 16176 | 13 | 0 | | | | While carbon tax is a policy that is implemented at the national or subnational level, it seems like a gap in coverage not to mention it as a policy option and note that would not be implemented at an international/multilateral level because international instruments do not have capacity to impose taxes. | Taken into account - carbon taxes are mentioned as an instrument under strong multilateralism and harmonized |
| 16358 | 13 | 0 | | | | Whilst the chapter draft gives a comprehensive overview of international negotiations, agreements and partnerships, it currently contains quite a lot of repeated material that makes it difficult to read in its entirety (eg discussion of CDM design and shortcoming comes up in several sections, as do national and non-national agreements and partnerships outside of the UNFCCC). Also, the concluding sections on finance and investment (13.11) and public/private involvement (13.12) deserve to be more comprehensive and take a stronger role in the overall chapter. | Noted |
| 11328 | 13 | 0 | | | | The chapter is very heavily focused on economics, trade and investment issues and does not adequately incorporate legal aspects or address the interlinkages between the international climate regime and other areas of international law and policy making. It misses a significant aspect of the international cooperation interface which is the possibility for substantive and procedural fragmentation and/or conflict between and among climate and non-climate regimes. For a comprehensive assessment of these interlinkages see the various chapters in Rayfuse, R. and Scott S. V. (eds.), International Law in the Era of Climate Change (Edward Elgar, 2012). The Australia EU linking arrangements will also need to be considered | Taken into account - our survey of the legal literature has improved, including citations to the Rayfuse and Scott book. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7133 | 13 | 0 | | | | The broadening of the institutions and policies addressing climate change is a consequence of the increase in the complexity of the climate debate, but also of the climate impacts, and of the public awareness on the matter.<br>All those elements are connected. With the goal of keeping the increase of temperature below 2 degree a much more aggressive mitigation policies are required at global, regional, national and subnational levels. The needs for adaptation are also increasing the need for several modalities of cooperation.<br>The Chapter makes reference several times at the increase in the complexity of climate arrangement since AR4, and maybe it could be useful to try to explain why it is happening.<br>This explanation could be useful also because in the way it now appears in the document produce the impression that is taken place a fragmentation of the global climate policies. That broadening is not necessarily detrimental to UNFCCC, but supportive in many cases. It is not the case of facing UNFCCC vs other modalities, but taking all – or at least many of this institutional arrangement – as part of a system with the same final porpoises.<br>Is also important to remark that International cooperation on climate change is not only expressed through direct actions for mitigation (targets, timetables, taxes, cap and trade, and so), but also by means of finance, tech and capacity building support, as is the case of UNFCCC, that is also strong multilateralism. In fact, UNFCCC is mainly about that kind of cooperation, due to the fact that no specific and enforceable mitigations goal appears in the Convention. That kind of cooperation paved the way for specific mitigation actions that resulted in the KP. | Taken into account - combined with comment 11328 |
| 11127 | 13 | 0 | | | | Reading is somehow disperse and complex. It would improve with reduction of text. It would also help to explain and discriminate concepts such as governance, authority and government, for example: the difference between authoritarian and command-control policies, on the one hand, and democratic participation on the other. | Noted |
| 3976 | 13 | 0 | | | | Overall, the chapter does a commendable job of integrating the state of the art on international climate policy, comprising a variety of disciplines and viewpoints. My main general concern relates to the Chapter's structure. The chapter rightly points to the complexity of international climate policy as a recent theme in the literature. However, it does so in a rather confused and disorganised fashion. For instance, the issue is first highlighted with Figure 13.1 in a subsection that barely addresses the issue. The issue is next touched upon in Section 13.3.1, but again only tangentially. The issue returns again in Sections 13.5.1.2-13.5.1.4, but also in 13.6, 13.8, 13.9 and 13.11. The problem with this scattered approach to the issue is that it becomes unclear which questions are being addressed. The Executive Summary does a better job at raising and addressing these questions (to the extent the literature allows). My suggestion is to be clearer about the specific questions that are being addressed. These include : 1) How does the regime complex for climate change look like - this is addressed in part by Figure 13.1 and its accompanying text; 2) What are the advantages and disadvantages of addressing climate change through a variety of institutions rather than through a single institution (this is in part addressed in section 13.5.1.2); 3) What are the possible responses to complexity? These responses could include linkages (which are discussed in Sections 13.6 and 13.7) but they are also discussed in other sections (e.g. 13.8 discusses how to respond to climate-trade interactions). | Taken into account - text revised throughout to focus discussion on complexity and fragmentation |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3977 | 13 | 0 | | | | Related to the first point, it is unclear why the chapter has chosen to single out interactions between international climate policies and issues such as international trade, technology transfer, capacity building and investment and finance. While I do not dispute the importance of these issues, there is virtually no attention for the institutional interactions between climate change and biodiversity; climate change and ozone depletion; climate change and local air pollution; climate change and marine pollution, to name but a few examples. There is no lack of literature on these issues. To give but a small sample: On biodiversity: 1) Sagemüller, Imke (2006). Forest Sinks under the United Nations Framework Convention on Climate Change and the Kyoto Protocol: Opportunity or Risk for Biodiversity? Columbia Journal of Environmental Law 31(2), 189-242; 2) Asselt, Harro van (2011). Integrating Biodiversity in the Climate Regime's Forest Rules: Options and Tradeoffs in Greening REDD Design. Review of European Community and International Environmental Law 20(2), 139-149; 3) Jacquemont, Frédéric, and Alejandro Caparrós (2002). The Convention on Biological Diversity and the Climate Change Convention 10 Years after Rio: Towards a Synergy of the Two Regimes? Review of European Community and International Environmental Law 11(2), 139-180; 4) Long, Andrew (2011). Global Climate Governance to Enhance Biodiversity and Well-Being: Integrating Non-State Networks and Public International Law in Tropical Forests. Environmental Law 41(1), 95-164; 5) Morgera, Elisa (2011). Far Away, So Close: A Legal Analysis of the Increasing Interactions between the Convention on Biological Diversity and Climate Change Law. Climate Law 2(1), 85-115; 5) Pittock, Jamie (2011). A Pale Reflection of Political Reality: Integration of Global Climate, Wetland, and Biodiversity Agreements. Climate Law 1(3), 343-373; 6) Savaresi, Annalisa (2012). Reducing Emissions from Deforestation in Developing Countries under the UNFCCC: Caveats and Opportunities for Biodiversity. Yearbook of International Environmental Law 21. On ozone depletion: 1) Oberthür, Sebastian, Claire Dupont, and Yasuko Matsumoto (2011). Managing Policy Contradictions Between the Montreal and Kyoto Protocols: The Case of Fluorinated Greenhouse Gases. In: Oberthür, Sebastian, and Olav Schram Stokke (Eds.), Managing Institutional Complexity: Regime Interplay and Global Environmental Change. (115-142). Cambridge, MA: The MIT Press; 2) McCabe, Daniel G. (2007). Resolving Conflicts between Multilateral Environmental Agreements: The Case of the Montreal and Kyoto Protocols. Fordham Environmental Law Review 18(2), 433-466. On local air pollution/short-lived climate forcers: Rosenthal, Erika, and Robert Watson (2011). Multilateral Efforts to Reduce Black Carbon Emissions: A Lifeline for the Warming Arctic? Review of European Community and International Environmental Law 20(1), 3-10. While I appreciate it may not be possible to integrate all these topics, at the very least the emerging body of literature on these institutional interactions should be acknowledged. | Taken into account - discussion of multiple interactions of climate change with other policy areas has been strengthened throughout.<br><br>In the next round of revisions, the links between climate policy and international conventions on biodiversity and desertification will be highlighted more thoroughly. |
| 3978 | 13 | 0 | | | | The term 'regime complex' is nowhere defined in the chapter. Does it only include multilateral, negotiated regimes? Or also public-private or even private initiatives? If the latter (which seems to be implied in the chapter), is the term even accurate? | Taken into account in the ES and Section 13.2 |
| 3172 | 13 | 0 | | | | CHAPTER 13<br><br>This chapter is in fine shape. I have lots of detailed comments, but that is mainly because this is one of the few chapters that is essentially complete (with a couple notable exceptions) and not so massively over-limit in length that it is impractical to review the text. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18432 | 13 | 0 | | | | The chapter has two major problems. The first one is avoiding addressing the strong contradiction between the outcome of climate science and the outcome of the UNFCC climate process. This process is presented with a bias in favor of authors that view the process in an optimistic way. Authors that have made a negative assessment of the UNFCCC process are reviewed but their conclusions have small weight in the overall tone of the chapter. This is very clear in pages 26 and 27, where the failures of the process are listed: end of Kyoto Protocol, new global agreement expected only in 2015 (whose probabilities are low), the insufficiency of Cancun pledges to avoid 2C target, and the problems of adaptation funds. However, the frame of the segment is too optimistic: the UNFCCC and the KP led to more climate action than any other agreement (pag 26 par 1). This is not wrong, but it should be presented in other way: current climate policy architectures are clearly failing, so other paths should be explored. There is a major mistake in the whole chapter: the argument that the UNFCCC negotiations are good, even when it has almost no impact in terms of emission reduction and other related goals. A second problem is not addressing the recent trajectory of carbon emissions and the assessment of climate/energy policies in each one of the major carbon emission countries. It could be the G20 countries, maybe adding some others like Nigeria, Egypt, Democratic Republic of Congo, Iran, Venezuela, Pakistan and Vietnam. | Rejected – no scientific evidence/publication provided to support changes suggested by the reviewer |
| 11435 | 13 | 0 | | | | The chapter tends to argue that the existing multilateral policy regime for climate change under the UNFCCC is not effective in addressing climate change mitigation. Hence, it argues, there is a need for regime change. However, the chapter does not have a clear discussion of exactly why the UNFCCC is not effective – e.g. whether the arguable ineffectiveness is due to the policy design and architecture of the UNFCCC itself (e.g. a in se flaw in the regime) or to the failure of implementation of the UNFCCC by those supposed to implement it (e.g. an implementation flaw). The chapter seems to assume that the UNFCCC itself is flawed in terms of its design and architecture and hence there is a need for other arrangements to be designed. It therefore disregards the possibility that perhaps the arguable failure of the UNFCCC as a regime is due to the lack of political will to fully implement it rather than to its design per se. | [draft single response will be made in line for comment #29] |
| 11436 | 13 | 0 | | | | There are inaccurate characterizations of the Copenhagen Accord as being on the same political and legal footing as the UNFCCC COP16 Cancun Agreements. They are not the same as the former was not adopted by the UNFCCC COP. Accurate characterization as the legal nature of the instrument is important because the chapter discusses issues | Taken into account - combined with comment 9040 |
| 11437 | 13 | 0 | | | | The chapter makes a strong pitch for the use of carbon market mechanisms as a key feature of any new international cooperation regime on climate change. It gives a lot of space for a discussion on the interlinkages between climate policy and other policy areas, particularly with respect to trade and intellectual property, which is good, but does so in a way that does not fully reflect developing country concerns with respect to the use of unilateral trade measures and to the barriers that IPRs may pose. On IPRs, for example, it emphasizes that strong IP enforcement regimes would have beneficial effects on technological investment but does not present alternative views on this issue. | Taken into account - combined with comment 9041 |
| 11438 | 13 | 0 | | | | The chapter does not adequately discuss UNFCC provisions regarding climate change-related technology transfer and climate finance as the policy jumping off point for discussions on international cooperation in these areas. | Taken into account - combined with comment 9042 |

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| 14700 | 13 | 0 | | | | Related to my comment no 3. The chapter's overall use of key terms like "agreement" (in my understanding: an individual accord between governmental and / or non-governmental actors) , "regime" and "institution" appears eclectic and interchangeable. This may create difficulties, since one of the chapter's explicit purposes is to give an overview of the complexity of global climate governance - and its different institutional elements. It therefore would be useful to briefly define and distinguish these terms for the purpose on the report based on some widely acknowledged international relations or international law definitions (as suggested in my comment no. 3 for 'regime' and 'institution') - and then use them accordingly throughout the report. | Taken into account - consistent usage of terminology has been improved, but we will continue to check for such confusing issues in the next round |
| 14701 | 13 | 0 | | | | This section gives a concise and much needed overview on the institutional nexus between climate and trade. However, it raises the question why other crucial institutional overlaps between climate change and other issue areas are not equally treated here in their own sections of chapter 13. This goes, for instance, for climate change and security, climate change and biodiversity, etc. I understand that these issues are partly dealt with in different chapters of the report. Still, giving climate and trade (and in the next sections: climate and technology; climate and investment) this extra attention in chapter 13, while leaving out other ovelaps, appears a bit selective. A solution would be to at least briefly introduce an overview of overlaps (that also accounts for: climate and forestry institutions; climate and biodiversity institutions; climate and energy institutions; climate and security institutions; climate and development institutions) - and then refer to the respective chapters and sections of WGIII AR5 where these institutional overlaps are addressed. | Taken into account - combined with comment 3977 |
| 10446 | 13 | 0 | 0 | | | I would urge you to refer http://planningcommission.nic.in/reports/genrep/index.php?repts=report_carbon.htm for future plans of India in terms of development as spelled out by its 12th five year plan | Rejected - outside of the scope of Chapter 13 |
| 6324 | 13 | 1 | | 58 | | The chapter contains useful information, but some aspects might need to be addressed, in particular the following: 1) Frequently, there are comparisons between diferent approaches without specifying what of these approaches has been implemented in practice and what are "paper approaches" prepared or suggested by scholars, but not implemented. This information should be provided; 2) In some sections the bibliographic sources of given statements and, even, of whole paragraphs are not identified. This does not allow to know if the authors missed to include the bibliographic sources or if the written statements come from the own author's ideas or views; 3) In some cases the sections do not reflect different opposite views in areas that are known to be controversial. | Taken into account - primarily covered in Section 13.13 |
| 14669 | 13 | 1 | | 92 | | A few overarching comments. First, I felt like much of this chapter read like a catalog. It would provide much more value to the reader if it could include more synthesis. Why are capacity building, or technology transfer, or finance important for the design and implementation of an international climate policy architecture? How do they relate to the principles presented at the top of the chapter. Second, I strongly recommend a sub-section on policy surveillance (i.e, national communications, emission inventories, MRV, and ICA). This is an important issue and needs more than the few, brief discussions in the current draft of the chapter. Third, and I suspect the next draft will highlight this in section 13.13, it is important to note the effectiveness of the various approaches taken to date on the elements that receive attention in specific sub-sections. For example, can one understand how the structure of agreements related to adaptation have impacted the effectiveness of adaptation efforts? Fourth, insights on how a reader may think about the evolution of international climate policy architecture would be helpful. The UNFCCC was originally charcterized by voluntary emission goals for about 35 nations. Today, the discussion is about whether to make legally binding commitments around a whole host of policy elements -- emission goals, financing goals, tech transfer, adaptation, etc. -- for developed and developing countries. In addition, the emerging role of SRM/geoengineering and how that affects the design, participation, implementation, and compliance with an international climate agreement is important. | Taken into account - deeper synthesis has been included in this draft; MRV discussion in 13.3 has been strengthened; the revised 13.13 synthesizes the literature on performance assessment in subsectors; the evolution of the UNFCCC is also covered in the revised 13.13; SRM governance is discussed in the revised 13.4 |
| 4942 | 13 | 1 | | | | Ch.13 International cooperation .. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12990 | 13 | 1 | | | | I was expecting to see more on the theoretical and empirical literature on international climate agreements. Is the game-theoretic literature covered elsewhere? Probably the empirical literature will be covered in the second order draft, as mentioned in sections 13.13.2.1 and 13.13.2.2.<br><br>Some sections are not well connected to the rest of the chapter.<br>In some sections the chapter still reads as a pathwork of literature reviews rather than as an assessment of the literature in which the authors guide the reader throught the most important issues that affect international cooperation on climate change.<br><br>However, I recognize that this is an early draft and much progress will be done in the second-order draft. | Taken into account - combined with comment 18351 |
| 4956 | 13 | 1- | | | | MISPRINTS etc. | Noted |
| 3739 | 13 | 10 | 11 | 18 | | see literature on social learning, especially Haas. | Taken into account. Reference to Haas is too vague . However, explicit mention to the wording "social learning" was added in thelast paragraph of section |
| 17666 | 13 | 10 | 12 | 10 | 13 | It is not clear what the term "policy entrepreneur" means in this context; the term should be explained or there should be an example in brackets; Also, in the next line, it is referenced to Chapter 15, but in Chapter 15 there's no more information about "policy entrepreneurs" | Taken into account. Reference to chapter 15 is eliminated because there is no reference there on "policy entrepreneurs" . Text was rephrased to |
| 8167 | 13 | 10 | 13 | 10 | 18 | "Each country must consent to a treaty to be bound": Treaties are not the only ways in which countries bind themselves. If the intent is to say "Each country must consent to a treaty to be bound by that treaty", it may be wise to spell that out. | Accepted. Text was rephrased as suggested. |
| 13627 | 13 | 10 | 16 | | | This line erroneously assumes that cooperation must take the form of a binding treaty. | Accepted. Text was rephrased as suggested. Related to another comment. |
| 3663 | 13 | 10 | 23 | 10 | 46 | Is there no special FAQ-section foreseen in the text? Please consider to intergate in a separate chapter. | Rejected. FAQ will be placed where |
| 8092 | 13 | 10 | 24 | 10 | 46 | This FAQ is excellent | Noted. No action required. |
| 13629 | 13 | 10 | 24 | 10 | 46 | I think there's a risk to claiming cooperation is necessary. First, what matters is emissions, not cooperation. Second, if we persist in believing that an international treaty is necessary, we may get more of what we've gotten so far, which is floundering international process and uneven domestic progress. There could be a case to be made to focus on pledge and review or other kinds of measures, at least in the near term. How about "desirable" instead of "necessary"? | Taken into account. Text was rephrased . |

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| 3965 | 13 | 10 | 27 | 10 | 28 | It is not so easy to characterize the climate change as “global commons” in international law. Climate change has been characterized in several ways including “common property”, “common heritage” and “common concern”. Common property, or res communis, refers to areas such as the high seas that are open for legitimate use by all States, and which may not be appropriated to the sovereignty of any individual State. Airspace above the high seas is in this sense “common property.” However, like sovereign airspace, common property is fundamentally a spatial dimension, and is therefore insufficient to deal with the atmosphere as a global unit as described in paragraphs 83-86 above.<br>The concept of common heritage was employed in UNCLOS Part XI on deep sea mining and in the Moon Treaty. However, Malta’s attempt at the UN General Assembly in 1988 to have the global atmosphere declared part of the common heritage of mankind was unsuccessful. Since ‘common heritage’ implies that a resource must be exploited and conserved for the benefit of mankind as a whole, such designation would usually require a far-reaching institutional apparatus to control the allocation of exploitation rights and benefits. If the atmosphere were treated as part of the common heritage of mankind, it would, in effect, place atmospheric problems under collective management - something widely considered premature.<br>While the concepts of common property and common heritage may not be appropriate indicators of the legal status of the atmosphere, the notion of common concern is, and should be included in its legal status under international law. In 1988, the UN General Assembly declared in resolution 43/53 on the “Protection of global climate for the present and future generations of mankind” that climate change was a “common concern of mankind”, somewhat mitigating the failure of Malta’s proposal mentioned above. The same concept was incorporated in the 1992 UN Framework Convention on Climate Change (preambular paragraph 1). In view of the growing recognition of the linkages between transboundary air pollution and global climate change, application of the concept of common concern to the whole of atmospheric problems should be considered appropriate.<br>The legal content of the concept of common concern is that States can no longer claim that atmospheric problems are within the reserved domain of domestic jurisdiction, because the issues now legitimately fall under “matters of international concern”. It will certainly lead to the creation of substantive legal obligations on the part of all States to protect the global atmosphere as enforceable erga omnes. It may be too early at present to interpret the concept of common concern as giving “all States a legal interest, or standing, in the enforcement of rules concerning protection of the global atmosphere,” in view of the absence of appropriate procedural law to implement such an interpretation. It may also be premature to consider that the concept of common concern creates rights for individuals and future generations.<br>Based on the foregoing analysis, it may be concluded that the atmosphere, and climate change in particular, has the legal status of an international resource, whether shared or common, indispensable for sustaining life on earth, health, crops and integrity of ecosystems that it is a common concern of mankind. | Coverage of the legal literature is presented in the current draft, but conceptualization from other disciplines is also included. Perhaps more could be done to distinguish which disciplines the cited literature come from, but our mission is to synthesize across disciplines. |
| 4714 | 13 | 10 | 31 | 10 | 32 | "These characteristics create incentives for actors to “free ride” on others’ investments in climate protection." True but, in addition, as US behavior makes clear, a MAJOR obstacle to international cooperation is not agreement that climate change mitigation is worthwhile but we want others to pay for it but, instead, that we are not sure that climate change mitigation makes sense (whether because of scientific disagreement or because of valuing the benefits of emitting carbon over the costs of restricting such emissions). The point is that some countries, in principle, and many others in practice, are behaving in ways that suggest they believe that addressing climate change is less important then economic growth, full stop. A Tragedy of the Commons problem involves everyone agreeing on the goal but some not wanting to contribute to achieving that goal -- in the climate case, however, that captures part but only part of the problem. A separate obstacle is the disagreement among countries over the goal itself, or the priority of the climate goal relative to other goals. | Rejected. The tragedy of the commons involve overuse of the commons because of free-riding. So, what matters is action, not goals. Those exploiting the commons do not share the goal of sustainable use with others. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15283 | 13 | 10 | 32 | 10 | 32 | "Section13.2" change to be "This section", because this is already in Section 13.2 | Taken into account. "Section13.2…" |
| 5913 | 13 | 10 | 33 | | | “to level the playing field” is a vague idiom. Do you mean it provides procedural fairness to participants? | Taken into account. "level the playing field " was replaced by "to give every |
| 3738 | 13 | 10 | 5 | 7 | | a table of emissions would be good here | Rejected. Comment is not clear.. |
| 13546 | 13 | 10 | 8 | 10 | 18 | The connections between chapter 13 and chapter 15 could be strengthened. Specifically, the idea that sub-national, national, and transnational policy experiments (see Hoffmann 2011; Bulkeley et al 2012, Rabe 2007b) could be the source of coalitions that make multilateral cooperation more likely is under-explored in Chapter 13. The focus of chapter 13, not unsurprisingly given what the bulk of the literature focuses on, concerns top-down forms of cooperation—how treaties and/or large multilateral agreements can be designed effectively to motivate and channel action. The literature on climate governance has begun to more significantly explore how climate action in other arenas could be the catalyst for action and that multilateral process might instead serve a coordinating role (Abbot 2011) or even follow from subnational and transnational action (Selin and Vandeveer 2009, Hoffmann 2011; Bulkeley et al 2012) | Editorial-copyedit prior to publication. Linking other levels of government is already discussed in chapter 13 (e.g. section 13.8) and linking among different levels of government is also analyzed. Most references are incomplete. However, attempt will be made of tracking them before publication. |
| 13911 | 13 | 10 | 1 | 10 | 5 | This sentence appears as a statement which does not follow logically: The first part states that coordinated action may be more effective than uncoordinated action, the second lists the reasons for this (diverse preferences and perceptions; geographically widespread emissions sources; uncertain and non-homogenous mitigation costs and climate change impacts). However, these seem to be more the barriers to cooperative action, than reasons behind its benefits. See Barrett, S., "Environment and Statecraft: The Strategy of Environmental Treaty-Making", Oxford, OUP, 2003. Barrett shows that the reasons behind the presumed effectiveness of cooperative action are: climate stabilization is a public good that cannot be provided by single actors (except potentially geo-engineering); the need to deter free riders; the possibility for pareto optimizing negotiation and effort sharing; the possibility for positive international spillovers resulting for more efficient, larger-scale actions | Taken into account. Text has been rephrased. Barrett (2003) was already cited. |
| 13912 | 13 | 10 | 11 | 10 | 13 | This list of ways to smooth the internalization of externalities is maybe missing the literature on effort sharing negotiations (see Ringius, L., "Differentiation, Leaders, and Fairness: Negotiating Climate Commitments in the European Community", International Negotiation, 4: 133–166, 1999); and the oppotunity to link climate policy to other policy agendas, such as fiscal reform, energy security, or sustainable development (see Huberty, M., "Green growth as necessity and liability:<br>The political economy of a low-carbon energy systems transformation in the European Union", Berkeley Roundtable on the International Economy, Working Paper no. 200, 2011. | Rejected. The first recommended is a bit "old". The second recommended paper is interesting, but grey literature. If published in time, better inserted at line 22 of page 10. |
| 6948 | 13 | 10 | 27 | 10 | 32 | Please see previous comments on this particular phrasing -- in addition, suggest not to simply copy/paste text here (in particular if it's partly incorrect) to avoid repetition and duplication. | Accepted. Change the word “depository” such as with the word “receptor” |
| 10806 | 13 | 10 | | 11 | | It is worth locating these principles more robustly, particularly with relevance to international law. While all these princples listed here may be relevant, they are not all equally clearly articulated, nor as widely accepted. One way to sort through them is to note which ones are enshrined in international law, and and how robustly. Absent this location and grounding, this section is very weak. | Taken into account. The reasons for the choice of principles and criteria that were selected has been clarified. |
| 14246 | 13 | 10 | | | | The discussion of various "principles" is a bit ad-hoc, artificial and mysterious. In economics we are concerned with simply efficiency and distribution, and that captures all the variants you here refer to. Cost-effectiveness is implied by efficiency (pareto efficiency, or as here utalitarianism: the maximization of global net benefits). The precautionary principle follows from uncertainty and risk aversion. Sustainability follows from both distribution and efficiency if discount rate is sufficiently low. Fairness refer to distribution, etc. | Taken into account. The reasons for the choice of principles and criteria that were selected has been clarified. The link among criterias has been analyzed more in depth. |
| 11588 | 13 | 10 | 48 | 11 | 29 | Equity is a key issue and should be included as a principle | Rejected. "Equity" is stated on page 11 line 4. It is also included under the principle of CBDR and respective |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18437 | 13 | 11 | | 13 | | I think one central principle is missing, the effectiveness of any treaty in terms of emission reduction with strong reference to the demands of science (pag 11 paragraph 2). This principle is common in literature, such as Stern or Keohane, but here seems not to be presented in an explicit way. Missing this principle, the others are incomplete: how to discuss efficiency and equity absent clear mitigation targets? Even more, the tradeoff (conflict) between effectiveness and equity has been always at the center of international climate politics. Those principles listed on page 11 are all related to "how", but no one focuses on "what" has to be done. This is rather strange because the reference to effectiveness appears immediately after as a criteria to assess the success of international cooperation (pag 12 par and last paragraph2; pag 42 par 1), along with efficiency and equity (pag 13 par 6 and 7).<br>I think the paper should talk about potential unpleasant tradeoffs between justice and effectiveness: it might discuss if there is a hierarchy in principles, and with the growing evidence of the climate crisis, effectiveness should not be gaining terrain in relation to efficiency and justice. | In Section 13.2, Rejected. Text in Section 13.2.2. and (Table 13.1) already includes environmental effectiveness.<br>We distinguish environmental effectiveness from compliance and from equity. Conflicts and complementarities among criteria are discussed in the text.<br><br>In Section 13.3, Section 13.2 already explicitly discusses environmental effectiveness as a primary objective, which is also highlighted in Table 13.1. Then, section 13.3. does explicitly |
| 2306 | 13 | 11 | 1 | 92 | 1 | GENERAL COMMENT: On the whole, this chapter is quite sound, although it does not get to the heart of the political issues involved. Perhaps a cogent political analysis is impossible in the IPCC context since these issues are so sensitive. I really liked Figure 13.1. | Noted. No action required. |
| 2164 | 13 | 11 | 12 | | | Sometimes first names (or their abbreviation) are stated and sometimes not (whole chapter 13). Please check! | Editorial -copyedit to be completed prior |
| 2268 | 13 | 11 | 15 | 11 | 18 | The precautionary principle is based o the assimption of maximum effort for the least risk . It is the opposite of common sense. | Rejected. Normative comment. No literature suggested for the statement. |
| 3742 | 13 | 11 | 15 | 18 | | differentiate between outcomes and outputs | Rejected. Comment unclear, there is no mention of outcomes/outputs in the text |
| 3966 | 13 | 11 | 15 | 11 | 15 | The term "precautionary principle" is misleading and inappropriate, treating as if it was a "legal" principle. The principle is not yet established, apart from specific treaty provisions, as customary international law. The Draft should continue to use the expression "precaution" or "precautionary measures (or approaches)". See, ILA Committee on Legal Principles relating to Climate Change, First Report, 2010, Second Report, 2012, http://www.ila-hq.org/en/committees/index.cfm/cid/1029 See also, Report of the National Committee, "Legal Principles relating to Climate Change: Preliminary Issues on the Methodology and Scope of the Work", Japanese Yearbook of International Law, vol. 52, 2009, pp. 508-511. | Taken into account. The term "precautionary principle" was change to the "precaution" principle. |
| 2407 | 13 | 11 | 15 | 11 | 15 | Comment on specific text: The core of the precautionary principle is that it creates policy space for regulators to act to guard against risks even in the face of scientific uncertainty. Your definition does not quite capture that. | Taken into account. The precaution principle was linked to risk by mentioning Weitzman dismal theorem |
| 2267 | 13 | 11 | 19 | 11 | 21 | Sustainable Development is impossible, There are only two directions, forward and backward. Future generations will make up their own minds up on what they want and they will not appreciate what we have willed upoin them. Currently we have plunged the next generatikon into mass unemployment. | Rejected. Normative comment. No literature suggested for the statement. No action required. |
| 3967 | 13 | 11 | 19 | 11 | 19 | On "sustainable development", add to the reference the ILA's final report and resolution: http://www.ila-hq.org/en/committees/draft-committee-reports-sofia-2012.cfm | Noted. This reference would need to be vetted. Hold for consideration in the next |
| 17098 | 13 | 11 | 19 | | | the principle of sustaianble development, as it is now emerging in the climate negotiations (China and the African Group calling for looking at concentrations of GHG's and sharing the carbon budget, at the most recent talks in Bangkok) and the literature cited above, as well as my peer reviewed work published in recent editions of 'Climate and Decelopment' need to be acknowledged, rather than the IPCC of 2007 and the World Bank on 2010. As the Cancun Agreement stated the political issue is equitable access to sustaianble development in the context of ecological limits and is about sharing the global commons, or sinks, or the carbon budget | Taken into account. Instead of citing a few papers on the vast sustainable development literature, a reference to chapter 4 review on that issue was added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11440 | 13 | 11 | 19 | 11 | 21 | This is an inaccurate characterization of the concept of sustainable development. The multilaterally accepted definition of sustainable development is contained in paragraph 2 of the 2002 Johannesburg Plan of Implementation (see http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf) and in paragraph 4 of the 2012 Rio+20 Outcome Document (see http://www.uncsd2012.org/content/documents/727The%20Future%20We%20Want%2019%20June%201230pm.pdf). The multilaterally agreed definition of sustainable development emphasizes the integration of the three pillars of sustainable development – economic development, environmental sustainability, and social development – rather than the temporal aspect of the academic definition of sustainable development that came out of the Brundtland Commission report and which were picked up by the IPCC and the World Bank. | Combined with comment # 17098 |
| 6833 | 13 | 11 | 2 | 11 | 8 | Inaccurate to characterize Rio Declaration and UNFCCC as 'literature' - these are legal instruments of varying degrees of legal bindingness and gravitas. This entire section needs to be further researched and nuanced. | Taken into account. Text was rephrased. |
| 14640 | 13 | 11 | 22 | 11 | 29 | Why are CBDR/RC and fairness treated as separate principles? Isn't CBDR/RC any interpretation of fairness? | Taken into account. We follow UNFCCC (art 3.1.) by not merging both concepts: "The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated |
| 14342 | 13 | 11 | 22 | 11 | 25 | With regard to "common but differentiated responsibilities and respective capabilities" - the text here assumes that this concept has been defined as purely a "historical" metric. In fact, there is no agreed definition of this concept, and certainly no agreement that it refers only to historic responsibility or capabilities. Current and/or future responsibility and capability are just as relevant. It is also important to note that both CBDR and equity are both closely linked to action, as in Article 3.1 of the 1992 Convention which says that all should act to protect the climate based on CBDR and equity. So they cannot be viewed outside of the context of action. | Rejected. The current text clearly mentions current responsibility and does not seem to give the impression that the concept should not relate to concrete action. |
| 3968 | 13 | 11 | 22 | 11 | 22 | On CBDR principle, add to the references the above ILA Committee on Legal Principles relating to Climate Change, First Report, 2010, Second Report, 2012, http://www.ila-hq.org/en/committees/index.cfm/cid/1029; and also the excellent study by Lavanya Rajamani, Differential Treatment in International Environmental Law (Oxford University Press, 2006. See also, Report of the National Committee, "Legal Principles relating to Climate Change: Preliminary Issues on the Methodology and Scope of the Work", Japanese Yearbook of International Law, vol. 52, 2009, pp. 505-508. | Taken into account. Some of the reference are grey literature. The Lavanya Rajamani book reference was added. |
| 14641 | 13 | 11 | 26 | 11 | 29 | An alternative view of fairness is one focused on outcomes. An agreement can be characterized as "fair" if countries willingly participate and comply with it. By their actions, they reveal their interpretation of the agreement as fair if they submit to the commitments represented therein. | Taken into account. Text was rephrased to include both outcomes and procedural fairness. A link was made to chapter 3 |
| 3743 | 13 | 11 | 26 | 29 | | elaborate this | Taken into account. Text was rephrased. |
| 12796 | 13 | 11 | 26 | 11 | 29 | You may like to provide a link and make a cross reference to chap. 4. | Taken into acccount. Cross reference to chapter 3 (on ethics) was added. No reference here on chapter 4 since it |
| 15662 | 13 | 11 | 26 | | 29 | To link more clearly with the discussion at the top of the page and avoid further proliferation of concepts, the principle of "fairness" could be used synonymously with the principle of "equity". This is common in the literature. See for example Soltau, F. 2009. Fairness in International Climate Change Law and Policy. New York: Cambridge University Press. | Taken into account. Cross reference to Chapter 3 included. |
| 6835 | 13 | 11 | 26 | 11 | 29 | None of the principles in FCCC Article 3 referred to above, engage notions of fairness that cover distributive justice within countries. Need to specify whether this is sourced to the FCCC or suggested in the literature. Cannot blur boundaries between the two without running the risk of erroneously converting aspirations/opinions expressed in secondary literature into interpretations of legal text. | Rejected. Fairness among countries and within countries belong to the generation of justice. Text in its present state is not saying that art 3 affirms it is. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2165 | 13 | 11 | 26 | | | Fairness does not only involve distributive fairness, but also procedural fairness (agents' conduct in the negotiation process). This should be mentioned here. Also reference could be made to Rabin (1993), American Economic Review and the concept of kindness functions in his game-theoretic approach. | Taken into account. The different aspects of fairness have been added as procedural and outcome fairness. The |
| 17099 | 13 | 11 | 26 | | | the principle is NOT "fairness" but "equity". The developed countries are describing this element as fairness while the developing countries refer to equity. You also refer to equity, but in the grouping club it under fairness. It should be EQUITY. | Editorial -copyedit to be completed prior to publication. This issue may be asked to co-chairs. See my answer to |
| 13630 | 13 | 11 | 30 | 11 | 41 | Suggest an example or two here. | Taken into account. Text was elaborated. |
| 3744 | 13 | 11 | 31 | 41 | | elaborate the tradeoffs/conflicts | Taken into account. Text was elaborated. |
| 7138 | 13 | 11 | 46 | 12 | 2 | "There are also goals not related with mitigation e.g the 100 billions on finance agreed on Cancun. As stated before, climate change agreements are not only about mitigation goals…" | In Section 13.2, rejected. Goals are those that imply reduction in concentrations. Funding is a mean to achieve that goal in a more equitable (and more feasible) way. Nevertheless, finance issues are considered important in international negotiations and so are treated in Section 13.11. |
| 4957 | 13 | 11 | 9 | | 29 | six broad categories: .. ~ but there are only five ? | Taken into account. Text rephrased to list five principles, by linking cost benefit |
| 8093 | 13 | 11 | 9 | 11 | 9 | Suggest changing "broad categories: The principle" to "broad categories: First, the principle" as on initial read it was unclear that lines 9-14 were related to the first principle only. | Taken into account. Text rephrased to list five principles, by linking cost benefit |
| 18692 | 13 | 11 | 9 | | | "[…] six broad categories" - I believe only give categories are covered in the following. | Taken into account. Text rephrased to list five principles, by linking cost benefit principle to cost effectiveness. Several |
| 6834 | 13 | 11 | 9 | 11 | 29 | Need to first source these principles (in the order in which they appear in Article 3 if that is the primary source), provide widely accepted legal interpretations of them, and then introduce secondary literature on these. Currently the legal interpretation and the aspirational/normative views on it have been conflated. Also need to cite work by the numerous Southern scholars that have worked on these principles. Among others, I have written an Oxford University Press, UK manuscript on Differential Treatment/CBDRRC, and numerous articles on peer-reviewed legal journals on CBDRRC. Also see the two Reports of the International Law Association Committee on the "Legal Principles Relating to Climate Change." http://www.ila-hq.org/en/committees/index.cfm/cid/1029 | Taken into account. Rajamani Lavanya (2012) is now cited, as it is peer-reviewed. Other literature would have to be throughly vetted. |
| 11333 | 13 | 11 | | | | What are the four criteria listed by Gupta referred to in line 1? What are the six broad categories referred to in line 9? How does this relate to the five principles listed and described? | Taken into account. The reasons for the choice of principles and criteria that were selected has been clarified. The difference between principles and criteria |
| 13914 | 13 | 11 | 15 | 11 | 18 | The discussion of the principle of precaution could also reference Weitzman's article, as it integrates the fat-tail risks particular to climate change with an empirical analysis of how these relate to the principle of cost-effectiveness, and in particular the discount rate used to measure same. See Weitzman, M., "A Review of The Stern Review on the Economics of Climate Change", Journal of Economic Literature, Vol. XLV (September 2007), pp. 703–724 | Accepted. There was a reference to Weitzman (2009, not 2007) in page 13 line 28 (section 13.2.2.1). That reference was replaced and Weitzman work conclusion on fat-tails was included in |
| 11682 | 13 | 11 | 9 | 11 | 29 | The author notes that "These principles can be grouped into six broad categories:", used Second, third, fourth, fifth, I think after the first principle, A related principle is also one category, the wording is a little bit confusing, so I think better to write a separate para. for the 2nd principle - cost-effectiveness, then it is much clear with six categories | Accepted.. Principles have been reduced to five by groping together two related principles: benefit/cost analysis and cost-effectiveness. The text was |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13913 | 13 | 11 | 9 | 11 | 29 | This section only numbers 5 categories of principles, not six as stated. If "cost effectiveness" is one of these six, it should be numbered as such for clarity. | Accepted.. Principles have been reduced to five by groping together two related principles: benefit/cost analysis |
| 2930 | 13 | 11 | 18 | 11 | | l. 18 as said clearly in ITLOS Advisory Opinion n°1, Case No. 17, Responsibilities and obligations of States sponsoring persons and entities with respect to activities in the Area (Request for Advisory Opinion submitted to the Seabed Disputes Chamber) | Reject. Comment unclear. |
| 2929 | 13 | 11 | 2 | 11 | 8 | what about principles of cooperation and prevention ? | Rejected. The principle of prevention can be linked to that of precaution appearing the text. And, the principle of cooperation is implicit in Section |
| 5684 | 13 | 11 | 33 | 9 | 34 | The conflict between cost-effectiveness and sustainable development is not obvious, particularly because much of the cost savings from market-based policy instruments is achieved dynamically (in the long run, not "on a short time horizon," as noted in the text). I don't know the source cited here, van Asselt and Gupta (2009), and that might clear up my confusion, but it is not in the list of references. | Taken into account. The part of the sentence referred to "short run" was deleted because it was indeed confusing. van Asselt and Gupta (2009) |
| 11334 | 13 | 11 | | | | This heading is inappropriate. You have listed principles in a previous section. This section discusses goals. It may be more helpful to have a heading that clearly indicates the 'concepts' you are addressing and then combine 13.2.1.3 and 13.2.1.4 | Taken into account. The reasons for the choice of principles and criteria that were selected has been clarified. The difference between principles and criteria has also be pointed out. The distinction |
| 5690 | 13 | 11 | 42 | 12 | 2 | Having a section entitled "principles and goals", just two sections after one entitled "principles" (sec. 13.2.1.2) is confusing, and this one-paragraph section does not add much. The authors could consider simply adding a sentence at the end of 13.2.1.2, stating that the goals that are incorporated in international climate change agreements flow from principles, and then drop section 13.2.1.4. | Accepted. Section 13.2.1.4 was dropped. Part of its content will move to a new subsection in 13.4.2.2 |
| 10807 | 13 | 12 | | | | How and why does the principle of "fairness" pertain to instituional feasibility? Institutional outcomes often do affect fairness, but why feasibility then? If the link is between institutional issues and principles, a case could be made for including all the principles: instituitonal design can affect sustainable development, precaution etc. It all depends what the institution is designed to do. | Taken into account. The reasons for the choice of principles and criteria that were selected has been clarified. The difference between principles and criteria |
| 14247 | 13 | 12 | | | | "Fairness" is too loose, as there are so many variants of what fairness could mean. | Taken into account. Text has been |
| 14248 | 13 | 12 | | | | "Institutional feasibility" is not a criteria but a constraint which cannot be violated. | Rejected. With the same logic, Environmental effectiveness is also a |
| 13631 | 13 | 12 | | | | Somewhere in here there should be a discussion of the political feasiblity of a particular approach as means to evaluate its prospects. Important tradeoffs apply. Equity is a fine principle, but it's clear that demand for net transfers from rich to poor countries, or any transfers for that matter, make it far more difficult to reach conclusion. Indeed some parties have used equity arguments precisely to inhibit progress (remember the compensation discussions under Kyoto promoted by the OPEC countries?) | Taken into account. The text makes it clear that political feasibility is included under the umbrella of institutional feasibility. |
| 3969 | 13 | 12 | | | | On “Principles and Criteria”, the concept of “fairness” is extremely ambiguous and confusing. The same is true with the concept of “legitimacy” in Page 14, Line 25. In this context, the concept of “equity” is more appropriate as a principle and criteria to be applied. Equity has three dimensions in international law (see for instance the 1985 ICJ judgment on Frontier Dispute (1985 ICJ Reports): equity infra legem, equity praeter legem and equity contra legem, which should be strictly differentiated. See Report of the National Committee, “Legal Principles relating to Climate Change: Preliminary Issues on the Methodology and Scope of the Work”, Japanese Yearbook of International Law, vol. 52, 2009, pp. 515-521. | Taken into account. Discussion to a precise definition of fairness was referred to the corresponding chapter 3. That chapter discusses ethics, and within it, considers that fairness is part of justice. |
| 6107 | 13 | 12 | | | | Principle of fairness is an important factor in evaluating institutional feasibility. However "cost" is another important factor for the evaluation of thie criterion. Here "cost" does not mean cost effectiveness. It does not necessarily mean economic efficiency. However it may be misleading to avoid to mention "cost" as a factor of evaluation of institutional feasibility. It may be better to add some explanation on cost as a footnote. | Taken into account. Text and figure were reworked. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13915 | 13 | 12 | 12 | 12 | 13 | To what extent the criteria of "institutional feasibility" solely draws upon the principle of fairness is questionable. Other principles may be relevant, such as cost effectiveness or administrative capacity to implement the policy. It would be useful to clarify what exactly Gupta (2007) means by "institutional feasibility". | Taken into account. Text was reworked and figure changed. |
| 8168 | 13 | 12 | 12 | | | There is much more to institutional feasibility than fairness. Designs can be fair but unwieldy; they can also be feasible even though many consider them to be unfair. | Taken into account. Text was reworked and figure changed. |
| 12797 | 13 | 12 | 12 | | | The table is not well described in the text. It might be helpful to explain the indicated relationships between criteria and principles to verbalize the additional information of the table. Esp. The link regarding Fairness is missing (resp. firstly found on p.13) | Taken into account. Text reworked and table changed. |
| 10411 | 13 | 12 | 12 | 12 | 13 | The criterion “Maximizing global net benefits” for the principle of aggregate economic performance should be revised, as this criterion does not take account of the circumstance of the developing countries. Only maximizing the global net benefit will bring the unfair issues, and even enlarge the economic gaps between developed countries and developing countries. So, countries convergence to certain economic level should be considered. Another criterion “mutual growth”should be added. In fact, such researches have been developed in developing countries and achieve some mitigation strategies, such as Wang,Zhang, Wu(2012). | Rejected. Maximizing global net benefits is what yields effficiency at the global level. This is correct. Equity is a different criteria, though it is related to efficieny. |
| 6987 | 13 | 12 | 18 | | 20 | The word “biased” wouldn’t seem relevant here, since you are emphasizing a difficulty to predict. Please just clarify what you mean. | Accepted. Tex rephrased. |
| 12798 | 13 | 12 | 20 | | | Is interaction typically costly as laid out in Levinson? You may like to cite some literature on issue linkage taking a different view point. | Accepted. Literature on conflicts and complementarity was added. |
| 14642 | 13 | 12 | 28 | 12 | 33 | There is a potential disconnect between the objective of the FCCC and the 2 degrees C goal elaborated first in Copenhagen (technically, first elaborated by the MEF Leaders, more on that below). The FCCC objective is focused on stabilizing concentrations. The temperature goal under Copenhagen could be achieved through geoengineeering (e.g., SRM as described in this chapter) and yet concentrations may not stabilize for some time. And the damages from a given concentration level may vary not only with the extent of geoengineering, but also with the investments made for adaptation. Is the FCCC objective still operational for evaluating environmental effectiveness? At the time the FCCC was being negotiated, policymakers were not seriously thinking about adaptation and geoengineering. How does the emergence of these options affect our understanding of environmental effectiveness? This is hinted at in the subsequent discussion, but could be made more explicit. | Accepted. A reference to the Copenhague Accord 2 degree idea was added. A cross-reference to the different ways to achieve environmental effectiveness as defined in chapter 6. Mention to geo-engineering was more explicit. |
| 12978 | 13 | 12 | 29 | | | I suggest cancelling "in this area". | Accepted. "in this area" was deleted. |
| 17100 | 13 | 12 | 3 | 3 | 27 | the 'criteria' to assess means of cooperations MUST include equity, which is not the same thing as 'distributional impacts'. Again, this is the developed country position that equity will be reflected in mitigation measures (different levels of reduction) and in adaptation (diffeent levels of vulnerability), whereas developing countries see equity in terms of "access to sustaianble development, for example, which is about comparable standards of living, poverty eradication as the overriding objective and sharing the carbon budget. The problem arises because euity is absent from the principles and sustaianble development is not defined in the UNFCCC context. There is no refeence to related peer reviwed literature from developing countries, including my work. | Editorial. See answer to comment 169. |
| 6108 | 13 | 12 | 33 | 13 | 1 | Citation of J.B. Smith is unnecessary. "Article 2 of UNFCCC" is enough. | Accepted. Refernce to Smith was |
| 9044 | 13 | 12 | 8 | 12 | 12 | The Chapter failes to recognize the possibility that principles and objectives set out in Articles 2 and 3 of the UNFCCC can also be used as assessment principles and criteria in themselves. To be comprehensive, AR5 should assess the effectiveness of international cooperation arrangements in the context of the implementation of the UNFCCC, rather than assess the effectiveness of the UNFCCC per se as an international cooperation regime. That is, the assessment focus should be on the implementation of the UNFCCC rather than on the design of the UNFCCC | Taken into account. The text is related to principles and criteria in general, not those specifically stated in the UNFCCC. However, text was rephrased to add more clarity. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 11441 | 13 | 12 | 8 | 12 | 12 | In addition to the reiteration of the IPCCAR4 principles and criteria for policies and arrangements as the potential criteria for assessing means of international cooperation for AR5, there should also be a discussion looking at how the principles and objectives set out in Articles 2 and 3 of the UNFCCC can also be used as assessment principles and criteria in themselves. This would then allow the IPCC to also assess the effectiveness of international cooperation arrangements in the context of the implementation of the UNFCCC, rather than assess the effectiveness of the UNFCCC per se as an international cooperation regime. That is, the assessment focus should be on the implementation of the UNFCCC rather than on the design of the UNFCCC. | Taken into account. The text is related to principles and criteria in general, not those specifically stated in the UNFCCC. However, text was rephrased to add more clarity. |
| 2408 | 13 | 12 | table | 12 | table | Comment on Table 13.1: I thought it would be helpful to specify more clearly the relationship between the criteria and the principles. What does it mean to say that a criterion 'draws upon' a principle in this way? In the main the principles seem to specify the components which make up the outcome (or criterion). Criteria and components might capture this relationship. Aggregate economic performance is made up of economic efficiency and cost-effectiveness. Institutional feasibility was harder to figure out here. Institutional feasability implies the task of identifying components which makes the emergence of an agreement which meets the other three criteria more likely. It suggests that institutional arrangements are purely a means to an end. High institutional feasibility arises when institutional arrangements deliver on the other three criteria. Is this what you mean to say? In this case, you will have to justify the assertion that fairness (presumably procedural fairness) as well as participation, compliance, legitimacy and flexibility (p. 14) are the components which make institutional arrangements likely to deliver on the three substantive criteria. Or do you mean to say that there are certain institutional attributes which, while one hopes they will deliver on the other three criteria, are of independent normative value. In which case you might end up having to discuss not only trade-offs between economic performance and distribution but also between environmental effectiveness and institutional appropriateness. | Taken into account. The reasons for the choice of principles and criteria that were selected has been clarified. The difference between principles and criteria has also be pointed out. Table 13.1. has been improved. |
| 11683 | 13 | 12 | 12 | 12 | 13 | In the Section 13.2.2 and Table 13.1, this section list the relationship to the six categories of principles discussed in section 13.2.1.1. The section title 13.2.2.3 is "Distributional and Social Impacts", but in the Table 13.1, only "Distributional Impacts", so Social impacts is missing; second, I think the matrics is slightly confusing, for instance, sustainable development is actually very comprehensive but vague, I think not only environmetnal effectiveness, and distributional impacts would related to the principle of sustainable development, the other two criteria are also could draw on "sustainable development", so the 4x6 matrix is slightly confusing regarding the concept connotion and relationship. | Taken into account. Table and text realaborated to make it clearer. |
| 5685 | 13 | 12 | 12 | 12 | 13 | I was surprised that "sustainable development" is not listed as a principle relevant to "aggregate economic performance," in the second row. | Taken into account. Text and table have been reworked. |
| 16178 | 13 | 12 | 3 | | | The list of criteria omits two important and related criteria: concerns about a democratic deficit in international administrative bodies and consequent lack of representativeness and legitimacy; and public participation. National governments' concerns about the former is one of several barriers to concluding successful climate change agreements. The mention on p 14, line 30 is useful but it should be addressed here as well. | Rejected. The two concerns (which are more specific than environmental effectiveness or efficiency or equity) are already incorporated withing the criteria |
| 15454 | 13 | 12 | 3 | | | When assessing the performance of international cooperation (or international regimes), it should be noted that there is always a problem of comparing it against counterfactual case. The "true" effect of cooperation (or regime) cannot be known unless it is compared with a counterfactual case with no cooperation. The problem is well known in the existing studies on international regimes. For example, Arild Underdal and Oran R. young (eds.) (2004) Regime Consequences: Methodologial Challenges and Research Strategies. Dordrecht: Kluwer Academic Publishers. Second, there could be different stateges of "effectiveness." For example, international cooperation might cause behavioral changes of parties but that do not necessarily mean the expected environmental changes would happen. National policies may fail even if parties did act. Although the issue is not solved yet, at least the complexity of "effectiveness" has been already identified in existing studies on international regimes and thus it should be acknowledged in this report too. | Rejected. Effectiveness is not understood in the text as the difference between BAU and actual, but as if goals are reached. This is clear in 13.2.2.1.. The comment on effectiveness stages is not relevant in this section, but is likely relevant to section 13.13. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12977 | 13 | 12 | 4 | 12 | 27 | This section is not clear. The reader does not understand the main message. The table increases, rather than reducing, confusion. | Taken into account. Table and text realaborated to make it clearer. |
| 6328 | 13 | 13 | | | | NAMAs and NAPAs go along the three dimensions and should not be located only at national/regional level. Support to them is international and, in many cases, the direct beneficiaries of NAMAs and NAPAsare at the local level. | belons to 13.4 |
| 4943 | 13 | 13 | 1 | | 3 | There were efforts by the IPCC itself to deal with the interpretation of the Article 2 and the dangerous anthropogenic interference and consequent vulnerabilities. | Rejected. Original sentence seems to be clear enough. |
| 8169 | 13 | 13 | 1 | 13 | 3 | This statement seems too absolute. Perhaps "some other" forums do not take a holistic approach, but it seems incorrect to imply that "all other" forums share that characteristic. | Accepted. Text was rephrased. |
| 12980 | 13 | 13 | 1 | 13 | 2 | This sentence is not clear. Not clear what "this objective" is. | Rejected. The objective is to stabilize GHG concentrations, as stated on page |
| 4958 | 13 | 13 | 11 | | | {Cor} storing {those} [emissions] underground<br>That is:<br>storing those underground | Accepted. Text revised as suggested. |
| 6836 | 13 | 13 | 13 | 13 | 17 | Not clear why SRM is listed here – why has this been chosen over other geo-engineering options? What gives it credibility? Need to establish. | Taken into account. SRM was not chosen over other options. However, the text was rephrased to make that clear |
| 3477 | 13 | 13 | 13 | 13 | 17 | This is a very brief and inadequate discussion of SRM and its potential benefits and risks. It needs references to a much larger discussion in the WG I and WG II reports. In WG I, the discussion is in Chapter 7.7. | Taken into account. SRM advantages and disadvantages are discussed in chapter 6. Here the interest in based on the need of not of international |
| 3479 | 13 | 13 | 13 | 13 | 17 | This is the wrong definition for mitigation. SRM is not mitigation. It is geoengineering, which is an attempt to actively control the climate. Mitigation is defined as reducing the emissions of greenhouse gases and aerosols that cause global warming. | Accepted. Text was rephrased. |
| 4959 | 13 | 13 | 14 | | | reflect solar radiation through .. | Accepted. Text was rephrased. |
| 5914 | 13 | 13 | 17 | | | Include references re acidification. Add: “and the associated ecosystem damage” (Doney, SC, Fabry, VJ, Feely, RA and Kleypas, JA. 2009. Ocean acidification: The other CO2 problem. Annual Review of Marine Science, 1: 169–192.; Fabry, VJ, Seibel, BA, Feely, RA and Orr, JC. 2008. Impacts of ocean acidification on marine fauna and ecosystem processes. ICES Journal of Marine Science: Journal du Conseil, 65(3): 414–432.). Solar radiation management also risks stratospheric ozone depletion, with ensuing health risks from increased ultraviolet radiation ( Rasch, PJ, Tilmes, S, Turco, RP, Robock, A, Oman, L, Chen, C-C, Stenchikov, GL and Garcia, RR. 2008. An overview of geoengineering of climate using stratospheric sulphate aerosols. Philosophical Transactions of the Royal Society A – Mathematical Physical and Engineering Sciences, 366(1882): 4007–4037, Tilmes, S, Müller, R and Salawitch, R. 2008. The sensitivity of polar ozone depletion to proposed geoengineering schemes. Science, 320(5880): 1201–1204.) | Taken into account. Geo-engineering definitions needed here follow now closely from chapter 6.3. Discussion in chapter 13 (not this Section 13.2, but Section 13.4) is limited to discuss the need of international governance, not scientific evidence on SRM impacts (which is reviewed in Section 6.9). |
| 15723 | 13 | 13 | 19 | 13 | 25 | would be important to mention impacts on water quality. What about side-effects on adaptation polices? | Taken into account. A mention and references were added to the link |
| 11696 | 13 | 13 | 24 | 13 | 25 | Final comments, I feel the refernce citation is not quite consistent, some provide detail page number, some are not, and some with first name initial but some are not) | Editorial- copyedit to be completed prior to publication. |
| 14643 | 13 | 13 | 37 | | | Could cite 1996 Wigley, Richels, and Edmonds Nature paper that provides an early, and effective illustration of cost-effectiveness analysis | Rejected. This is not a new literature post AR4. |
| 6110 | 13 | 13 | 38 | 13 | 39 | Add "(benefit)" after performance in the following sentence. It does not require environmental performance to be monetized. This makes the meaning clearer. | Accepted. Text was rephrased. |
| 11791 | 13 | 13 | 4 | 13 | 8 | Nuclear power should be put into example of low carbon emitting methosds. | Rejected. The text is giving an example of cleaner technologies, not a list of all of them. So, there seem to be no need to |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6837 | 13 | 13 | 40 | 14 | 6 | Unbalanced treatment – one paragraph on distributional and social impacts – there are reams of literature on this, including by several developing country academics/policy scientists, that is not referred to here. | Taken into account. Text was more reworked. Space is still limited. |
| 2166 | 13 | 13 | 41 | | | Please also refer to procedural fairness and put it in context when you also discuss "legitimacy" on page 14. | Accepted. Mentions to procedural fairness and procedural legitimacy are |
| 3979 | 13 | 13 | 43 | 14 | 39 | The terms political and institutional feasibility are never really defined either. The lack of such a definition becomes apparent in the discussion of the subcriteria: On lines 18-20 of page 14 it is stated that compliance can challenge institutional feasibility. So what exactly does it challenge? Its environmental effectiveness? Its legitimacy from those who want the institution to succeed? On line 34 of page 14, this aspect of 'success' is again mentioned - but doesn't this mean that institutional feasibility simply replaces other criteria already mentioned (including environmental effectiveness or aggregate economic performance)? Only if institutional feasibility is more clearly defined can it be useful as a criterion for assessing policies. Otherwise, anyone could simply insert his or her definition of feasibility, clouding the judgment. | Taken into account. Text was added and existing text was rephrased. |
| 9519 | 13 | 13 | 6 | 13 | 7 | Please, replace 'by switching from …storage' with 'by improving energy efficiency in direct combustion and end use and deploying low carbon rechnologies such as renewables and nuclear' (WEO 2010, p393 and Figure 13.9). | Taken into account. The sentence was rephrased and shortened. |
| 3478 | 13 | 13 | 9 | 13 | 12 | This is the wrong definition for mitigation. CDR is not mitigation. It is geoengineering, which is an attempt to actively control the climate. Mitigation is defined as reducing the emissions of greenhouse gases and aerosols that cause global warming. | Accepted. The whole subsection on environmental effectiveness was rephrased to follow closely chapter 6 definitions on mitigation, CDR (including |
| 3480 | 13 | 13 | 9 | 13 | 12 | This is a very brief and inadequate discussion of CDR and its potential benefits and risks. It needs references to a much larger discussion in the WG I and WG II reports. In WG I, the discussion is in Chapter 6. | Taken into account. Discussion on subsection on environmental effectiveness was shortened and cross- |
| 6109 | 13 | 13 | 9 | 13 | 9 | GHG concentrations can be reduced by, "in addition to emission reductions", methods of sequestration --. | Accepted. Text revised as suggested. |
| 13916 | 13 | 13 | 43 | 13 | 43 | Some confusion over the terminology could arise between "political feasibility" evoked here, and "institutional feasibility" evoked in the next section. What is the difference, where do they overlap, etc? | Taken into account. Text was rephrased. |
| 11684 | 13 | 13 | 45 | 13 | 46 | Revise "assessed along several dimensions" to "assessed along two dimensions", since only two: intra-generational equity and inter-generational equity | Accepted. Text was corrected. |
| 2931 | 13 | 13 | 3 | 13 | 6 | include a reference to human rights | In Section 13.5,taken into account - section 13.2, 13.5. For the next draft, the authors will review the literature on |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15384 | 13 | 14 | | | | This page gives an excellent but far too brief discussion of the critical issues in formation of international agreement. This should be the heart of the discussion, not buried in an obscure paragraph. I would focus the discussion on the observation that 20 years after signing of the Framework Convention, there is still no enforceable agreement on mitigation and the prospects are universally recognized to be worse now than they were thought to be then. It is necessary to recognize and explain these historical events before any other discussion of international agreements is worthwhile. The answer has been clearly laid out by Scott Barrett and Bossetti et. al., and I would characterize the problem as being that negotiators have pursued national interests in the negotiations, not some global optimum, and if agreements do not promote those interests, they will be discarded when they taken home – as was the Kyoto Protocol in several countries that voted for it in Kyoto. The discussion needs to start here, then discuss possible solutions for some measure of progress (and their likelihood). Maybe the fact that Solar Radiation Management does not require collective action moves it up in the ranking, since the game theoretic models of Barrett (Why Cooperate?: The Incentive to Supply Global Public Goods. New York: Oxford University Press, 2007.; Environment & Statecraft: The Strategy of Environmental Treaty-Making. New York: Oxford University Press, 2003.), Bossetti ("The Incentives To Participate In And The Stability Of International Climate Coalitions: A Game-Theoretic Approach Using The Witch Model, OECD Economics Department Working Papers No.702.), and others show that only low level, individually motivated action on mitigation is likely. | Taken into account. Section 13.13. deals with the performance assessment. Suggested Barrett (2003,2007) are already cited in section 13.2.1 Bossetti et al (2009) is also cited (in Section 13.3.1.) |
| 12799 | 13 | 14 | 1 | 14 | 3 | Maybe you like to consider not speaking only of burden but also of benefit sharing. It is also expected to make a difference in the assessment of burdens and benefits if the focus is on a second best world (cost-effectiveness) or on welfare maximization (first best focus) as well as on whether there is a right to pollute (no mitigation duty per se) or a rigeht to protect (posing a mitigation duty). Maybe you like to add some words on these issues. | Taken into account. Space is limited so no nots can be added. However, we introduce the suggestion to talk about burden and benefits sharing. |
| 6033 | 13 | 14 | 12 | | | Is it possible to provide some examples of the types of incentives included in the literature? | Accepted. Examples were included, as |
| 6034 | 13 | 14 | 12 | 14 | 17 | I think this paragraph needs a general statement about why participation matters (see introductions to the subsequent sub-criteria). | Taken into account. The last sentence of this paragraph to the beginning after |
| 4715 | 13 | 14 | 18 | 14 | 24 | The relationship of compliance to institutional feasibility needs to be better delineated. Compliance has some relationship to institutional effectiveness but the linkage to getting agreement is less clear. As the signing and ratification of Kyoto and the UNFCCC made clear, most countries did not assess compliance costs before signing up - they signed up because that was the politically correct thing to do. In any event, showing how compliance relates to feasibility needs to be clarified. | Rejected. Text was considered clear. |
| 16180 | 13 | 14 | 2 | 14 | 2 | Add external funding to the list of burden-sharing options in international agreements. | Accepted. Have added "and funding or technology transfers" at the end of the |
| 15663 | 13 | 14 | 2 | | | Criteria for burden sharing also relate to financial transfers | Accepted. Have added "and funding or technology transfers" at the end of the |
| 12475 | 13 | 14 | 22 | 14 | 24 | Please note that national trade partners may be allowed by WTO or others (p 38) to tax or ban goods from companies in other contries that do not comply. | Rejected. Unclear comment. I.e., What p.38 refers to? |
| 4944 | 13 | 14 | 22 | | 24 | It is true, however, sometimes compliance is facilitated through incentives and/or sanctions either within the same agreement or in another agreement/mechanism (see options by the Compliance Cmte of the Kyoto Protocol and the eligibility conditions for funding of the GEF in relation to climate projects ). | Taken into account. GEF funding conditions may be a too specific incentive for UNFCCC compliance. |
| 7665 | 13 | 14 | 22 | 14 | 22 | Another ref. would be Heitzig, Lessmann, Zou (2011) PNAS, doi:10.1073/pnas.1106265108 | Accepted. Suggested reference was |
| 17667 | 13 | 14 | 22 | 14 | 24 | Maybe you should rather say "in international agreements, it is hard to establish an authority (…)" instead of "in international agreements, there is no authority (…)", because it's not impossible to establish one (see WTO Dispute Settlement Body) | Accepted. Text was rephrased. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4716 | 13 | 14 | 23 | 14 | 23 | "compliance is fundamentally problematic in international agreements, as there is no authority that can reliably impose sanctions upon national governments" -- much of the international relations literature on this point has shown Downs, Rocke, and Barsoom 1996 to be wrong. Chayes and Chayes, Mitchell, Brown Weiss and Jacobson, and others have all shown the power of various other forms of social control, including shaming, norms, preclusive policies, etc. to be important ways of influencing state behavior. | Taken into account. Text was added. |
| 2409 | 13 | 14 | 23 | 14 | 23 | Comment on specific text: You say that there is no authority that can reliably impose sanctions on national governments. Not only does this seem quite a sweeping statement when you think about the powers of the UN Security Council but also it depends upon how you define the concept of sanctions. If you take a broad understanding, including for example, reputational sanctions then many international organizations can 'sanction' the behaviour of states. | Taken into account. Text was rephrased. |
| 16363 | 13 | 14 | 25 | 14 | 31 | Legitmacy discussion would benefit from more discussion of political drivers and barriers " at home" for each country | Taken into account. A sentence on domestic feasibility was added in the first paragraph discussing institutional |
| 8170 | 13 | 14 | 28 | 14 | 29 | This statement seems too absolute. Perceived legitimacy of rules may be based on their expected consequences, including but not restricted to distributed fairness; perceived legitimacy may also acrue from a belief that the rules do not create perverse outcomes (e.g. single country veto). | Taken into account. Text was rephrased. |
| 12800 | 13 | 14 | 29 | 14 | 31 | You may like to make a cross reference to chap. 4. | Accepted. A reference to chapters 2 and 4 was added, since in both concepts of |
| 17101 | 13 | 14 | 3 | | | the phrase "emissions budget over time" is NOT used in the literature or in the negotiations commonly. The commonly used term "carbon budget" should be used here. | Taken into account. The sentence was rephrased and shortened. |
| 6036 | 13 | 14 | 41 | 16 | 6 | I really like the discussion about how the broad landscape of climate change governance has changed since AR4 and think it's an important context that needs to be addressed in the chapter. But I'm not sure it fits in Section 13.3 at least in its current form where there is relatively little explicit discussion about the lessons to be learned from some of these different types of initiatives. This makes for an awkward transition to the discussion of game theory and rationalism. | Rejected - Figure 13.1 should stay in 13.3 because 13.3 does begin to discuss the lessons of the regime complex across the landscape of proliferating agreements (which are then |
| 4945 | 13 | 14 | 43 | | 45 | "since the publication of AR4" ~ better to avoid an interpretation that the sole reason for such a change is the AR4 (there are equally essential e.g. political factors), moreover | Accepted in part, by revising text to explain "in 2007". |
| 8171 | 13 | 14 | 45 | 14 | 46 | For the only published review of those efforts, see Michonski and Levi (2010), cited in other chapters. | Noted; the paper cited is already mentioned in 13.5.1.2 and included in |
| 3980 | 13 | 14 | 45 | 46 | | There are a few publication that should be mentioned here: 1) Hoffman, Matthew J. (2011). Climate Governance at the Crossroads: Experimenting with a Global Response after Kyoto. Oxford, UK: Oxford University Press; 2) Zelli, Fariborz (2011). The Fragmentation of the Global Climate Governance Architecture. WIREs Climate Change 2(2), 255-270; 3) Biermann, Frank, Philipp Pattberg, Harro van Asselt, and Fariborz Zelli (2009). The Fragmentation of Global Governance Architectures: A Framework for Analysis. Global Environmental Politics 9(4), 14-40; 4) Bausch, Camilla, and Michael Mehling (2011). Addressing the Challenge of Global Climate Mitigation – An Assessment of Existing Venues and Institutions. Berlin: Friedrich-Ebert Stiftung. | Accepted. These publications by Hoffmann 2011, Zelli 2011, and Biermann et al. 2009, are already cited in section 13.5. Citations to them, and also the book Biermann et al. 2010, are now being added to the beginning of section 13.3 as well. (Bausch and Mehling 2011 is in the grey literature.) |
| 14697 | 13 | 14 | 45 | 14 | 46 | There is a much larger body of literature on the institutional complexity (or fragmentation) of climate governance. Further texts to be referred to here include: Biermann, F., P. Pattberg, H. van Asselt, and F. Zelli (2009). The Fragmentation of Global Governance Architectures: A Framework for Analysis. Global Environmental Politics 9(4), 14-40; Hoffman, Matthew J. (2011). Climate Governance at the Crossroads: Experimenting with a Global Response after Kyoto. Oxford, UK: Oxford University Press; Zelli, F. (2011). The Fragmentation of the Global Climate Governance Architecture. WIREs Climate Change 2(2), 255-270. | Accepted. These publications by Biermann et al. 2009, Hoffmann 2011, and Zelli 2011, are already cited in section 13.5. Citations to them, and also to the book Biermann et al. 2010, are now being added to the beginning of |
| 6111 | 13 | 14 | 5 | 14 | 6 | Why poverty is not included here? | Reject. Poverty is important, but not for this part of the text. Here the text refers to the difficulty of assessing security |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 2305 | 13 | 14 | 7 | 14 | 39 | The discussion of political feasibililty of institutions is curiously apolitical. The political science literature is quite clear that the most important condition of institutional feasibility is consistency between the interests performed by the institutions and the interests of powerful member states -- those whose participation is required for the institution to be effective. National capacity is also important. See Haas et al (1993), especially 398-408. | Taken into account. Text was clarified. |
| 11685 | 13 | 14 | 1 | 14 | 6 | Since it mentioned intra-generational equity and inter-generational equity, it would be better in this paragraph, not only discussing the otpions for burden sharing across countries, but also how the distributions of burden across the generation, are there any examples on these? also what might be the social impacts, this part also needs to extend a little bit, and the lengthes is slightly too limited compared to other principles | Taken into account. Intra and inter generational equity I smentioned in the previous paragraph. A cross reference to chapters 3 and 4 (where distributional issues are discussed in more depth) has |
| 13918 | 13 | 14 | 32 | 14 | 39 | The discussion here could reference the literature on designing policy to balance flexibility and certainty, in particular regarding the need to clearly define objective criteria for policy adjustment and delegating policy adjustment to independent authorities. See Brunner, S., et al, "Credible commitment in carbon policy", Climate Policy 12 (2): 255-271, 2012 | Accepted. The drade-off between flexibility and regulatory uncertainty was inserted. The reference was added. |
| 16232 | 13 | 14 | 38 | | | Suggest inserting a penultimate sentence to paragraph: "Flexibility also has the virtue of attracting participation by governments even in the face of uncertainty about policy options and future political demands (Thompson, 2010)." The cite is to Thompson, A. (2010). Rational design in motion: Uncertainty and flexibility in the global climate regime. European Journal of International Relations 16, 269-96. | Accepted. Text has been modified and reference inserted. |
| 13917 | 13 | 14 | 7 | 14 | 11 | There is a risk of confusion between the criteria of "institutional feasibility" and the criteria of "distributional impacts" and the principle of "fairness". Reading your sub-criteria (participation, compliance, legitimacy, flexibility), they seem to relate more to institutional effectiveness, than feasibility. "Institutional feasibility" could be changed for "institutional effectiveness" | Taken into account. Text has been rephrased. "Feasible" seems better than "effective" for institutional issues. Have decided not to change wording. |
| 14644 | 13 | 15 | | | | I recommend including Arctic Ministerial and Clean Energy Ministerial under the Other Multilateral Clubs category | Rejected - the legend of Figure 13.1 only lists a few examples of each type, and there is not space in the legend to add more examples. More details on specific |
| 6035 | 13 | 15 | | | | Overall I like this figure but I would suggest revising the Legend note to clarify that this figure is meant to illustrate the broad range of initiatives. I find the language "but either a representative set of examples or the principal ones" a little confusing. Which is it, representative or principal? In the end, I don't think it really matters, again because this is really meant to be illustrative rather than comprehensive, right? | Taken into account in revised new version of Figure 13.1. As the comment states, Figure 13.1 is only meant to be illustrative. |
| 11686 | 13 | 15 | | | | It needs explanation what is "NAMAs, NAPAs" | Taken into account in revised version of |
| 10808 | 13 | 15 | | | | Nice figure! Perhaps useful to cross reference with Ch 15, and find ways of expanding the national and sub-national rings. | Noted; there are already cross-references to section 13.5 and Chapters |
| 4960 | 13 | 15 | | | | Fig 13.1: these are agreements and various cooperative mechanisms; some others to be added: Non-UN IOs: GEF; Other multilat: UNCCD | Taken into account in revised version of Figure 13.1. Caption revised to add "and institutions". Some additional examples will be included, but Figure |
| 18661 | 13 | 15 | | | | Page 15: Useful figure presenting the landscape of agreements on climate change | Noted. |
| 17668 | 13 | 15 | | | | I do not find the figure very useful; Note: In the legend to figure 13.1, it is not specified what "Regional governance" and "NAMAs/NAPAs" entails; this should be added to make the legend complete | Taken into account in revised version of Figure 13.1. The legend is only illustrative and cannot go into every |
| 11589 | 13 | 15 | | | | This figure is the UNFCCC with an attempt to capture the infrasture of support to the work including the decisions taken under the UNFCCC. The link with other institutions clearly point to the climate change issue as cross-cutting. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16181 | 13 | 15 | | | | Should include sectoral agreements - industry-based measures may need to be distinguished from "other multilateral clubs" which are, presumably, inter-state. Human Rights Council should be included in list below figure. | Taken into account in revised version of Figure 13.1. Not every variation can be shown in the figure. The legend lists |
| 16364 | 13 | 15 | | 15 | | In this list, would be good to split out priate sector partnerships (eg Green Growth Action Alliance, CCS Institute, Climate Group), from other non-business partnerships. Other multilateral clubs could also include IEA implementing agreements | Taken into account in revised version of Figure 13.1. Not every variation can be shown in the figure. The legend lists |
| 11103 | 13 | 15 | | | | Please include Global Superior Energy Performance Partnership (GSEP) as examples of "Other multilateral clubs." Please rename "Partnerships" as "Public-Private Partnerships." In addition, please include IPCC as another example of "Other UN Intergovenmental Organizations." | Taken into account in revised version of Figure 13.1. Not every variation can be shown in the figure. The legend lists |
| 3981 | 13 | 15 | | | | The Figure is a good effort as mapping the global climate governance landscape. However, there are a few issues: 1) it uses the term 'agreements' and 'international agreements'. While this may be appropriate for most international institutions, it is difficult to capture transnational initiatives such as city networks under this term; moreover the presence of NAMAs/NAPAs becomes all the more confusing; 2) The lines are confusing - are they representing existing relationships? If so, what kind of relationships (these are often quite unclear), or are they representing desirable relationships (one where different non-UNFCCC governance arrangements link to the UNFCCC)? And is it really necessary to have these lines?; 3) The figure groups many different institutions which have different characteristics (e.g. private initiatives; treaties; international organizations) - it would be helpful to add a distinction (e.g. in the shape of the box) that highlights some of these differences; 4) It is debatable whether clubs such as the G20, APP or MEF are 'multilateral' - the better characterization is probably 'plurilateral' (conform WTO terminology), or to use a more fashionable word: minilateral; 5) the correct name of the APP is the Asia-Pacific Partnership on Clean Development and Climate; the correct name of Methane to Markets is the Global Methane Initiative (others may need checking as well). | Accepted by revising Figure 13.1 to reorient and add several of the items; by revising the caption of the Figure to add "and institutions"; by explaining the connecting lines in Figure 13.1 in the subsequent text in section 13.3.1 that again discusses Figure 13.1; and by editing the legend of Figure 13.1. Also, the term "plurilateral" is added to the text discussing the evolution of multiple coalition agreements in the trade/WTO context. |
| 14698 | 13 | 15 | 5 | | | Figure 13.1 seems to draw on a similar "onion" figure by Biermann et al. , dating back to 2009,that also assigns institutions into different spheres of the fragmentation of climate governance. But even if Figure 13.1 originated without being familiar with the Biermann et al. figure, the latter one should be referred to here. Unlike figure 13.1 (that uses scale as the criterion for distinguishing spheres), the figure by Biermann et al. used the predominant jurisdiction or subject matter of the institutions to distinguish between different spheres (namely, from inside out: climate regime; climate and energy-related multilateral partnerships; non-climate environmental institutions; non-environmental institutions). The reference for this figure is: Biermann F., P. Pattberg, and F. Zelli (2009). Global climate governance after 2012. Architecture, agency and adaptation. In: Making Climate Change Work for Us. M. Hulme and H. Neufeldt, (eds.), Cambridge University Press, Cambridge, UK, pp. 263-290, (ISBN: 978-0521119412). Moreover, Figure 13.1 should also clarify the meaning of the connectors/ arrows between some types of agreements. | In Section 13.3, Accepted, by adding citation to Biermann et al. 2009 (and also Biermann et al. 2010 and other citations) in the text at the beginning of section 13.3, near Figure 13.1; by revising Figure 13.1; and by revising the text in section 13.3.1 where Figure 13.1 is again discussed (including to explain the meaning of connecting lines in Figure 13.1).<br><br>In Section 13.5, Taken into account- |
| 7722 | 13 | 15 | 1 | 15 | 5 | In the Figure, interaction between UNFCCC and other environmental treaties is shown and in Footnote 4, Montreal Protocol is shown as an example. The lessons form the successful Montreal Protocol to the Kyoto Protocol are very important. I recommend to cite Chapter 10 'Lessons from the Success of the Montreal protocol' in the book entitled "The Montreal Protocol celebrating 20 years of environmental progress -Ozone Layer and Climate Protection-" edited by Donald Kaniaru, published 2007 by Cameron May Ltd. Insertion of a new sub-chapter will be desirable to describe or cite Lesson 1 to Lesson 11 in the book from page130 to page152. | Accepted in part, by adding a citation to Kaniaru 2007 in a new sentence in section 13.3 referring to lessons from the Montreal Protocol. The specific chapter 10 in Kaniaru noted in the comment is by Sarma, Anderson and Taddonio; we are now adding a citation to their book (2007) as well. But there is not sufficient space in section 13.3 to add an |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 14249 | 13 | 16 | | | | You write that the game-theoretical literature assumes that no IEA can enforce agreements. Well: In reality, by requiring domestic ratification, domestic stake-holders (e.g., in the USA) can hold a government accountable if it breaks its pledges, so some enforcement is possible by requiring ratification. Some game-theoretical analysis takes this into account and analyses the implications of the limited enforcement-possibility on the design and optimal duration of IEA: see e.g. Harstad, Bard, 2012: "Climate contracts: a game of emissions, investments, negotiations, and renegotiations," Review of economic studies, forthcoming, or the companion paper "The dynamics of climate agreements." | Taken into account in revised text mentioning the role of domestic actors in enhancing international cooperation. But if an IEA "requires" domestic ratification, it must still provide incentives for countries to ratify, hence still "self-enforcing" regarding participation/abatement. |
| 15385 | 13 | 16 | | | | Where are Bossetti et al ("The Incentives To Participate In And The Stability Of International Climate Coalitions: A Game-Theoretic Approach Using The Witch Model, OECD Economics Department Working Papers No.702.)? How about a discussion of the issue of a non-cooperative equilibrium with low levels of action? | Bosetti et al. 2009 was already cited (although sometimes it was misspelled Bossetti), and is now being cited additionally in 13.3. The issue of a non-cooperative equilibrium with low levels of action is discussed above in 13.2, and in the climate change framework chapter. |
| 18018 | 13 | 16 | 13 | 6 | 13 | The sentence of "absence of ..a binding international agreement on climate change" does not reflect the fact that UNFCCC and KP are actually binding agreements. | Taken into account by revising the sentence including adding "universal." Also, the sentence is referring to |
| 3745 | 13 | 16 | 19 | 24 | | this literature isn't game theoretic | Taken into account by revisions to this paragraph which explain that actual institutions may play roles not fully |
| 16183 | 13 | 16 | 19 | 16 | 20 | Here or in subsequent discussion of WTO sanctions mechanisms, should discuss CITES trade sanctions, which are highly relevent to the question of enforceability of environmental agreements. See, e.g., Peter H. Sand, Whither CITES - The Evolution of a Treaty Regime in the Borderland of Trade and Environment, 8 Eur. J. Int'l L. 29 (1997) | In Section 13.3, taken into account by expanding the discussion of trade sanctions in 13.3.1, but without referring specifically to CITES which would take too much space here.<br><br>In Section 13.8, Rejected: Interesting comment but cannot be included for the following reason. The issue here is the link between climate policy and trade. There is a reference to the Montreal Protocol in that sense (p. 19, line 14), which is closely linked to climate. CITES |
| 7663 | 13 | 16 | 20 | 16 | 20 | "IEAs are self-enforcing" should be replaced by "IEAs need to be self-enforcing to ensure compliance" since history shows that some IEAs have not been sufficiently self-enforcing, leading to compliance issues. | Taken into account in revisions to this sentence. |
| 17669 | 13 | 16 | 20 | | | I recommend to write "IEAs should be self-enforcing" instead of "IEAs are self-enforcing" because they are not necessarily self-enforcing | Accepted. |
| 3746 | 13 | 16 | 24 | 28 | | elaborate with names of countries, and consequencs for the effectiveness of governance. Is this really significant for any country other than China? | Rejected - no need to name specific countries in this discussion of the general concept of the distribution of net |
| 12981 | 13 | 16 | 25 | 16 | 33 | I suggest rephrasing this paragraph. It reads as a patchwork of citations. | Taken into account in revised paragaph. |
| 7139 | 13 | 16 | 26 | 16 | 29 | How that fix with the CBDR principle? If responsibility of major emitters is accepted, it is hard to expect a symmetric distribution on net gains, or compensatory measures. | Taken into account in revised paragraph. |
| 7664 | 13 | 16 | 31 | 16 | 31 | If only "some suggest" that countries pursue their interests rather than the global interest, this sounds like altruism was the standard assumption in this analysis. To my knowledge, it is rather standard to assume countries maximize their own welfare instead of global welfare. | Taken into account in revised paragraph. |
| 12982 | 13 | 16 | 35 | 16 | 36 | Please provide a definition of open and exclusive participation. | Accepted - done. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16184 | 13 | 16 | 35 | | | Should read "membership" not "accession". Accession is "the route followed by a state that did not originally negotiate or sign a treaty, but that subsequently wishes to adhere to the agreement." Janis, International Law (5th ed. 2008, Wolters Kluwer) 22. | Accepted - clarified. |
| 16185 | 13 | 16 | 36 | | | Given the lack of empirical evidence, "major" overstates this theoretical result. | Accepted - reframed in revised |
| 4946 | 13 | 16 | 39 | | 41 | Just contrary in practice, as it was demonstrated in case of some recent negotiation rounds with exclusive participation of a limited number of Parties/actors during the UNFCCC COP sessions. | Taken into account in revised paragraph, but citing other exclusive memberships such as Annex I/non-Annex I, EU ETS, |
| 7659 | 13 | 16 | 39 | 16 | 41 | Is there a reference for this claim? It seems that whether exclusive membership helps in practice can only be judged once it has actually been tried in practice. Has it? The formation of a coalition bottom-up, e.g. by linking carbon markets, which is a form of „closed membership“ coaliton, has been suggested and seems to be tried already. | Taken into account in revised paragraph. See comments 303 and 285. |
| 6838 | 13 | 16 | 39 | 16 | 41 | In the context of ‘treaty’ negotiations that appears to be the focus of this section, there is an exclusive institution with authority to host climate change negotiations i.e. the UNFCCC. I’m not sure what point, therefore, is being made here. In any case, it needs to be explained | Taken into account in revised paragraph. See comments 303 and 285. |
| 9045 | 13 | 16 | 40 | | 43 | These statements are in erroneous. The UNFCCC is, by intent and design, the primary multilateral institution and forum for climate negotiations. Nothing prevents states from making commitments at the sub-multilateral level on climate change and establish plurilateral or bilateral regimes but the UNFCCC is designed to be a comprehensive legally binding global treaty on climate change | Taken into account in revised sentence, although the sentence is discussing the conceptual option of multiple coalition agreements and is not saying that the |
| 11442 | 13 | 16 | 40 | 16 | 43 | These are factually incorrect statements. The UNFCCC is, by intent and design, the primary multilateral institution and forum for climate negotiations. States may, of course, also undertake negotiations at the sub-multilateral level on climate change and establish plurilateral or bilateral regimes. Furthermore, the UNFCCC is designed to be a comprehensive legally binding treaty on climate change. | Taken into account in revised sentence, although the sentence is discussing the conceptual option of multiple coalition agreements and is not saying that the |
| 11443 | 13 | 16 | 40 | 16 | 47 | This is factually incorrect because it assumes that the UNFCCC is not a comprehensive legally binding agreement. | Taken into account in revised sentence, although the sentence is discussing the conceptual option of multiple coalition agreements and is not saying that the |
| 8172 | 13 | 16 | 42 | 16 | 47 | "Multiple agreements can be an interim solution". Why interim? What evidence is there that multiple agreements cannot be a permanent solution (or that single agreements can be)? | Taken into account in revised sentence. |
| 9043 | 13 | 16 | 42 | 16 | 43 | The Chapter fails to recognize that the Framework Convention is comprehensive and legally binding. Line 42-43 in page 16 states: “Multiple agreements may be an interim solution, in the absence of a comprehensive legally binding treaty on climate change” despite the fact that the Concvention itself is a comprehensive legally binding treaty on climate change. | Taken into account in revised sentence. The sentence is discussing conceptual options; it is not saying that the UNFCCC is not legally binding. |
| 16186 | 13 | 16 | 42 | | | Instead of "interim", use "alternative". There is no reason that a single omnibus treaty is necessary. | Taken into account in revised sentence. |
| 16365 | 13 | 16 | 42 | 16 | 45 | Would be useful to split out the "single comprehensive" aspect from the " legally binding" aspect and treat these separately here | Taken into account in revised sentence, but the sentence is contrasting a single universal agreement to a set of multiple |
| 6839 | 13 | 16 | 42 | | | Isn’t it too early in the chapter to reach this conclusion? Is this borne out by the literature? | Taken into account in revised paragraph. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 7134 | 13 | 16 | 42 | 17 | 8 | Express the idea that multiple agreements may be an interim solution, in the absence of a comprehensive legally binding treaty on climate change. That could be theoretically correct considering the analysis in a vacuum, but does not apply to reality do to the existence of UNFCCC.<br>The vision in this Section, but also in other parts, of the Chapter, seems to downplay de role of UNFCCC, by locating the Convention as one among many international agreements. See list on 13.1. In our view that is no accurate in various senses, including that the list make a very broad consideration of what an agreement is, eg. UNEP, UNDP, these UN bodies does not make or negotiate climate policies, but work on supporting UNFCCC work.<br>In fact, the UNFCCC has been progressing on creating the basis for future developments, as showed by the Durban decisions which include the negotiation of a new legally binding instrument in the framework of the Convention, with a strong focus on mitigation. | Taken into account in revised paragraph, which now references the universal design of the UNFCCC and the Durban Platform. |
| 3983 | 13 | 16 | 42 | | 43 | "Multiple agreements may be a pragmatic interim solution in the absence of a comprehensive legally binding treaty on climate change". This is not only suggestive that they are indeed a solution, it also provides an incorrect dichotomy. There IS already a comprehensive legally binding agreement (the UNFCCC) and there are already multiple agreements. The correct question is to ask how they could or should relate to each other to effectively address climate change. | Accepted - revised in rewritten paragraph. |
| 4947 | 13 | 16 | 47 | 17 | 2 | "Whether these will evolve into an effective global agreement.." This is crucial point for the critical stage of the climate negotiations. There are examples with subjects closer to climate change, e.g., the JREC (Johannesburg Renewable Energy Coalition as response to the failure to agree on global targets on renewables at WSSD that lately expanded but could not become global; or the more recent problem on more concrete agreement on corporate sustainability reporting at the UNCSD, 2012 and the formation of the Group of Friends of this procedure.) Another very concrete aspect not mentioned here in context of multiple agreements and linking various agreements is the one that is now inherent element of the ongoing climate negotiations: the parallel negotiations since 1997 on the extension of the Kyoto Pr. and the new instrument with the intended universal participation and commitments. | Taken into account in revised paragraph, althoug not using all of the examples proposed here. |
| 11444 | 13 | 16 | 47 | 16 | 48 | The reference to the emergence of “bilateral and multilateral” (this should properly be called “bilateral and plurilateral” because the WTO is the multilateral regime) trade agreements, there is no empirically proven causal relationship between the slow progress of the WTO Doha negotiations and the emergence of such bilateral and plurilateral trade agreements. Negotiations on such bilateral and plurilateral trade agreements have taken place both before and during the WTO Doha negotiations. | Taken into account in revised text. |
| 13547 | 13 | 16 | 7 | 16 | 41 | This section is indicative of theoretical unevenness throughout Section 13.3 International Agreements: Lessons for Climate Policy and that to some extent characterizes much of the chapter. Rational choice approaches certainly have a great deal to say about the issues raised in this section and have produced significant insights. However, the sociologically-oriented literature on international agreements has some equally strong theoretical findings about international agreements that have significant empirical evidence behind them. This literature is cited in the chapter, but is not as extensively drawn upon in the analysis as the rational choice literature. The lessons about why the multilateral process have faced challenges are often different as are the solutions to those challenges. | Taken into account in revisions to 13.3, such as regarding norms, acculturation, and legitimacy, but this comment does not suggest specific literature to cite. |
| 4717 | 13 | 16 | 7 | 16 | 12 | As just noted, there is an extensive literature in IR that goes beyond the "rationalist school in political science" and lays out a range of mechanisms that have been shown, empirically, to be central to the processes by which international agreements influence state behavior or do not. States rarely negotiate "treaties with teeth" and, when they do, rarely apply them. The mechanisms of behavioral influence are rather broader and, if the goal is to have those designed into the follow-on to Kyoto, it would be valuable to mention the range of other strategies that international treaties use to get states to adjust and comply. | Taken into account in revisions to 13.3, such as regarding norms, acculturation, and legitimacy, but this comment does not suggest specific literature to cite. |
| 16182 | 13 | 16 | 7 | 16 | 12 | Add Chayes & Chayes, A New Sovereignty. The managerial approach is still important and was historically significant in the existing climate architecture. | Taken into account in new text on reputation, norms and legitimacy. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3982 | 13 | 16 | 7 | | 12 | Not only is this sentence a quite abrupt transition from the discussion of the governance landscape to one of lessons learned from game theory, it never states clearly what lessons are learned. Moreover, the list of references at lines 11-12 is very random, and does not support the argument preceding these. | Taken into account in revised and expanded text. |
| 16234 | 13 | 16 | 23 | | | I suggest replacing the cite to Keohane 1989 with Keohane 1984, which is the classic work on transaction costs and international cooperation. Keohane, R.O. (1984). After Hegemony: Cooperation and Discord in the World Political Economy. Princeton University Press, Princeton, NJ. | Accepted by adding citation to Keohane 1984. |
| 16235 | 13 | 16 | 24 | | | Suggest adding a sentence at the end of the paragraph: "International organizations can also promote cooperation by orchestrating the activities of other actors and institutions, both public and private, involved in the governance of an issue area (Abbott and Snidal, 2010)." Abbott, K., and D. Snidal (2010). International regulation without international government: Improving IO performance through orchestration. Review of International Organizations 5, 315-44. | Accepted by adding citation to Abbott and Snidal 2010. |
| 5304 | 13 | 16 | 7 | 16 | 12 | the first sentence implies that the game-theoretic approach is limited to environmental economics. Game theory is itself a big subject in political science, particularly in international relations (see Avenhaus and Zartman, 2007, diplomacy games. Formal models and international negotiations). Furthermore, it would be interesting to show that there is a huge community of scholars on negotiation, several of which focusing on climate (environmental) regime and cooperation (for instance Sjöstedt 1993 International Environmental Negotiation). | Accepted by clarifying that game theory is used in both disciplines, and adding citations to Sjostedt 1993 and Avenhaus and Zartman 2007. |
| 8086 | 13 | 16 | 7 | 16 | 33 | On line 7, it is surprising that under the heading “lessons from game theory” the coalitional stability issue (a game theoretic controversy of long standing, and recognized in AR3 as well as in AR4) is not mentioned, although the controversy has made progress recently, as in Bréchet, Gerard and Tulkens (2011). The conceptual progress consists in (i) clarifying the different logical nature of two coalitional stability concepts involved (namely, core stability vs. “Internal-external” stability), and (ii) in testing either one of them on the same IAM numerical model. One policy implication one can derive from that comparison is that one concept is more appropriate when considering the a priori design of cooperative international agreements, whereas the other suits better for the study of compliance of existing such agreements.<br>Reference:<br>Bréchet, Th., F. Gerard and H. Tulkens (2011). Efficiency vs. Stability in Climate Coalitions: A Conceptual and Computational Appraisal, The Energy Journal 32 (1), 49-75. | Accepted by adding discussion of coalitions, and citations to work by Brechet et al. and others. |
| 16233 | 13 | 16 | 8 | | | The classic cite for the rationalist school in political science, which I suggest adding before the Downs et al. cite, is: Koremenos, B., C. Lipson, and D. Snidal (2001). The Rational design of international institutions. International Organization 55, 761-99. | Accepted by adding citation to Koremenos, Lipson and Snidal, 2001. |
| 14645 | 13 | 16 | | | | Denny Ellerman has a chapter in Aldy and Stavins 2010 book about lessons from the EU ETS for international climate policy. Isn’t the EU climate policy, negotiated among an exclusive club (EU members), an example of an effective climate agreement (if at the regional level as opposed to global)? | Accepted by explaining this in the text, and citing Ellerman 2012 (a newer chapter on this topic). Cross-references to Chapter 14 also made throughout |
| 14646 | 13 | 16 | | | | A more nuanced take on participation could benefit the reader. What does it mean for developing countries to participate in the Kyoto Protocol if it does not impose any emission commitments on them? What lessons can we learn in terms of promoting participation in global climate agreements from the effective prohibition under the Kyoto Protocol of any new country taking on an emission commitment? In 1999, Argentina proposed an emission commitment (similar in form to what China and India proposed in 2009), but there is no mechanism under the Kyoto Protocol for Argentina to accede to Annex B. | Accepted by explaining the possibility of different types of participation with different commitments, as under the Annex I/non-Annex I distinction in the Kyoto Protocol and potential evolution in subsequent agreements such as the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6988 | 13 | 16 | | | | I am rather skeptical of the value of "exclusive membership" for providing a global public good. If the cited papers can explain this, the paragraph should at least mention the mechanisms they identify which give this result. At a minimum, exclusivity raises problems of legitimacy as regards global public goods. The Antarctica Treaty is exclusive, and in my view lacks legitimacy for that reason. The WTO is also exclusive, but the WTO is not trying to provide a global public good.<br><br>Lines 40-41 say that there is no exclusive institution with the "authority" to host climate negotiations. I was confused here, because several such institutions (or organizations) have undertaken minilateral initiatives—an example being the MEF. You might explain what you mean by "authority." Do you mean the UNFCCC?<br><br>In the trade area, while it might be argued that preferential or regional trade agreements (RTAs) can lead to a multilateral agreement, the opposite argument is at least as powerful. RTAs create trade diversion, and so can have negative consequences for countries outside the "region." But, as noted above, trade is not a global public good, so the relevance of this should be explained. You might cite the paper by Asheim, Bretteville Froyn, Hovi, and Menz (2006) on the utility of small agreements for addressing climate change.<br><br>On the role of transfers, I would suggest citing Carraro and Siniscalco (1993), who show that, assuming countries are symmetric, transfers won't help increase participation (without commitment); and Barrett (2002), who shows that, if countries are strongly asymmetric, transfers can increase participation dramatically (asymmetry becomes the source of commitment).<br><br>You discuss trade later, but the role that trade restrictions can play in increasing participation should be mentioned here; see Barrett (1997) below, though this point is also made in Barrett (2003), which is already cited in your chapter. Note also that I have always looked at compliance and participation jointly. I don't think they should be considered separately. See Barrett (1999), though again this same point is made in Barrett (2003), already listed in your references. Asheim, G.B., C. Bretteville Froyn, J. Hovi, and F.C. Menz (2006). "Regional versus global cooperation for climate control," Journal of Environmental Economics and Management 51: 93-109.<br><br>Barrett, S. (1999). "A Theory of Full International Cooperation," Journal of Theoretical Politics, 11: 519-41.<br><br>Barrett, S. (1997). "The Strategy of Trade Sanctions in International Environmental Agreements," Resource and Energy Economics 19: 345-61.<br><br>Barrett, S. (2001). "International cooperation for sale." European Economic Review 45: 1835-1850.<br><br>Barrett, S. (2011). "Rethinking Climate Change Governance and Its Relationship to the World Trading System," The World Economy, 34(11): 1863-1882. | Accepted by revising text to note both pros and cons of exclusivity and to discuss actual examples of open vs. exclusive climate agreements. Then, transfers and trade sanctions are discussed a little later in this subsection, where this comment is again accepted by adding several sentences and citations. |
| 6579 | 13 | 16 | 45 | 16 | 47 | Supply more details about "the practical difficulties encountered in negotiating short term"constitutionally. | Taken into account by revising this paragraph; this sentence is redundant with the first sentence of the paragraph. Text is now inserted to explain the |
| 6578 | 13 | 16 | 47 | 17 | 8 | Good example. | Noted. |
| 8006 | 13 | 16 | 47 | 17 | 8 | I fully support this part because both globally centralized and de-centralized scheme & intiatives are required for the effective and practical policies & measures against climate change. | Noted. |
| 3750 | 13 | 17 | | | | fairness - how is this operationalized? Absolute effort, MC of effort, environmental outcomes, procedural approaches, representation in decisions? | Noted, but a detailed comparison of different conceptions or measures of fairness is beyond the scope of this |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 14250 | 13 | 17 | | | | Is there a trade-off between depth and breadth? Maybe not: (i) In reality, Kyoto 1 performs badly on both, (ii) in theory, a large coalition internalizes the externality of more countries, suggesting a positive relationship between breadth and depth, (iii) this is consistent with a recent analysis that investigates the relationship between depth, breadth, and duration of the agreement (see Marco Battaglini and Bård Harstad, 2012, "Participation and Duration of Climate Contracts") | Accepted. |
| 12801 | 13 | 17 | 13 | 17 | 14 | "equity concerns arising…" How is it meant? Do you refer to precursor behaviour in the sense of the Kyoto Protocol, here? | Taken into account in revised sentence. |
| 3749 | 13 | 17 | 19 | 28 | | elaborate | Taken into account in expanded |
| 15386 | 13 | 17 | 19 | | | This is also very important – it is hard to even tell what they are talking about, which in plain language is: thus there is a fundamental conflict, that even with no transfers to developing countries and full participation, the net benefits of undertaking the globally optimal mitigation burden are less than the costs to necessary participants. Therefore national interests are clearly opposed to any "equity" solution. The research challenge is to determine how robust this conclusion is under different formulations of the damage function for major emitters. Some is on 18. It is agross understatement that "sanctions are not fully credible" under Kyoto Protocol – its one thing to say that the literature has opposing views, another to water down what articles actually say. I don't see how it is possible to mention participation on p. 21 without the 16 – 19 game theory. | Taken into account in revised paragraph on transfers and equity in 13.3.1. (The end of this comment 326 appears to be addressing a different section, p.21 in section 13.4.) |
| 12802 | 13 | 17 | 19 | 17 | 28 | See former comment; it may be worthwile to not focus only on burden but also on benefit sharing (you may like to check for the whole chapter). | Taken into account in revised paragraoh on transfers. |
| 6840 | 13 | 17 | 24 | 17 | 26 | This statement is not clear i.e. "it is not sufficient to consider only plausible and widely accepted equity criteria for the redistribution of the gains from cooperation" – this seems to suggest that implausible and less well accepted criteria should be taken into account? If that's the argument, it needs further explanation. | Taken into account in revised paragraph on transfers and equity in 13.3.1. |
| 13634 | 13 | 17 | 26 | | | This is the point I was making earlier about equity notwithstanding, countries won't act against their own interests. | Noted, and clarified in revised text. |
| 3751 | 13 | 17 | 29 | 39 | | elaborate - which linkages foster agreement,w hich inhibit it? | Taken into account in revised text. |
| 13632 | 13 | 17 | 29 | | | Note that important linkages exist whether or not there are formal linking agreements. An important transmission mechanism is through prices of traded fuels. Our research has found that some of the countries most affected by mitigation are not those mitigating. Rather, the greatest GDP hit can fall on energy exporters. | Accepted and added in revised text. |
| 16187 | 13 | 17 | 29 | 17 | 39 | Add linkages to human rights and biodiversity. | Accepted. |
| 16366 | 13 | 17 | 29 | 17 | 32 | Important to mention fossil fuel subsidies. Note OECD and IEA work in this area | Noted, but fossil fuel subsidies are not the kind of linkage discussed here, which is from climate treaties to non- |
| 11445 | 13 | 17 | 29 | 18 | 3 | The treatment of issue linkages (e.g. between mitigation, adaptation, finance, technology) in these lines should be improved in terms of what the advantages are. The way that the phrasing is made currently, it creates the implication that issue linkaging in the context of climate negotiations has become a stumbling block to concluding multilateral climate negotiations. | Clarified in revised text. |
| 2410 | 13 | 17 | 3 | 17 | 7 | Comment on specific text: Global administrative law emerges not only from the specific recommendations of organisations such as the subsidiary bodies of UNFCCC but also from the routine practice of governance. One of the distinctive things about the methodology of GAL is that it is formed also from the bottom-up. GAL principles are viewed as of normative significance, regardless of whether a particular institution has expressly endorsed them or not. This may also be of relevance when you are thinking about institutional feasibility/appropriateness as discussed above. | Accepted in revised text. |
| 8173 | 13 | 17 | 30 | 17 | 32 | It would seem appropriate to add international security to the set of issues with significant linkages. | Accepted along with coment 332 regarding human rights and biodiversity. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18693 | 13 | 17 | 40 | 17 | 43 | The effect of linking with R&D (or technology oriented agreememts) needs references, poss ibly Nagashima and Dellink (2008) and/or Lessmann and Edenhofer (2011). Also, the language in these lines is rather strong ("can only work"). Unless the author adds references that I am not aware of, some qualifications are needed. | Accepted, text revised. |
| 8174 | 13 | 17 | 41 | 17 | 42 | Linking can work even if benefits of R&D spread to nonmembers so long as *some* benefits do not. | Accepted. |
| 12983 | 13 | 17 | 45 | 17 | 46 | This first sentence repeats what said at p. 17 line 29. | Accepted and revised in line 29. |
| 7140 | 13 | 17 | 45 | 18 | 3 | This analysis does not take fully into account the fact that all the elements under negotiation are connected and the progress in one area (e.g. mitigation), is related with advances in other areas (e.g. finance). This paragraph, among several others in this Chapter, suggests a non-UNFCCC approach as the preferred one. | Taken into account in revised paagraph. |
| 3748 | 13 | 17 | 9 | 12 | | is this talking about G20 versus UN? | Noted; the sentence is speaking conceptually, not specifically about the G20 versus UN. See revised paragraph. |
| 8088 | 13 | 17 | 26 | 17 | 28 | This reviewer wishes to suggest that what is mentioned in these two lines be more explicitly connected with what is said in lines 37-40 and 45-47 of p. 62 of chapter 4: the transfers discussed here (in chapter 13) do have a fundamental role in making the Paretian approach (discussed in chapter 4) a feasible one in terms of voluntary agreements.<br>Astonishingly, both here in chapter 13, and there (throughout chapter 4), the inescapable necessity of a voluntary character of any international agreement is pretty much ignored, the authors seeming to be dominated by the quest for equity. But on this subject, undermining the voluntary dimension is a severe lack of realism.<br>NB : in referring to p. 62 of chapter 4, I ignore lines 41-44, because they are an extreme, and actually, as stated, incorrect implication of paretianism. There are better things to say on Pareto improvements in international affairs. | Accepted and added in revised text.<br>Note that the "voluntary character of any international agreement" is already discussed in 13.3 in terms of the lack of a supranational coercive institution and the need for IEAs to be self-enforcing; but this "voluntary" or "consent"-based character is now mentioned there as well. |
| 8087 | 13 | 17 | 9 | 17 | 18 | The paragraph devoted to the alternative “breadth vs. depth” introduced by Barrett (2002) does not, in this reviewer’s opinion, reflect correctly the state of this interesting question. Hence two suggestions:<br>– After mentioning that the “breadth first” option is (rightly) credited to Schmalensee (1998), it could be added to the text at the end of line 12:<br>“The entire chapter 11 of Barrett (2003) is devoted to justify this option in formal terms. However, a weakness of this justification is pointed out in Chander and Tulkens (2009) (pp. 180-181) who therefore find the preference for this option not well established in theory.”<br>– In the text then continuing with “Other scholars…” it would be good to have some reference appearing in support of the alternative view.<br>Reference<br>Chander, P. and H. Tulkens (2009). “Cooperation, Stability and Self-Enforcement in International Environmental Agreements: A Conceptual Discussion”, chapter 8 in R. Guesnerie and H. Tulkens, eds, The Design of Climate Policy, The MIT Press, Boston. | Accepted - citations added. |
| 8175 | 13 | 18 | 2 | 18 | 3 | This risks appearing dated if there is progress in negotiations. | Revised to remove "current" and make the sentence more conceptual. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6329 | 13 | 18 | 27 | 18 | 36 | This paragraph is controversial and, to certain extent, subjective. The sentence that begins in line 31, to certain extent, put in doubt one of the main findings of the AR4 on the need to carry adaptation action together with mitigation action. The sentence that begins in line 32 need to be expanded and clarified: the current wording could be perceived that, in general, mitigation and adaptation actions counterrest each other and this is not the case. Finally, its last sentence, which is not supported by any bibliographic source, might be controversial. For this reason the referred experimental evidence should be described. In addition, the concept that adaptation is private might be no appropriate and does not reflect the agreements of the international community that request to give the same attention to adaptation than to mitigation, as stated in the preambular language of the Cancun agreeemnts (decision 1/CP.16) | Taken into account in revisions to paragraph. |
| 12984 | 13 | 18 | 27 | 18 | 36 | These two papers provide an analysis of the optimal mix of adaptation and mitigation:<br>Bosello, Francesco, Carlo Carraro, and Enrica De Cian. 2010. “Climate Policy and the Optimal Balance Between Mitigation, Adaptation and Unavoided Damage.” Climate Change Economics 01: 71. doi:10.1142/S201000781000008X.<br>de Bruin, K., Rob Dellink, and Shardul Agrawala. 2009. Economic Aspects of Adaptation to Climate Change: Integrated Assessment Modelling of Adaptation Costs and Benefits. OECD Publishing. http://ideas.repec.org/p/oec/envaaa/6-en.html. | Accepted. |
| 13635 | 13 | 18 | 27 | | | One challenge with adding adaptation into the mix is that many adaptive policies are adopted by sub-national governments. It is difficult for some national governments to bind or speak on behalf of their sub-federal entities. | Noted. |
| 7141 | 13 | 18 | 27 | 18 | 28 | This is an idea hard to sustain. Adaptation is key for all, but particularly for more than a hundred countries in the UNFCCC process. Those countries, if taken together, amount just a very small portion of the GHG, the broad participation in the UNFCCC is a consequence of a broad approach to CC, which include mitigation and adaptation together, in addition to compromises on means of implementation. | Noted. The text already indicates that adaptation is crucial for many countries. |
| 2175 | 13 | 18 | 27ff | | | Highly vulnerable countries (island states) are frequently minor carbon emitters. So the linkage between mitigation and adaptation looks a bit blurred. I guess, some better distinction between different adaptation measures could also be helpful (maybe a reference to adaptation related chapters of the report?). | Taken into account in revised text which clarifies that this paragraph is discussing incentives to participate in supporting |
| 11446 | 13 | 18 | 29 | 18 | 29 | The reference to “highly vulnerable” countries should be reworded because it could create unintended categorizations among countries that would depend on how one defines what “highly vulnerable” means. Under the UNFCCC, the phrasing is with respect to “particularly vulnerable” countries (which is defined in preambular paragraph 19 and Article 4.8 of the UNFCCC) | Accepted. |
| 2167 | 13 | 18 | 32 | | 34 | I think that it would be more helpful to refer to empirical papers investigating substitutability of adaptation and mitigation. Referring to theoretical papers in this respect is of lesser relevance, I guess (in the context of this paragraph; otherwise mentioning these theoretical paper is very appropriate, I think) | Taken into account in revisions to paragraph to highlight the need for empirical research here. Unfortunately, |
| 11572 | 13 | 18 | 34 | 18 | 36 | Here, it may be fruitful to distinguish between "direct" and "indirect" benefits. The direct benefits of types of adaptation may be local and private but indirect benefits may be global and public. If people near the sea benefits directly from an adaptation policy, people living elsewhere may benefit indirectly if the adaptation policy secures the sustainability of the sea community (and thereby reduces the pressure on other communities). | Taken into account in revised paragraph. |
| 14647 | 13 | 18 | 37 | 18 | 45 | This literature showing that reducing uncertainty could reduce the participation incentive seems to mask a participation-compliance trade-off. That is, at the compliance stage, uncertainty should be reduced (countries will know their costs of compliance), and thus even if participation is high before the resolution of uncertainty, then compliance may be low once that uncertainty is resolved (a possible real-world example of this could be Canada under the Kyoto Protocol). | Taken into account in a revision to the text. But the text already captured this point by saying that "as parties learn of the actual costs of mitigation, so their incentive to participate may shrink," and then by adding that reduced uncertainty |

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| 6841 | 13 | 18 | 37 | 18 | 42 | What is 'experimental' research and 'experimental' evidence. Need greater clarity here on what this is and is not. | Noted. The word is not necessary to the sentence. It refers to laboratory experiments using volunteers, but there |
| 6037 | 13 | 18 | 4 | 18 | 21 | This is an important point but I'm not sure it belongs in the section on lessons for participation. | Kept in current location because it addresses how to deal with regime |
| 8176 | 13 | 18 | 4 | 18 | 5 | What is the evidence for this claim? It is unclear that "better articulation" of linkages is necessary for "adequate" aggregate effect, which itself is undefined. | Taken into account in revised sentence. |
| 2411 | 13 | 18 | 4 | 18 | 4 | Comment on section of text: I liked the section on linkages but felt that it could be expanded a little more and perhaps organized a little better. In a sense, you have an opportunity here to set out an agenda for creative thinking on the part of the different 'elements' and for research.<br>I thought it might be worth stressing very clearly at the beginning of the discussion that linkages need to be designed/evaluated from the point of view of the criteria and principles set out earlier in the chapter. This is, I think, what is meant here by 'adequate aggregate effect'. But also that fragmentation/interaction provide opportunities to contest and develop what the appropriate criteria are, mean and require.<br>Drawing on non-climate change literature examining fragmented/multi-level governance I thought it might be worth trying to identify certain values that could inform the design/evaluation of actual or proposed interactions/linkages. Several come to mind:<br>i) mainstreaming: horizontal integration of climate change policies and objectives into all other policy spheres. EU experience with 'environmental integration' or 'gender mainstreaming' are relevant here.<br>ii) Redundancy: Fragmented governance can provide 'safety nets' to guard against the negative effects of under-regulation elsewhere. This is expressly discussed in the US federalism literature. See e.g. Robert Schapiro on polyphonic federalism.<br>iii) Accountability: e.g EIRS: Empowering Responsible Investment<br>iv) Learning: e.g. UN database on local coping strategies<br>With the emphasis upon outcomes (criteria) and values, there is space for all sorts of different kinds of institutional frameworks for linkage. You see this kind of approach in Sabel & Zeitlin's work where they insist that their vision of 'experimentalist governance' should be understood in functional rather than structural/institutional terms. The different elements that make up experimentalist governance can be performed through a variety of different institutional arrangements (http://www2.law.columbia.edu/sabel/learning%20from%20difference%20ELJ%202008.pdf p. 274).<br>Still it might be possible to try to identify certain kinds of interactions/linkages that may be productive from the point of views of the outcomes (criteria) and values above. Again, it should be possible to illustrate by reference to climate change and non-climate change governance literature. Some candidates overlapping with your section on p. 18:<br>i) hierarchy<br>ii) catalyst:<br>iii) networks<br>iv) monitoring/peer review<br>No doubt reflecting my own current research interests, I would like to see you pay more attention to the catalyst potential inherent in actions by individual (powerful) states and supranational organizations such as the EU. The EU-ETS aviation example and biofuels again come to mind. There is a rich IR and legal literature that points to the potential or unilateral action to galvanize global change, whether as a result of emulation of norms or as a result of ensuing global agreement. Beth Simmons writing in the area of financial regulation offers one very well known example of this. | Accepted - several points here added to this revised paragraph, although unfortunately there is not space in 13.3 to go into detail on all of these. |
| 6463 | 13 | 18 | 40 | 18 | 42 | Meaning of "transfer" should be clarified, such as technical tranfer, financial transfer, or both. | Noted. It refers to the transfers discussed on the previous page, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11447 | 13 | 18 | 46 | 19 | 41 | The section on compliance needs to have text relating to positive or incentive-based compliance regimes (such as the provision of support similar to what is contained in Art. 4.7 UNFCCC) rather than simply focusing on punitive or sanction-based compliance regimes. | Accepted in revised text. |
| 8177 | 13 | 18 | 47 | 18 | 49 | I would characterize this as the view of one scholar rather than as an undeniably true statement. It is far from clear that "a high frequency of reporting" is necessary to effective compliance strategies. | Noted and clarified in the text, with cross-references to preceding sections and to |
| 7142 | 13 | 18 | 47 | 18 | 48 | MVR is not only about mitigation, since the Bali Action Plan there is also MRV of means of implementation." | Noted. The paragraph on MRV does not confine itself to mitigation. |
| 4961 | 13 | 18 | 48 | | | MRV is used for measurement, reporting and verification AND for monitoring, reporting and verification ~ recently, the latter version is used for c.c. negotiations | Added in the text. |
| 16367 | 13 | 18 | 49 | 19 | 4 | Important to specify that these initiatives are for MRV regimes under FCCC. Also, would be good to introduce tiering options as discussed in Ellis et al (2011),FREQUENT AND FLEXIBLE: OPTIONS FOR REPORTING GUIDELINES FOR BIENNIAL UPDATE REPORTS http://www.oecd.org/environment/climatechange/48073760.pdf | MRV applies to the UNFCCC but also potentially to other initiatives and institutions. |
| 14648 | 13 | 18 | | | | Some real-world grounding for the discussion of transfers is warranted. The scale of transfers discussed in the literature -- and by some in international negotiations, especially those who care that the form of transfers is by and through governments -- does not seem feasible given the current fiscal outlook in the US, EU, and Japan. This goes beyond my area of expertise, but is there some political science literature that could shed light on how foreign aid varies with a donor country's fiscal outlook? | Taken into account in text added on feasibility of transfers via allowance allocation rather than government aid, citing Ellerman 2012. |
| 13919 | 13 | 18 | 22 | 18 | 26 | The issue of technological change, unilateral action and participation under repeat interactions is also discussed in a game theoretic: See Pitel, K. and D. R bbelke, "Transitions in the negotiations on climate change: from prisoner's dilemma to chicken and beyond", International Environmental Agreements, DOI 10.1007/s10784-010-9126-6. ü | Accepted. |
| 7507 | 13 | 18 | 22 | 18 | 26 | Important point. | Noted. |
| 13920 | 13 | 18 | 42 | 18 | 45 | This section could also reference Weitzman's article (Weitzman, M., "A Review of The Stern Review on the Economics of Climate Change", Journal of Economic Literature, Vol. XLV (September 2007), pp. 703–724 ) which shows that negative damage risks should lower discount rates and hence increase incentives to mitigate/participate. | Accepted. |
| 4718 | 13 | 18 | 46 | | | This section has two problems. First, even the Montreal Protocol has sought to facilitate compliance as much as to enforce it, but that approach receives no mention. Second, the larger issue of inducing "adjustment" or achieving "effectiveness" is replaced with a now passe notion that compliance is what matters. Compliance can be coincidental and hence unimportant (ie, not due to the treaty and counterfactually, would have occurred anyway) whereas non-compliance can reflect important efforts that fell short of compliance but nonetheless would not have occurred absent the treaty. Indeed, one imagines that eventual analyses of the Kyoto Protocol will show very low levels of compliance but, we hope, at least some effectiveness in leading to emission trajectories that were ever-so-slightly less than they would have been in the absence of the Protocol. This literature noting that effective behavior change is more important than compliance should be reflected in this chapter, I believe. | Accepted; see new paragraph on effectiveness. |
| 17663 | 13 | 18 | 47 | 19 | 41 | It might be useful to note that the withdrawal of Canada from Kyoto I, also revealed some important lessons with respect to compliance. If a country expecting to fail to meet its commitments can withdraw from a treaty without sanction the effectiveness of even the most sophisticated compliance mechanism is ultimately undermined. | Accepted as a conceptual point to add regarding noncompliance and withdrawal. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17664 | 13 | 18 | 47 | 19 | 41 | Note that the implications of incomplete enforcement of a treaty differ among the regulatory approaches, i.e. between a cap-and-trade system and international emission taxes. Overselling and underbuying of permits undermines the environmental integrity under cap-and-trade regulations while international harmonized emission taxes are additionally exposed to the risk of fiscal cushioning, i.e. the adjustment of domestic fiscal policies to offset the emission tax incentive effect (Rohling and Ohndorf (2012)). For example, tax exemptions, special provisions for exporting firms, or subsidies for pollution intensive sectors undermine the international tax rate. Enforcing fiscal cushioning is difficult as detailed directives on domestic fiscal policies can be considered as unacceptable infringements in the countries' sovereignty (Wiener (1999), Victor (2001), Hoel (1993), Nordhaus (2007), Aldy et al. (2008), ).<br><br>Aldy, J. E., Ley, E. and Parry, I. W.: 2008, A tax-based approach to slowing global climate change, Discussion Paper RFF DP 08-26, Resources for the<br>Future.<br><br>Hoel, M.: 1993, Harmonization of carbon taxes in international climate agreements, Environmental and Resource Economics 3, 221–231.<br><br>Nordhaus, W. D.: 2007, To tax or not to tax: Alternative approaches to slowing global warming, Review of Environmental Economics and Policy 1(1), 26–44.<br><br>Rohling, M. and Ohndorf, M.: 2012, Prices vs. Quantities with fiscal cushioning, Resource and Energy Economics 34, 169–187.<br><br>Victor, D. G.: 2001, The Collapse of the Kyoto Protocol and the Struggle to Slow Global Warming, Princeton University Press, Princeton, N.J.<br>Wiener, J. B.: 1999, Global environmental regulation: Instrument choice in legal context, Yale Law Journal 108, 677–707. | Accepted; new paragraph added on these points. |
| 3473 | 13 | 19 | | | | Section 13.4 is in general very clear (although I believe 13.4.2 schould not be a section) | Noted. Purpose of section on SRM more |
| 14345 | 13 | 19 | 1 | 19 | 1 | This references a paper by Ellis and Moarif from 2009, which is a follow up to the original paper from the previous year: Ellis J. and K. Larsen, "Measurement, Reporting and Verification of Mitigation Actions and Commitments," OECD/IEA, Paris, 2008. The original paper should be referenced here. | Accpted. |
| 4948 | 13 | 19 | 10 | | 14 | It is not fully clear, since possible sanctions in the compl. system under the KP include the suspension of eligibility to take part in the flexibility mechanisms (in particular, in trading with AAUs) which proved to be a "credible" provision to some extent. | Accepted. |
| 8178 | 13 | 19 | 10 | 19 | 11 | I would suggest listing and/or citing some of the proposed alternatives. | Accepted, per comment 377. |
| 12804 | 13 | 19 | 13 | | | Can you provide a reference? | Unfortunately, the comment did not suggest a reference. Found Feldstein |
| 8754 | 13 | 19 | 14 | 19 | 21 | A fundamental point about trade sanctions is that they are costly for the countries imposing the sanctions as well as the countries sanctioned. This increases the reluctance to use them. See Kemfert et al., Can Kyoto Protocol Parties Induce the US to Adopt a more Stringent Emissions Target?, Interdisciplinary Environmental Review, v. 5, n. 2, 2003, pp. 119-141. | Accepted. Added to earlier text on trade sanctions in 13.3.1. |
| 8094 | 13 | 19 | 14 | 19 | 21 | Would mention here that trade-related measures can also be used to prevent emissions leakage, as well as sanctions instruments, and the WTO considerations are different in each case. | Noted, but this point relates to national policies seeking to avoid leakage, whereas this section is on international |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2302 | 13 | 19 | 14 | 19 | 21 | The claim that "in any case, trade sanctions run the risk of reducing cooperation" is misleading, because the absence of strong self-interested incentives, such as the prospect of trade sanctions, also runs the risk of reducing cooperation due to the collective action problem. This paragraph is more negative on trade sanctions than justified, since it does not consider the incentive effects of the prospect of trade sanctions. If trade sanctions are actually imposed, they will have failed; the positive impact comes prospectively. The discussion on pp. 36-37 of the same issue is much more balanced, and it seems to me that the discussion on p. 19 is inconsistent with it. | Taken into account in revised text on trade sanctions in both 13.3.1 and 13.3.2. |
| 8179 | 13 | 19 | 14 | 19 | 21 | This does not appear to acknowledge the option of altering the WTO. | Taken into account in text. |
| 3175 | 13 | 19 | 15 | 19 | 17 | p.19, lines 15-17. Perspectives are evolving here, and certainly my view is a bit different from how I am quoted here. I laid out in some detail in Victor (2011) the tradeoffs involved here—on the one hand, trade measures open the door for mischief (and in hard economic times the incentives for mischief are legion). On the other hand, the free rider problems are nearly impossible to solve without punishments for free riders and semi-appropriable benefits for "club" members. | Noted with added reference to Victor 2011 and this dilemma, at the end of the paragraph. |
| 12551 | 13 | 19 | 18 | | | After “2011”, add -- “For example, Hoerner (1996) showed that a symmetrical border tax levied on ozone-depleting chemicals by the US was trade-compliant.” J. Andrew Hoerner, 1996. Tax Tools for Protecting the Atmosphere: The US Ozone-depleting Chemicals Tax. In Green Budget Reform: An International Casebook of Leading Practices, Robert Gale, Stephan Barg, Alexander M. Gillies, International Institute for Sustainable Development, Earthscan. | Noted, but this example is too specific to the Montreal Protocol to add here, where we cite more recent analyses on the WTO-legality of border taxes on GHGs or embedded carbon. (which may raise |
| 3970 | 13 | 19 | 19 | 19 | 19 | The sentence that "trade sanctions pose significant risk of reducing cooperation" should be strengthened. Trade sanction as a measure for compliance is grossly inappropriate: See Shinya Murase, “Conflict of International Regimes: Trade and the Environment”, in S. Murase, International Law: An Integrative Perspective on Transboundary Issues, Sophia University Press, 2011, pp. 130- 166. | Taken into account by revising the text to note the difference between threatened and imposed trade sanctions, adding this and other citations, adding a cross-reference to the discusion of trade |
| 13636 | 13 | 19 | 21 | | | A border tax on even one good by one party, the airline fuel tax in the EU, has produced strong backlash. | Noted, but not mentioned for now because no literature is yet identified discussing this airline fuel tax example, |
| 15072 | 13 | 19 | 21 | | | An example illustrating the possiblity that border taxes could harm the countries intending to punish others appears in WJ McKibbin and PJ Wilcoxen, "The Economic and Environmental Effects of Border Tax Adjustments for Climate Policy," in L Brainerd and I Sorkin, (eds), Climate Change, Trade and Competitiveness, The Brookings Institution, pp. 1-34, 2009. | Accepted. |
| 7662 | 13 | 19 | 22 | 19 | 23 | In my understanding punishments are not mainly targeted at misreporting only but at missing the targets. | Text clarified to indicate that sanctions |
| 12805 | 13 | 19 | 22 | 19 | 25 | Can you provide a reference? | This text just states the rationalist observation that parties will comply if the benefits exceed the costs. The text also seems out of place; it belongs earlier in |
| 17670 | 13 | 19 | 22 | 19 | 25 | It would be valuable if you gave some examples for "deterrence machnisms" in this context and cite some literature | Text revised, see comment 391. |
| 7661 | 13 | 19 | 23 | 19 | 25 | One such mechanism is described in Heitzig, Lessmann, Zou (2011) PNAS, doi:10.1073/pnas.1106265108 | Already inserted per comment 377. |
| 6330 | 13 | 19 | 26 | 19 | 28 | Is it necessary to use this extensive list of literature from 1998 to 2006. Was not this issue covered by the AR4? If so, possibly it could be cited instead. There are not more updated literature on this matter? | Taken into account by adding newer citations. Deleted Doelle 2004 which is about a different topic. Older citations |
| 10809 | 13 | 19 | 26 | 19 | 41 | Consider citing a recent book on Climate Change Liability by Lord, Goldberg, Rajamani and Brunee. Cambridge 2012. | Accepted. |
| 16188 | 13 | 19 | 26 | 19 | 41 | Add Daniel A. Farber. 2011. The UNCC as a Model for Climate Compensation in Gulf War Reparations and the UN Compensation Commission: Environmental Liability. Cymie R. Payne and Peter H. Sand, eds. New York: Oxford University Press. | Accepted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6842 | 13 | 19 | 26 | 19 | 41 | There is a vast quantity of more current literature on climate litigation that has not been referred to. See for instance, Richard Lord, Silke Goldberg, Lavanya Rajamani and Jutta Brunnée (editors), CLIMATE CHANGE LIABILITY: TRANSNATIONAL LAW AND PRACTICE (Cambridge University Press, UK, 2011); See also work by Osofsky and Burns | Lord et al. 2011 now added. Burns was already cited. |
| 6843 | 13 | 19 | 26 | 19 | 41 | There is also an increasing emphasis on human rights remedies that should be mentioned. See work by Stephen Humphreys, formerly of ICHRP, for instance, as well the work on the OHCHR on this. In the context of the climate negotiations see also:The Increasing Currency and Relevance of Rights-Based Perspectives in the International Negotiations on Climate Change, 22(3) JOURNAL OF ENVIRONMENTAL LAW 391-429 (October 2010) | Human rights are important but are not the topic of this paragraph on civil liability litigation as a complance enforcement mechanism; instead, the role of human rights in international law related to climate change is being |
| 2412 | 13 | 19 | 26 | 19 | 41 | Comment on specific text: As above, I think it would be helpful to specify what you mean by legal remedies here. It seems that you have private law remedies (especially tort) in national legal systems in mind? The concept of legal remedies seems quite vague and to cover a lot of things that are also discussed elsewhere. | Text clarified. |
| 3752 | 13 | 19 | 45 | | | define durability | The term is used in its ordinary sense and is explained in the cntext of the |
| 4962 | 13 | 19 | 5 | | 6 | Actually, the compliance system was not established by the KP per se, but that was elaborated and adopted several years later (in 2001 as rightly indicated in Table 13.2 on p.20), but formally/legally it is "under" the KP. | Noted and text revised to add "and its follow-on accords". |
| 12803 | 13 | 19 | 5 | | | MEAs (not explained; reference was IEA so far) | Text revised to refer only to IEAs |
| 7660 | 13 | 19 | 7 | 19 | 9 | A credible sanctioning mechanism for the Kyoto protocol and similar architectures has recently been suggested in the game-theoretic literature (Heitzig, Lessmann, Zou (2011) PNAS, doi:10.1073/pnas.1106265108) | Accepted, and statement that "few alternatives have been identified" is removed. |
| 14649 | 13 | 19 | | | | The discussion of compliance could expand the brief text on MRV to include lessons learned from non-envl international policy surveillance programs, such as IMF Article IV consultations, OECD economic policy reviews, WTO trade policy reviews, etc. May also be useful to draw lessons from arms control treaty surveillance. | Taken into account in revised text. |
| 5686 | 13 | 19 | 26 | 19 | 41 | If legal remedies for climate damages are to be discussed as a potential solution, it would be helpful if this paragraph offered an example of a case in which this has happened. In addition, the paragraph should mention the lack of an international legal system with the power to enforce credible penalties/sanctions. This would seem to be a key barrier to the liability approach, and very similar to the more general problem of enforcing international agreements, discussed earlier in the chapter. | Taken into account in revised text. |
| 2933 | 13 | 19 | 39 | | | add a reference to Lord et all, 2011 : Richard Lord QC, Silke Goldberg, Lavanya Rajamani, Jutta Brunnée (eds.) (2011), Climate Change Liability: Transnational Law and Practice, CUP, 712 p. | Accepted. |
| 13921 | 13 | 19 | 5 | 19 | 9 | The discussion on the Kyoto compliance regime could benefit from further nuance. The references cited (Obertuer and Lefeber, 2010; Doelle et al, 2012) show that the Kyoto regime has been successful in inducing compliance with onerous reporting requirements, which itself can raise the detection risks and political costs of non-compliance. They also argue that, whatever its failings, the Kyoto compliance regime presents important elements and lessons-learned that could feed into future regimes, in particular with regard to the MRV requirements. | Accepted. |
| 2932 | 13 | 19 | 6 | | 7 | include WHILE others MEAS… | Accepted. |
| 18662 | 13 | 20 | | | | Page 20: Useful typology of commitment in international agreements for climate change | Noted |
| 3971 | 13 | 20 | | | | On typology of commitments, the first Colum, the reference to WTO is not appropriate, since the WTO dispute settlement enforces States to comply only with future commitments (such as amending the non-compatible national laws for the future) without demanding the ex-post-facto restitution or redress. WTO mechanism looks quite rigid at first sight, but actually quite “soft” allowing flexibility. See, Shinya Murase, “International Lawmaking for the Future Framework on Climate Change: A WTO/GATT Model”, in S. Murase, International Law: An Integrative Perspective on Transboundary Issues, Sophia University Press, 2011, pp. 167- 180. | Taken into account - text revised to recognise the claim re the WTO was too strong in the earlier version. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3972 | 13 | 20 | | | | There should be an additional Colum between “Mandatory provision in a legally-binding agreement” and “Mandatory provision in a non-legally-binding (“political”) agreement”, regarding “Mandatory provision of legally binding agreement with flexible commitments” to which the WTO/GATT mechanism belongs. See, Shinya Murase, “International Lawmaking for the Future Framework on Climate Change: A WTO/GATT Model”, in S. Murase, International Law: An Integrative Perspective on Transboundary Issues, Sophia University Press, 2011, pp. 167- 180. | Taken into account. The clarification of the meaning of "mandatory" (see response to #418) has specified that this could include obligations that contain flexibility, so the proposed extra row is unnecessary. The suggested refernce |
| 11590 | 13 | 20 | | | | The table is a clear demonstration how the UNFCCC has met all the requirements for an international agreement.It is the burden sharing that is causing difficulties because those who are supposed to take a leadership role are not doing so. | Noted |
| 16189 | 13 | 20 | | | | Should read "somewhat more weight than a political agreement …." | Accepted - text revised. |
| 11336 | 13 | 20 | | | | A 'mandatory provision in a non-legally binding 'political' agreement'- is not binding as a matter of law - but only as a matter of morality. Theer are no degrees of bindingness. | Taken into account. The opening paragraph has specified that bindingiess may be legal but may come in other forms - these are not "degrees" but types |
| 11448 | 13 | 20 | | | | The reference to the Copenhagen Accord in the third row, third column, of Table 13.2 is factually inaccurate. The Copenhagen Accord is not an official document of the UNFCCC COP. In this context, UNFCCC Parties submitted mitigation pledges and NAMAs in response to UNFCCC COP decision 1/CP.16 (the Cancun outcome) rather than the Copenhagen Accord. If UNFCCC Parties made submissions pursuant to the Copenhagen Accord, they did so legally not as UNFCCC Parties but rather as individual States. The conclusion in the fourth row, third column, that UNFCCC Art. 4.2 is a non-mandatory provision in a legally binding agreement is not accurate. Art. 4.2 – particularly paragraphs (a) and (b) therefore – is a mandatory provision because it specifically commits and requires Annex I Parties to undertake specific actions. The “aim” language relates to the mitigation target of returning emissions to 1990 levels by 2000 and should be read as a legal requirement because it is in the context of the mandatory requirement of Annex I Parties to report on the mitigation actions that they are to undertake in compliance with Art. 4.2(a) of the UNFCCC. It is a standard rule in treaty interpretation that the text of treaty provisions should not be read in isolation but rather in terms of their context and ordinary meaning. | Part I (Copenhagen Accord) - accepted - text revised. Part II (Article 4) - taken into account - text revised to distinguish beteen article 4.2(a) and (b). |
| 6112 | 13 | 20 | 18 | | | In the 4th column of Example, there is a description that "The UNFCCC target for developed countries to return their emissions to 1990 levels by the year 2000" (Article 4.2). This is incorrect. Correct wording is "the return by the end of the present decade to earlier levels". Then US President Bush senior opposed to sign the treaty if it is written as to stabilize at 1990 level by 2000. After the final negotiation, the wording "return -- to earlier level" has been agreed. Please change "1990" to "earlier". | Accepted - text revised. |
| 6844 | 13 | 20 | 6 | 21 | 27 | There are, again, southern legal scholars that have written on these topics in peer reviewed international legal journals but are not cited here. Among others, I have written numerous pieces on the issue of legal form. A more comprehensive literature survey(going beyong American journals/scholars) and reflecting greater balance and diversity in the voices/literature cited would be helpful. For instance, L. Rajamani, The Copenhagen Agreed Outcome: Form, Shape and Influence, XLIV (48) ECONOMIC AND POLITICAL WEEKLY 30-35 (28 November 2009)<br>L Rajamani, Addressing the Post-Kyoto Stress Disorder: Reflections on the Emerging Legal Architecture of the Climate Regime, 58(4) INTERNATIONAL & COMPARATIVE LAW QUARTERLY 803-834 (October 2009) | Accepted. Rajamani's second suggested article incorporated (The first, in EPW, is not peer-reviewed, but also more of a commentary on the copenhagen negotiations rather than a detailed exploration of the legal form question). However, in the next round of revisions, the authors will consider more literature from developing country authors. |
| 4963 | 13 | 20 | 7 | | | these are generally not among governments, but among States (usually represented at the negotiations by gov. representatives) | Accepted - text revised. Similar consequent change also made in FAQ |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10811 | 13 | 20 | | 23 | | The sub-sections of 13.4.1 do not seem to me to cover the full range of issues on which international cooperation is needed, nor those on which discussion is, in fact, already ongoing. The discussion as currently written tilts too much toward mitigation alone, with no real space given to the cooperation required on adaptation, financing, technology and so on. There are two ways forward: If the current construction is retained, it would be good to explain where the categories of legal binding, burden sharing and flex mechs come from. And then to make sure the substantive themes such as adaptation, finance etc., are appropriately discussed in brief, most likely under burden sharing (and to a greater extent than a single word reference, which is what exists at the moment). Another option would be to use other alternative typologies available, for example, by drawing on the UNFCCC process in general and the Bali Action Plan pillars in specific. Either way, the underlying point is that the scope of international cooperation should be widened to, at minimum, encompass the current discussions. | taken into account. Section structure reorganised. Additional subsection on "goals, actions and metrics" added, to be drafted yet. Emaphsised that these elements are not the only ones that could be discussed. |
| 14650 | 13 | 20 | | | | The legal bindingness section should include some discussion of how treaty obligations vary across nations as a function of their respective domestic law. As I understand it, a ratified treaty in the United States carries the force of domestic law, while in other nations ratified treaties do not necessarily provide standing for domestic constituents to sue for compliance by their soveriegn. | Accepted - text revised. |
| 5311 | 13 | 20 | 1 | 21 | 27 | It is interesting to see the typology of commitment in international agreements for climate change. It may be useful to add the growing literature on "norm-building" in international relations especially in the absence of a legally binding agreements. For instance, although we do not have an international treaty on nuclear tests (the CTBT is not yet in force), there is always a huge international protest when one country announces nuclear tests. In the climate change context, norms may be more effective than legal binding agreements. | accepted. Discussion of this incorporated into section on legal bindingness. |
| 11141 | 13 | 20 | 6 | 21 | 27 | The word "bindingness" does not exist in the English language. Please clarify in all instances. | Rejected - the comment is incorrrect about the existence of the word bindingness. First use according to the |
| 3176 | 13 | 20 | 6 | | | section 13.4.1.1 and section 32.4.1.3. There's a lot of literature (by lawyers and political scientists alike) on bindingness and on flexibility. The Hafner-Burton et al (2012 AJIL) article reviews the political science literature in some detail. Helfer's work, among others, addresses the law. Also, I think the section on flexibility is overly focused on the CDM as a source of flexibility when, in fact, countries have used (and have available in the future) lots more—such as the ability to adjust (before a treaty is finalized) their targets, possible designs that include more explicity target or commitment flexibility (e.g., pledge and review), etc. This text makes is sound like the CDM is the cat's meow for flexibility. | taken into account. Opening paragraph added empahsising plural ways that flexibility might be organised. The argument in Hafner-Burton used as an example. But overall focus of section remains on Kyoto flexibiltiy mechanisms. Re the final point (the "cat's meow"), it is worth noting the section cites a good deal of mateiral highly critical of the CDM. See also response to #107 |
| 6990 | 13 | 21 | 1 | | 10 | You might note that an agreement can require that parties adopt domestic legislation for compliance. | Rejected. The text already states that agreements may "set in motion domestic legal-implementation |
| 16368 | 13 | 21 | 1 | 21 | 10 | Could metnion here analysis and literature on examples of where domestic law has been triggered by international commitments (eg EU ETS) | Rejected. This comment is correct but not relevant here. The sentence refers only to the different sort of authority relations in domestic and international law, not to the dynamci relationship between the two levels. This comment |
| 11337 | 13 | 21 | 1 | | | There is no such thing as a nonbinding treaty (even though a treaty may contain non-binding or non-enforceable 'obligations') | taken into account. The word treaty has been replaced with agreement to be consistent with the rest of the section, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10810 | 13 | 21 | 11 | 21 | 19 | The definition of soft law used here is imprecise. Better to use the most accepted definition by Abbott, Kenneth W. and Snidal, Duncan, Hard and Soft Law in International Governance (2000). International Organization, Vol. 54, p. 421. They distinguish hard and soft law on three axes: obligation, precision, and delegation. These actually map quite well to Werksman's latter three categories of obligatory language, sufficient detail for compliance and mechanims (his fourth is legal form), which is citied at the beignning on 13.4.1.1. Making the link locates this discussion in a broader context of international relations thinking and scholarship. | accepted - text revised to make the definition of soft law more precise. |
| 11338 | 13 | 21 | 14 | | | enactnment of domestic legislation is not necessarily indicative of a state's acceptance of something as legally binding. It may do so for purely pragmatic or political reasons | reject. This comment is mistaken. The sentence does not imply that all domestic action is evidence that states regard an international agreement as binding - just that if states do treat it as binding this may lead to domestic |
| 4949 | 13 | 21 | 16 | | 19 | There is also a climate policy related example: the declaration in 2001 (the "Bonn Declaration") by the EU members and some other developed countries to provide a concrete amount of financial means to the developing countries. | rejected. It is too unclear if the bonn declaration has had the effect implied in the text - that states have regarded such |
| 6331 | 13 | 21 | 25 | 21 | 27 | This last sentence of this paragraph is not backed by any literature source. In addition, it is not clear that the cited section 13.3.1 backs this statement. | accepted. Sentence on administrative law deleted here, because not strictly relevant to the question of legitiamcy - whi ch here is introduced to explain why legal bindingness may not always be central to a successful agreement. |
| 6991 | 13 | 21 | 25 | | 27 | Please explain the shift in the direction of administrative law. I didn't find the description here or in 13.3.1 to be satisfactory. I didn't even understand what was meant by the term. Please also give evidence of the "shift." Perhaps you could give examples? | see response to #447 |
| 8180 | 13 | 21 | 25 | 21 | 27 | This is a huge statement. At a minimum, I would recommend explaining what you mean by "less and less important" (i.e. less important in what sense). I would recommend considering deleting this. | see response to #447 |
| 11339 | 13 | 21 | 25 | 21 | 27 | What is your authority for the statement that international law is shifting in the direction of administrative law? What relevance the x reference to section 13.3.1 which merely refers to literature asserting that international organisations may be developing some form of global administrative law. The literature cited here is old and while it may be arguable that administrative aspects are developing within international law that is not the same thing as saying that internationnal law is becoming nothing more than administrative law - which is what your statement suggests. | see response to #447 |
| 14651 | 13 | 21 | 26 | | | I do not understand this reference to administrative law and the reference to see the section on participation. | see response to #447 |
| 16190 | 13 | 21 | 26 | 21 | 27 | This understates the importance of national governments' concerns about the democracy deficit in international organizations that assume significant decision making authority through administrative structures. | rejected - This comment is not relevant here. The sentence refers to argumetns that empirically, the character of international law is changing. Governments' concerns about this may |
| 6845 | 13 | 21 | 26 | 21 | 27 | This is quite a sweeping claim i.e. that international law is shifting in the direction of administrative law and the issue of state consent is becoming less and less important. This lacks context and nuance. There are a group of primarily American scholars that hold this view but this by no means undisputed. | see response to #447 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17102 | 13 | 21 | 28 | 22 | 11 | burden sharing methods is only PART of the new rules since Copenhagen-Cancun, because ecological limits has brought on assessments by UNEP, which were discusses in the most recent informal negotiations of the UNFCCC at Bangkok, on "resource sharing" and considering the global carbon budget. Burden sharing is now being discussed in the literature and the negotiations interms of BOTH costs and carbon budget. The terminology used, "share of global GHG emissions covered" is not a commonly used term in the literature of in the negotiations and should be replaced with the term "global carbon budget". | taken into account. Title of subsection changed to "participation, equity and effort sharing methods". Section expanded in response to other comments. Discussion of on carbon budgets introduced.. |
| 6846 | 13 | 21 | 34 | 21 | 39 | Principle 7 of the Rio Declaration is not identical to Article 3 of the UNFCCC. There are important differences - and these were negotiated in by the US primarily because the legal status of the two instruments (Rio Decl and UNFCCC) are different. Cannot conflate in this manner. | Accepted - text revised. |
| 14652 | 13 | 21 | 36 | | | This quote should also include "respective capabilities." | Accepted - text revised. |
| 8095 | 13 | 21 | 36 | 21 | 36 | Change "common but differentiated responsibility" to "common but differentiated responsibilities and respective capabilities" | Accepted - text revised. |
| 6992 | 13 | 21 | 37 | | | I don't see how the UNFCCC's mention of avoiding "dangerous" interference relates to burden sharing. It's a collective goal. | rejected - the overall objective of the FCCC creates a set of limits to GHG emissions that thus imply distributive questions. The line is however amended to read "… the objective of |
| 4965 | 13 | 21 | 39 | | | burden sharing (here and generally): recently it was replaced with a "positive" terminology in the EU's climate-energy package and pol. documents, namely: with "effort-sharing" .. | taken into account. Section title changed to effort sharing, clarification in the text |
| 4964 | 13 | 21 | 7 | | | {Add} objective of {}avoiding "dangerous anthropogenic .. | rejected - unclear to which bit of text this comment applies. Clearly not relevant |
| 7143 | 13 | 21 | 9 | 21 | 10 | That's right, but there is also a fact that international law produces the development of domestic law, which is the case of climate change, e.g. The European normative. In the absence of UNFCCC and, particularly, of the KP, must of the current domestic legislation related with CC never have been issued | rejected. This comment is correct but not relevant here. The sentence refers only to the different sort of authority relations in domestic and international law, not to the dynamci relationship between the two levels. This comment |
| 13922 | 13 | 21 | 1 | 21 | 10 | The discussion on bindingness and effectiveness could benefit from a reference to Raustiala's paper: Raustiala, K., "Form and Substance in International Agreements", The American Journal of International Law, 99, 2005. He makes the point that there is often an inverse relationship between bindingness, stringency and the means of enforcement with an IEA, as government's seek to reduce the potential costs of non-compliance. | accpted. Text revised accordingly. |
| 5305 | 13 | 21 | 7 | 21 | 7 | loss of reputation should be changed to "loss of good reputation". | rejected - the term "good" is redundant - to lose a reputation implies to lose a good reputation. This is particularly |
| 10812 | 13 | 21 | | 22 | | The participation and burden sharing section is disproportionately small compared to legal bindingness and flex mechs. Yet there is a huge literature on this topic, and a great deal of new insight generated in the last 5 years since AR4. I realize there is a section 13.13.2.2 assessing burden sharing still to come. But for balance, this section needs to set up the problem better. At minimum, the resource versus burden sharing frameworks should be laid out, with representative studies of each of these. The citations in lines 8-10 p. 22 are broadly right, but perhaps some survey articles are worth mentioning. I am not fully aware of the literature, but one by D. Narasimha Rao in Handbook of CLimate CHange and India, Navroz Dubash (ed.) OUP/Earthscan 2012 has some key citations. | Accepted. Section significantly reorganized and expanded. |
| 13923 | 13 | 21 | 28 | 22 | 11 | The discussion on participation could reference (Raustiala, K., "Form and Substance in International Agreements", The American Journal of International Law, 99, 2005.) on the relationship between legal form and substance: the legal nature of commitments and the participation that the regime is likely to attract. | rejected. Article consulted, the point about the relationship between legal form and participation seems relatively |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6580 | 13 | 21 | 28 | 22 | 11 | Consider coorelation between "Participation" and "Degree of Legal bindingness".<br>Examples of examination objects are as follows.<br><br><Mandatory provision in a legally-binding agreement with enforcement mechanism: Kyoto Protocol><br>At the time of the adoption of the Protocol, it covered 58% of global emissions. Because of US withdrawal and rapid increase of emissions from emerging economies, coverage has shrunk to only 27% in 2008 (figures are based on ener-gy-related CO2 by IEA statistics). And at COP 17 in 2010, Japan, Russia and Can-ada made it clear that they do not commit any numerical figure for the second commitment period of the Kyoto Protocol. This has led to the outcome that the protocol covers less than 15% of global CO2 emissions in 2009 No treaty without the United States and emerging economies is effective.<br><br><Mandatory provision in a non-legally-binding ("political") agreement: The Copenhagen Accord><br>The Copenhagen Accord is quite welcome in that it adopted the pledge and review style, and almost all coun-tries agreed to submit their pledges. | taken into account. Revision of text in line with #434 addresses this point. |
| 12000 | 13 | 22 | 12 | 23 | 25 | Note that the Schneider study came to the conclusion that there is theoretical gaming possibility but that there is no evidence of this having happened. Also, it is wrong to imply that all projects are financed by the project owner and it is wrong to imply that there is something wrong with the cases where the projects are indeed financed by the project owner because that is simply a question of financing. The importance lies in the incentive in the form of the carbon price (from industrial countries), the international exposure, the access to new customers and international currency the CDM provides: by putting a price on the currently issued credits, investors are incentivized to develop the next project. Otherwise it is like asking a constructor to build a house and then when she is done and wants the bill paid, you say "well, clearly you built my house without me giving you the money upfront i.e. you do not need my money!" Wrong approach.<br><br>Please make sure to refer to the High Level Policy Panel's study findings that are now available at cdmpolicydialogue.org/ i.e. a lot of the governance issues have been fixed or are currently being fixed. Also, it is important to mention here the necessity for continuous demand, be it for specific methodologies and countries, in order to maintain that price signal of the CDM. This statement needs to be made prominently, as it is at the very basis of the CDM: The market has collapsed, people have been leaving for the past year and a half. Less than one more year like this and we do not need to mention the CDM anymore as it won't matter, the capacity will have disintegrated beyond a critical point. | taken into account. Reference to final report of CDM Policy Dialogue included. The text includes already the point re the Schneider paper. The text does not imply that unilateral proejcts are necessarily more problematic than others. |
| 15724 | 13 | 22 | 12 | 23 | 25 | Green Investment Schemes should be mentioned. More than 300 Mio AAUs were traded so far under GIS. | In Section 13.4, taken into account. More approrpaite for section 13.13 than here.<br><br>Section 13.7, Taken into account - green |
| 11450 | 13 | 22 | 12 | 23 | 25 | The discussion on flexibility mechanisms erroneously highlights these mechanisms as main components of international cooperation arrangements on climate change. Under the UNFCC and the Kyoto Protocol, such flexibility mechanisms are rather subsidiary mechanisms that are intended merely to assist in achieving compliance with mitigation commitments rather than serve as the primary vehicles for achieving such compliance. | Rejected. The focus on flexibility mechanisms as elements in existing agreements is appropriate. The chapter also discusses other aspects of international climate agreements, in this |
| 6993 | 13 | 22 | 13 | | | Flexibility mechanisms cannot have the desired effects mentioned here unless backed up by enforcement. This kind of observation is important for readers trying to connect one part of your chapter with another. | rejected. Unnecessary detail for this section. All types of agreements entail a question about enforcement. Dealt with |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11688 | 13 | 22 | 13 | 23 | 25 | In the section 13.4.1.3, many flexible mechanisms are discussed including trading allowances, CDM, JI etc, but I feel that the pricing regime is neglected somehow, for instance, the Australia carbon tax might be able to link with future trading regime, so I wonder if it is better to include discussions or surveys of carbon tax related policies, so maybe change the title to "carbon pricing and flexibility mechanisms"? | rejected. The title of flexibility mechanisms includes the dimension of carbon pricing in that they frequently operatve by generating a carbon price. The main discussion of Austrlaia's new |
| 8181 | 13 | 22 | 13 | 22 | 13 | "Utilize markets": I recommend being more specific. Does this mean emissions permit markets or markets in general? | accepted- text revised. |
| 8755 | 13 | 22 | 30 | 22 | 31 | "which takes advantage of Article 4 of the Kyoto Protocol, which allows parties to meet their Kyoto commitments jointly" is not relevant to the use of Kyoto units in the EU ETS. Delete the phrase. | accepted. The statement in the text is correct but not pertinent to the point about the EU ETS being the driver of |
| 4966 | 13 | 22 | 31 | | | to set/define and meet their Kyoto commitments jointly ~ otherwise it would mean the JI .. | rejected. Text no longer in given response to previous comment. |
| 4967 | 13 | 22 | 32 | | | {Cor} entities (companies or {their installations} [plants])<br>That is:<br>entities (companies or their installations) | accepted - text revised. |
| 8756 | 13 | 22 | 34 | 23 | 25 | Revise this section using the reports prepared for the CDM Policy Dialogue. See http://www.cdmpolicydialogue.org/ Three background reports were prepared and should be available on the site by mid-October. The reports review the literature on all substantive and governence issues related to the CDM. | taken into account. See response to #473. |
| 17103 | 13 | 22 | 34 | | | the negotiations are focussing on equity, and not fairness. There was also a workshop to discuss this issue, and reflects a clear position of the majority of countries. The meaning of this term, as is emerging in these negotiations , is NOT burden sharing rules about how parties are " differentially obligated" as is in the text (this is the position of developed countries in the negotiations), while developed countries (especially the African Group, ALBA and China) are focussing on sharing the carbon budget, or equitable access to sustaianble development, and you need to refer to the most recent consensus on this in the Cancun Agreement, including in the literature referred to in this section, but has not been specified. This omission gives a distorted picture of the literature. | Taken into account. Response to #454 addresses also the concern in this comment |
| 17671 | 13 | 22 | 36 | 22 | 38 | Can you specify what the "market price effect" is and what role it plays in the context of baselines and leakage. This is not clear without further information. | taken into account .reference consulted and the meaning of this term specified. |
| 16191 | 13 | 22 | 38 | | | Consider reference to Michael Wara, Measuring the Clean Development Mechanism's Performance and Potential, 55 UCLA L. Rev. 1759 (2007-2008) | accepted. Citation incorporated. |
| 16192 | 13 | 22 | 43 | 23 | 14 | Reference Barbara Haya. Failed Mechanism: How the CDM is Subsidizing Hydro Developers and Harming the Kyoto Protocol. Working Papers from eSocialSciences at http://econpapers.repec.org/paper/esswpaper/id_3a4822.htm or | reject. report checked, it is an NGO report and would not meet the peer-review test. There is plenty of material |
| 16369 | 13 | 22 | 43 | 22 | 45 | Perhaps too strong to say that project needs to be "motivated primarily" by credit sales; each investor assesses the business case of projects, and credit revenue may be a crucial factor in making a project viable even if not "primary" motivator (cf electricity sales etc). | accepted. Text revised to clarify the role of CER income in a project's viabiltiy to qualify as "additional". |
| 2168 | 13 | 22 | 43 | 23 | 25 | Rive and Rübbelke (2010) Review of World Economics have investigated the interplay between CDM effects and national regulation effects (in China). This paper could help linking the CDM section (13.4.1.3) and Section 13.4.3 and Section 13.7 (especially Subsection 13.7.2) on page 34. | accepted. Introduced in the context of bringing more attention to developing country motivations for the CDM (See |
| 4950 | 13 | 22 | 48 | | | in fact this aims at "certification" in accordance with the name of the CDM-units: "CER" | Reject. In fact the processes identified in the text refer to what in the CDM are the two separate processes of "certficiation" and "verification". Audit is a reasonable |
| 11449 | 13 | 22 | 5 | 22 | 11 | Given the high importance that many countries attach to equity and burden sharing in the context of mitigation, and the extensive academic research that have gone into these issues, the discussion on these issues should be substantially expanded beyond these 6 lines. | accepted. Text revised as explained in response to #438. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6038 | 13 | 22 | 7 | 22 | 8 | Include a sentence that characterizes the "considerable discussion of burden-sharing in the scholarly literature" | accepted. Text revised as explained in response to #438. |
| 12476 | 13 | 22 | 7 | 22 | 11 | This sentence states that "There is considerable discussion of burden sharing in the scolarly literature". Then 11 different references are given. But there is nothing about results or findings from these references. Please consider to include some of the findings, if the references are to be listed. | accepted. Text revised as explained in response to #438. |
| 6847 | 13 | 22 | 7 | | | Where is this right to sustainable development sourced to? Article 3 - refers to the "right to and should promote" SD. Not the same thing. | taken into account. Text revised to be more precise in citing the FCCC, article |
| 6848 | 13 | 22 | 7 | 22 | 11 | Again, Many southern voices not reflected - as for instance work by Jayaraman et al, TISS, Mumbai, on the global carbon budget approach. | accepted. Text revised as explained in response to #438. |
| 6332 | 13 | 22 | 12 | 23 | 25 | To facilitate the understanding of the reader on flexibility mechanisms it is needed to describe in numbers the magnitude achieved by the different flexibility mechanisms, in terms of emission reductions and financial amounts. A table with this information would be ilustrative and useful. | reject- this discussion will take place in 13.13.1.2 |
| 11687 | 13 | 22 | 7 | 22 | 11 | In this part, it is written "there is considerable discussion of burden-sharing in the sholarly literature", however there are no discussions of these studies at all except just a long list of the literature. Or if skip the discussion then need to provide a reference to the section 13.13.2.2 which will discuss more on burden sharing | accepted. Text revised as explained in response to #438. |
| 11573 | 13 | 22 | | | | Flexibility mechanisms of the market are mentioned. What about flexibility mechanisms of political institutions and administrative procedures? | Rejected. The text makes clear what flexibility mechanisms are to refer to, and the sorts of flexibility implied by the |
| 3177 | 13 | 22 | 1 | | | section 13.4.1.1 and section 13.4.1.3. There's a lot of literature (by lawyers and political scientists alike) on bindingness and on flexibility. The Hafner-Burton et al (2012 AJIL) article reviews the political science literature in some detail. Helfer's work, among others, addresses the law. Also, I think the section on flexibility is overly focused on the CDM as a source of flexibility when, in fact, countries have used (and have available in the future) lots more—such as the ability to adjust (before a treaty is finalized) their targets, possible designs that include more explicity target or commitment flexibility (e.g., pledge and review), etc. This text makes is sound like the CDM is the cat's meow for flexibility. | same comment as #422. see response to that comment. |
| 16236 | 13 | 22 | 23 | | | Suggest adding a sentence at the end of the paragraph: "Flexibility is politically valuable because it allows governments to reduce emissions at a lower cost overall and because it offers governments a toolkit of policy options that can be adjusted over time as circumstances change (Thompson, 2010)." Thompson, A. (2010). Rational design in motion: Uncertainty and flexibility in the global climate regime. European Journal of International Relations 16, 269-96. | Reject. The point made in this comment is already reflected at pp22, line 13. the point is also ubiquitous in literature on this subject back to the early 1990s. Little gain is to be had by a single |
| 11142 | 13 | 22 | 38 | 22 | 40 | This "conclusion" has been rejected by the CDM Executive Board and has not been accepted (please see EB papers). | Rejected. The reference to EB papers is too vague to be useful, and are not peer-reviewed literature in any case. The text also only states that thereis an incentive to increase emissions in the HFC |

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| 6582 | 13 | 22 | 43 | 23 | 25 | Add following 7 problems of CDM. CDM has both good and bad points.<br><br>Quote>><br>1.The Clean Develop Mechanism's (CDM) credits, CERs, are worth the same as EU ETS credits and can be submitted by ETS installations instead of EUAs. CERs are generated by extra-EU emission reducing projects to be sold on, to incentivise green investment, especially in developing nations. The EU is effectively offloading its ETS obligations in a 'do as I say, not as I do' move.<br>2.The CDM is a 'zero sum' mechanism. For example, a CDM project reducing emissions by 1,000 tCO2e will generate 1,000 CERs, which can be bought by ETS installations to allow the emission of 1,000 tCO 2.<br>3.The CDM is vulnerable to corruption. A study of the top five UN-accredited CDM validatory bodies found that on a scale from 'A' (very good) to 'F' (very poor), none scored higher than 'D'.<br>4.A 4,000MW coal plant in Gujarat, India, has received CERs because it is marginally less polluting than other coal stations. This is despite the fact it emits 26 million tonnes of CO2 per annum, will do so for at least 25 years, is India's third largest source of emissions and is the 16th largest worldwide.<br>5.Industrial gas credits reap huge profits. HFC-23 generates 11,700 credits per tonne destroyed at approximately €12, but costs only €0.17/tCO2e to destroy: a 7,000 per cent markup. As a result, some companies are creating HFC-23 just to destroy it in order to generate credits. If the scheme did not exist, these emissions would never have been produced.<br>6.This is especially rife in China where, because it is so lucrative, the government<br>taxes CDM revenues at 65 per cent, expecting to generate £1.7 billion by 2013.<br>7.While gas credits have been banned from May 2013, lobbying led to a delay in the ban and 412 million credits are still waiting to be issued through the scheme.<br><br>For citation: David Merlin-Jones (2012). CO2.1 Beyond the EU's Emissions Trading System. 17-27 | Rejected. The proposed source is not in the peer-reviewed literature and cannot thus be cited. |

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| 6581 | 13 | 22 | 48 | 23 | 5 | Especially for projects for energy saving, it is difficult to work for CDM.<br>It is necessary to establish new frame work to evaluate contributions of technology transfer seeing following analysis.<br><br>Quote>><br>The CDM under the Kyoto Protocol is generally believed to lower economic barriers with the introduction of climate friendly technologies. According to authors' experiences in promoting energy saving projects under the CDM scheme in China since 2005, however, CDM procedure is extremely complex and its socalled additionality check is excessively strict in validating a qualifying project. Additionality check requires an investment analysis. For a project to be qualified as ''CDM'' there is a need to show that the investment will not be decided without CO2 credit.<br>Economic or environmental additionality is a typical item.<br>''Economic additionality'' in CDM context, for example, is used in the following manner. If a certain project is profitable enough to invest without an economic benefit of CDM credit, this project is not appropriate as a CDM project due to being recognized as a business-as-usual project (IGES, 2010). As the initial investment in steel sector is generally too large to be paid back by the economic incentive accruable by CDM credits, there have been many cases where energy saving technologies were adopted by steel companies in developing countries, without waiting for CDM Executive Board's decision, which were frequently rejected later (an example of the rejected CDM application is available in UNFCCC (2010)). Even in such cases, steelmakers can still get benefit from energy saving investments primarily by lowering their energy costs. Typically, an energy saving investment yields an annual saving of 20–30% (depending on the price of energy) relative to the initial investment. Even if a project is qualified<br>under the CDM scheme, the value of the resulting credits will be much smaller than the benefit of the energy cost reduction by a factor of 10. For a typical smaller CDQ facility, an initial investment is about f3.5 billion per facility and the annual reduction in energy consumption (crude oil equivalent) is approximately 14,000 t-crude oil/year. The annual energy saving benefit is about 28% of the initial investment (Refer to NEDO (2008)). This means CO2 reduction is approximately 0.1million t-CO2/year and the value of the CO2 credit (if calculated at f1000/t-CO2) is only about one-tenth of this benefit. Since the value of credits is only a minor factor concerning the investment decision, the benefit of removing the economic barrier through CDM would probably not be significant. In order to promote technology transfer, it is necessary to establish a new framework to evaluate contributions of technology transfer from developed to developing countries in more practical manner than that of current CDM. In addition, the length of the CDM procedure presents major risks for project owners, letting them cast doubts on the reasons for the very existence of the CDM scheme.<br><br>For citation: Okazaki T, Yamaguchi M (2011). Accelerating the transfer and diffusion of energy-saving technologies steel sector experience - lesson learned. Energy Policy 39. 1296-1304 | taken into account - reference added into to list of references on debates about CDM governance. |
| 3469 | 13 | 23 | | | | The section on Cooperation in solar radiation management (SRM) should probably be a box, rather than a section | taken into account. Structure of section revised to make place of SRM |
| 6334 | 13 | 23 | 15 | 23 | 25 | To facilitate the understanding of the reader on the issue of sectoral CDM, it might be useful to provide informaton on the actual results in using sectoral or policy approaches, in terms of GHG emission reductions and financially. | rejected. The status of sectoral mechanisms remains at the level of a set of proposals, and no such evidence exists. Section 13.13 will deal more |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16370 | 13 | 23 | 15 | 23 | 25 | Discussion would benefit from fuller treatment of host country government involvement in sectoral initiatives, including the need to overcome incentive problems to individual actors, and the resulting need for the host government to impose some form of binding compliance or penalty regime on covered emitters. On baselines, see Prag and Briner (2012), CROSSING THE THRESHOLD: AMBITIOUS BASELINES FOR THE UNFCCC NEW MARKET-BASED MECHANISM (OECD/IEA info paper) | accepted. Text revised. Reference introduced. |
| 3984 | 13 | 23 | 26 | | | The heading seems to be incorrect, as not only SRM is discussed. Moreover, why is the term geoengineering not used (as it is in many of the references cited)? | Accepted. Subsection title changed. |
| 8182 | 13 | 23 | 27 | 23 | 28 | Is the international policy itself adapting or is it helping countries adapt? Unclear. | accpted- text revised to clarify. |
| 14339 | 13 | 23 | 31 | 23 | 31 | the cross-reference to chapter 5, section 5.8 seems to be wrong | Accepted. Cross reference referred to section in the First Order Draft, this has been moved to chapter 6. cross |
| 3482 | 13 | 23 | 32 | 23 | 39 | This needs a reference to WG I report, Chapters 6 and 7.7, where these ideas and problems with them are discussed in great detail. | accepted - cross reference inserted. |
| 3476 | 13 | 23 | 35 | | | Change "upper atmosphere" to "lower stratosphere" | accepted- text revised. |
| 3481 | 13 | 23 | 35 | 23 | 36 | Change "increasing clouds with reflective properties" to "making low clouds more reflective" | accepted- text revised. |
| 8525 | 13 | 23 | 35 | 23 | 35 | “sulfate particles” instead of “sulfur particles”. “Sulfur particles” means that the particles consist of elemental sulfur. | accepted- text revised. |
| 8526 | 13 | 23 | 35 | 23 | 35 | It is better to say “into the stratosphere” instead of “to the upper atmosphere”. The upper atmosphere is higher than 50 km. | accepted- text revised. |
| 8528 | 13 | 23 | 35 | 23 | 36 | Examples of SRM should include ground-based option – enhanced reflective properties of the ground surface (different kinds of vegetation, roofs and so on – see Section 9.5.2) | accepted. Example included. Not clear what 9.5.2 refers to. |
| 8527 | 13 | 23 | 36 | 23 | 36 | «increasing clouds with reflective properties» It is better to say “increasing of clouds reflectivity” or “increasing of cloud brightness” | taken into account. Text revised as suggested by #510 |
| 16193 | 13 | 23 | 39 | | | Consider reference to Robock, Alan, 2012: Will geoengineering with solar radiation management ever be used? Ethics, Policy & Environment, 15, 202-205 and/or Robock, Alan, 2008: 20 reasons why geoengineering may be a bad idea. Bull. Atomic Scientists, 64, No. 2, 14-18, 59, doi:10.2968/06400200 | Rejected. These references refer generally to the pros and cons of geoengineering, not to specific questions |
| 6335 | 13 | 23 | 40 | 24 | 8 | The text is useful, but it seems to be apologetic in relation to SRM. It might be needed to include some bibliographic source(s) that point out to risks and disadvantages of SRM 1. | Taken into account. Most of this comment is more relevant to chapter 6, section 9. Revisions to this passage however in response to other comments |
| 6994 | 13 | 23 | 40 | | 43 | David Victor has suggested that individuals might deploy geoengineering. I have not suggested that, and so the writing here could be more specific. Also, I have pointed out that many countries would have an interest in deploying (combined with an ability to deploy) geoengineering, but I wouldn’t put “small” countries in this category. Geoengineering is “cheap” relative to the size of India or Indonesia but not Tuvalu or Mauritania. | accepted. Text revised to reflect these citations more precisely. |
| 11574 | 13 | 23 | 40 | 23 | 45 | What is the incentive for small states to engage in SRM? The authors claim that smaller-scale actors may perceive advantages to be first-movers with SRM, in order to ensure both global climate protection and a favourable distribution of regional impacts from their SRM projects. Several premises should be clarified. Do small-scale actors want to ensure global climate proctection? If they would, there may be easier and more inexpensive ways to make local solutions. Second, what kind of SRM does only have regional impact? More should be said about what kind of SRM projects the authors are talking about. | taken into account. Text revised, clarified, example introduced, citation given. |
| 6995 | 13 | 23 | 45 | | 48 | You should explain why countries might “rush” to use geoengineering. You’re implying there is a first mover advantage. Why? | rejected. The text already explains why an actor might percieve first moveer |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14338 | 13 | 23 | 45 | 23 | 48 | The text "hardly any cooperation might be needed" suggests that unilateral pursuit of geoengineering would be politically easy. However, it has been shown that there are several strong reasons why it is in the national interest to participate in an international governance framework even for those states that could pursue geoengineering unilaterally (Bodle, Ralph, "International governance of geoengineering: Rationale, functions and forum", in: William C.G. Burns and A. Strauss, (eds.), Climate Change Geoengineering: Legal, Political and Philosophical Perspectives, Cambridge: Cambridge University Press (submitted February 2011; in press).<br>First, the mere potential for transboundary impacts even at an early (field testing) stage could have serious foreign policy implications and entail the risk that other nations may hold the researching or deploying state responsible for alleged impacts. Second, the public debate could become framed in terms outright rejection or support, which could eventually polarize and divide the science community and public opinion in a way similar to the broader debate on climate change. Third, depending on the particular technique, research and experiments are likely to require coordination at the international level in order to attribute data to particular experiments and ensure valid results (Bodle, Ralph, Geoengineering and International Law: The search for common legal ground, Tulsa Law Review. Geoengineering Symposium issue, 46 Tulsa Law Review 2 (2010) 305-322, at 322) | rejected due to space constraints. Article from Tulsa Law Review inaccessible. |
| 8183 | 13 | 23 | 47 | 23 | 47 | Recommend qualifying "benefits" and "damages" with "perceived" -- leaders make decisions based on their beliefs rather than based on actual costs and benefits. | taken into account. Text revised - percoieved added, "risk-adjusted" |
| 6333 | 13 | 23 | 6 | 23 | 14 | First sentence: it is not clear that by whom was thought. Second sentence: Seems that the process of unilateral CDM is driven by consultants, and not by the companies or national authorities of a given country and this might not be exact. Possibly, this sentence might be redrafted. Sentence starting in page 11: Although the clause " even if unfounded" softens the meaning, it would be more balanced that in addition to the current sentences, to provide information of the current efforts and future plans of emission limitation that might have the countries that more practice unilateral CDM. This would contribute to balance the content of this paragraph. | accepted. Text revised accordingly. |
| 4951 | 13 | 23 | 6 | | 14 | Concerning CDM, it is a sensitive question to mention only its benefit for the relevant developed countries (cost-eff. in meeting the target), since it was basically accepted by the developing countries as a mechanism contributing to their sustainable development – in this sense, it is a kind of a compensatory instrument .. | accepted. Additional paragraph on this introduced. |
| 16238 | 13 | 23 | 19 | | | Suggest adding a reference at the end of this sentence to Keeler and Thompson, 2009. Keeler, A., and A. Thompson (2009). Mitigation through resources transfers to developing countries: Expanding greenhouse gas offsets. In: Post-Kyoto International Climate Policy: Implementing Architectures for Agreement. J.E. Aldy and R.N. Stavins, (eds.), Cambridge University Press, Cambridge and New York, pp. 439-68. | accepted. Refernce added. |
| 16237 | 13 | 23 | 5 | | | Suggest ending the paragraph with the following sentence: "While some progress has been made to standardize methodologies and streamline the approval process, the CDM is currently supporting a relatively narrow set of projects and benefitting a limited set of countries (for example, few least-developed countries are able to participate)." | accepted. Text incorporated. |
| 14251 | 13 | 23 | | | | On SRM, one may notice that (i) since SRM can be implemented unilaterally, the risk is that one party implements it despite negative consequences for others, (ii) Risk aversion (or the precautionary principle) suggests one should be overly careful with SRM, (iii) humans do not have a good track-record w.r.t. solving one ecological problem by influencing other parts of the environment. For these reasons, the possibility or "threat" of future SRM is an additional reason for early abatement / emission reduction. | Taken into account. First part accepted - text revised to bring in this point. Other points rejected, for space reasons. |
| 8355 | 13 | 23 | | | | I suggest section 13.4.2 be moved into Box because 13.4.2 is unnatural in terms of hierarchy in 13.4. | Noted. Section reorganized and title changed to clarify its relation to the rest |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8402 | 13 | 23 | | | | A point that should be made in this section is that, as shown in our recent paper, the same conditions that might require SRM (in particular, a high climate sensitivity) also require substantial emission mitigation. Therefore, should such conditions be percieved to be in place, governance that assures that mitigation and SRM would be conducted in concert is needed. Reference: Smith, Steven J and PJ Rasch (2012) The Long-Term Policy Context for Solar Radiation Management Climatic Change (accepted). | accepted. Point and reference incorporated. |
| 11689 | 13 | 23 | 26 | 23 | 26 | The section title is "Cooperation in solar radiation management (SRM)", but in the main text CDR and SRM have similar lengths, so the title might be better to include CDR as well | Accepted. Subsection title changed. |
| 4719 | 13 | 23 | 26 | | | Although exciting and new, should the notion of regulating SRM be central to the argument being made here? I think it is a smaller piece of the puzzle and unlikely to be addressed in international negotiations (given the problems in mitigation and adaptation already on the table). I would recommend this be given less space and more be dedicated to the more central themes that are likely to take up negotiators time in the foresseeable future. | noted. Section reorganized, and place of SRM clarified as a consequence. Explanation of discussion also introduced into subsection. |
| 6949 | 13 | 23 | 26 | | | It's necessary here to refer to WGI AR5, Chapter 7, and its assessment of the physical science basis of SRM and CDR technologies. Please avoid re-assessing the natural science components here in order to avoid duplication and inconsistencies in assessment between WGs. We suggest to also consider the cross-WG IPCC Expert Meeting Report on Geoengineering held in June 2011 (IPCC, 2012: Meeting Report of the Intergovernmental Panel on Climate Change Expert Meeting on Geoengineering [O. Edenhofer, R. Pichs-Madruga, Y. Sokona, C. Field, V. Barros, T.F. Stocker, Q. Dahe, J. Minx, K. Mach, G.-K. Plattner, S. Schlömer, G. Hansen, M. Mastrandrea (eds.)]. IPCC Working Group III Technical Support Unit, Potsdam Institute for Climate Impact Research, Potsdam, Germany, pp. 99. ). | Taken into account. Current draft of WGI report, chapter 7 read, and cross reference inserted. No inconsistencies between our presentation here and that chapter observed, and the focus here clearly on implications for international agreements rather than the natural science aspects. |
| 8401 | 13 | 23 | 31 | | | Discussed also in chapter 6, section 6.9 | Noted. Text corrected as in response to |
| 6568 | 13 | 23 | 40 | | 43 | Explain what is "SRM options" that appears first and "other SRM approaches" that appears next or give examples for them. | Accepted. An example of cheap SRM options given. The other approaches are too variable to specify here - they are |
| 5915 | 13 | 23 | 26 | 24 | 8 | This sub section is not mentioned in the introduction and seems incongruous to the heading “architecture”. SRM is well covered in chapter 6.9.2. The relevance for chapter 13 is that international agreement is required for the governance of SRM. An agreement on SRM would also be subject to debate on fairness as the most poor and vulnerable parts of the world are the least likely to have access to this technology, consequential changes to other parts of the climate system are uncertain and cannot be limited, and there is the risk of the unilateral use by a country or individual to the detriment of others.. (Lin A. (2009): Climate engineering governance. Issues in Legal Scholarship, Vol. 8, No. 3., Article 2; Barrett S. (2008): The incredible economics of climate engineering. Environmental and Resource Economics, Vol. 39, No. 1, pp. 45–54. ) | Taken into account. Section revised to restrict discussion only to questions of international cooperation. Particular relation of this subsection to the overall section more clearly explained. Barrett reference is already cited; Lin reference incorporated. |
| 3470 | 13 | 24 | | | | 13.4.3 Approaches to international cooperation, a Figure or a scheme to represent different nuances of cooperation prociding existing examples would be very insightful | accepted. A figure has been produced to represent the options discussed in this section and facilitate greater |
| 6996 | 13 | 24 | 1 | | 8 | I have argued in favor of an international agreement on geoengineering with open participation because of the governance problems. I mention this because many people (at least in conference discussions) have proposed exclusive membership. | Noted |
| 3484 | 13 | 24 | 1 | 24 | 8 | This section needs to include a discussion of and reference to the SRMGI report: Solar Radiation Management Governance Initiative (SRMGI), 2011: Solar radiation management: The governance of research. (Royal Society, London, UK), 69 pp., http://www.srmgi.org/report/ | Accepted. This is a follow-up report to the Royal Society (2009) report already cited, that elaborates further on the |
| 6997 | 13 | 24 | 16 | | 23 | I have a hard time seeing how Kyoto can be called an example of “strong multilateralism.” Perhaps the problem is that I don’t understand the definition of this term. | taken into account. Section resrtuctured and retitled - meaning of multilateralism |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4968 | 13 | 24 | 18 | | 19 | {Cor} ETS: here sometimes system or scheme, but latter is the official one .. the EU ETS for {all EU member states} [participating EU nations])<br>That is:<br>ETS: .. scheme ..<br>the EU ETS for all EU member states) | accepted. Scheme is the correct term for the EU ETS. Changed here. Other places noted to be changed also. |
| 10032 | 13 | 24 | 20 | 24 | 27 | This part should be deleted completely. EU-ETS is based on the Kyoto Protocol. But the Kyoto protocol has substantially become ineffective in the second commitment period because the condition of meaningful participation has not met. In addition, EU-ETS has several problems. Volatility of emission permit prices affects volatility of product prices as evidenced by fluctuating price developments in the EU-ETS. Therefore, the market-based policy tools of cap-and-trade cannot provide credible incentives for the technological change, as described in (Montgomery, 2005, abstract) and (Baldursson, 2009, page29). In addition, CO2 leakage caused by the implementation of the ETS happened actually through transfer of industry from one country to others. Market mechanisms at least under Kyoto-like international scheme, where the condition of all countries' meaningful participation is not met, does not work well, as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These two literatures are listed in the No50 line of this table.<br><br><Reference><br>[1] Montgomery, W.D., and Smith, A.E.(2005). Price, Quantity and Technology Strategies for Climate Change Policy, CRA International. Available at: http://crai.ca/uploadedFiles/RELATING_MATERIALS/Publications/Consultant_publications/files/pub_4141.pdf<br>[2] Baldursson et al. (2009). Price Volatility and Risk Exposure: On the Interaction of Quota and Product Markets. Available at: http://ssrn.com/abstract=1394342 or http://dx.doi.org/10.2139/ssrn.1394342 | rejected. This comment is too evaluative for this section. The argumetns are in effect already dealt with in 13.13. some suggested references are not peer-reviewed but industry consultant reports, and the one article (Baldersson et al) is in a solid journal but is tangential to the discussion in this section. |
| 6998 | 13 | 24 | 28 | | 33 | Copenhagen couldn't be considered "strong multilateralism" by any sensible definition. It's not even a treaty! | tken into account. The figure helps understand the necessary simplification the ideal types introduce, and the title has been changed to reflect its character. Nevertheless, Copenhagen did introduce a process whereby states |
| 14346 | 13 | 24 | 28 | 33 | | This paragraph characterizes the Copenhagen/Cancun pledge and review system as "voluntary" in nature. Decisions taken by the COP are not considered to be voluntary simply because they are not legally binding. The mitigation pledges contained within the Cancun and Durban decisions are not considered voluntary by most (though some claim they are conditioned on international financial support). It would be more accurate todescribe them not as "voluntary" but as non-legally bindding. | taken into account. Point contradicts #541. word voluntary removed, text revised. |
| 7369 | 13 | 24 | 28 | 24 | 33 | It is unclear how 'pledge and review' requires "cooperation to come to an agreement" in the same sense as the agreements listed above (Kyoto, the EUETS). The determination of 'targets' and the 'bindingness' of that target are the key elements of international agreement on mitigation, 'pledge and review' requires no cooperation to reach agreement on those elements and so should be classified seperately. The current discussions in the UNFCCC reflect how distinct 'pledge and review' is, with countries having distinctly different targets in terms of form and accounting rules in contrast to the Kyoto Protcol period 2008-2012. | taken into account. Section has been reorganised. Figure clarifies that pledge and review may have a range of processes of coordination, with the Copenhagen accord at the more "centralised" end of the spectrum. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10033 | 13 | 24 | 28 | 24 | 33 | This part should include the advantages of "voluntary target scheme" and successful examples in the world. Each industry in Japan has voluntary target and the voluntary target scheme has played a big role, as described in (Yamaguchi, 2012, page35 and 154), (Manuel, 2010, page 6 and 13), and (Yamaguchi, 2010, abstract). In addition, there is also a successful example of "voluntary target scheme" in Netherlands, as shown in (Martijin, 2002, page162).<br><br><Reference><br>[1] Yamaguchi et al (2012). Climate Change Mitigation, A balanced approach to climate change, Springer, London<br>[2] Manuel Frondel et al (2010). Economic Impacts from the Promotion of Renewable Energy Technologies: The German Experience, Ruhr Economic Paper #156, Energy Policy 38, 4048-4056. Available at: http://www.rwi-essen.de/publikationen/ruhr-economic-papers/74/<br>[3] Yamaguchi ( 2010 ) . Voluntary CO2 emissions reduction scheme: Analysis of airline voluntary plan in Japan, Transportation Research Part D: Transport and Environment, Volume 15, Issue 1, January 2010, Pages 46-50. Available at: http://www.sciencedirect.com/science/article/pii/S1361920909000856<br>[4] Martijin G. Rietbergen, Jacco C.M. Farla, Kornelis Blok (2002). Do agreements enhance energy efficiency improvement? Analysing the actual outcome of long-term agreements on industrial energy efficiency improvement in The Netherlands, Journal of Cleaner Production 10 153-163 | rejected. This suggestion is not appropriate for chapter 13 but for chapter 15. it focuses on domestic action alone, not on how they may be connected or coordinated. |
| 11451 | 13 | 24 | 28 | 24 | 29 | There is no need to reference the Copenhagen Accord together with the Cancun outcome. The official UNFCCC instrument in relation to pledge and review is the Cancun outcome rather than the Copenhagen Accord. | reject. The focus of the chapter is not only on the UNFCCC, but all instances of international cooperation over climate |
| 6337 | 13 | 24 | 31 | 24 | 31 | It seems questionable to consider as "strong multilateralism" the pledges presented in Copenhagen and Cancun. If it is so, how to consider an approach as the Kyoto Protocol with legally binding targets?? It might be considered not to use the adjective "strong" . | taken into account. See response to #541 |
| 13637 | 13 | 24 | 34 | | | This gives WAY too short shrift to the potential for price-based agreements! All sorts of proposals have been advanced that would treat climate negotiations more like economic or trade negotiations. In my view, as a former negotiator, price based agreements have a lot of potential. And harmonized national policies don't only have to be negotiated in decentralized ways. There could be strong multilateralism involved. | taken into acount. The figure 13.2 reflects the diveresity of way that price agreements mgiht be governed as suggested here. But overall, the text |
| 14656 | 13 | 24 | 37 | | | Another example of a harmonized national policy would be an agreement to phase out fossil fuel subsidies, as the G20 and APEC leaders agreed to in 2009. | accepted. Example incorporated into text |
| 16372 | 13 | 24 | 40 | 24 | 46 | Note that linking ETS can be an example of the harmonised policies described in 13.4.3.2 - would be good to highlight this, or not make the distinction between these two subsections | taken into account. The figure shows that ETS linkage may be more or less decentralised depending on hos much harmonisation of rules is involved, and |
| 2413 | 13 | 24 | 40 | 24 | 40 | If I am not mistaken, whenever you talk about decentered linkages you always use the example of tradeable permits. There must be other examples of loose coordination between the activities of differnet states? The EU's sustainability criteria for biofuels and European Commission endorsement of private biofuels certification schemes in e.g. Brazil might be one example. Giving rise to transnational, public-private (hybrid) interactions. | accepted. Example incorporated into text. |
| 8184 | 13 | 24 | 42 | 24 | 44 | This should cite Victor et al, "A Madisonian Approach to Climate Policy", Science, 16 September 2005. | accepted. Citation incorporated. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8757 | 13 | 24 | 47 | 25 | 3 | See also Mehling and Haites, Mechanisms for linking emissions trading schemes, Climate Policy, v. 9, n. 2, 2009; Climate Policy, v. 9, n. 4, 2009 , a special issue on linking emissions trading schemes. It is useful to distinguish a unilateral link (common) from a bilateral link (none yet). Most links have quantity constraints that affect price convergence -- see Linking Emission Trading Schemes: A Short Note, Georg Grull and Luca Taschini, Economics of Energy & Environmental Policy, V. 1, N. 3, 2012. The conditions mentioned apply to a bilateral link but not to a unilateral link. In addition the compatibility of the linked systems must be sustained -- see Ensuring the environmental effectiveness of linked<br>emissions trading schemes over time<br>E. Haites & X. Wang, Mitigation and Adaptation Strategies for Global Change (2009) 14:465–476. | taken into account. Mehling & haites reference incorporated. But detail not introduced here - more appropriate for 13.6. |
| 6336 | 13 | 24 | | 25 | | The 1st general comment to chapter 13 (see comment no.1 above) is specially valid for this section: "1) Frequently there are comparisons between diferent approaches without specifying what of these approaches has been implemented in practice and what are "paper approaches" prepared or suggested by scholars, but not implemented. This information should be provided". The differentiation between actual and potential approaches would be important to understand properly this section. The consideration of the potential peformance of not actually implemented approaches is useful, but this performance has not been demonstrated yet and the reader should be informed on this. | accepted. The distinction between agreements in place and those proposed is made more clear throughout the text. The new figure also helps indicate this. |
| 10813 | 13 | 24 | | 25 | | This section is conceptually murky and incomplete. The distinctions between the three categories are not clear. Exactly what separates each category? Lines 10-11 flag degree of centralization in organization and management as key distinguishing factors. These categories suggests a four box diagram along these axes. But I don't really see evidence of high-low organization/management in the three categories that follow. Is it the extent of overall agreement on outcomes? Or the overall agreement on means and instruments? Or harmonization of those? Putting pledge and review in the "strong multilateralism" bucket further confuses matters. If that is strong multilateralism, then it certainly seems bizarre to put mutual recognition of permits, which is a far stronger form of cooperation, in the third category of decentralized architecture and coordinated national policies. Second, the literature often refers to "top down" and "bottom up" approaches, which the chapter may wish to refer to. Admittedly, this is simplistic and conflates things that should really be teased apart. But moving away from the accepted language without clear conceptual distinctions between your categorizations is not so useful. Xinyuan Dai "Global Regime and National Change" in Climate Policy 10(2010) represents one effort to move beyond these binary distinctions. Dubash and Rajamani "Beyond Copenhangen, CLimate Policy 10 (2010) represent another. It might be helfpul to acknowledge the use of the crude top down and bottom up terms in this section, and then problematize it by showing that there are, in fact hybrid spaces. Without recourse to the literaure, and without clear definitional clarity, these three categories here are unhelpful. | taken into account. section reorganized and various elements of the comment here clarified. Figure introduced to clarify. Reference to the "top-down vs bottom up" distinction made, as well as the limits of this sort of framing |
| 10814 | 13 | 24 | | 25 | | A second point about 13.4.3 is that all the examples of coordination and harmonization are market based. But there are other forms of coordination that are arguably more realistic given current debates, in particular around reporting, information and so on. There is a literature on how common reporting can lead to linkages between domestic and international policy, again, see Xinyuan Dai "Global Regime and National Change" in Climate Policy 10(2010). The broader point is that harmonization taxes or cap and trade, or allowing for recognition of credits do not constitute the full set of possibilities of international collaboration. | accepted.a number of examples not about market-based agreements now introduced. See in particular responses to #532, #548, and #550, that make similar points with specific suggestions. Reference also incorporated into text. |
| 14252 | 13 | 24 | | | | The strongest form of "strong multilateralism" (13.4.3.1) is to combine it with harmonization (not discussed as a weaker form, 13.4.3.2): while this is "inefficient" when countries are heterogeneous, I think such harmonization-clauses (which the EU has, for example) can facilitate the negotiation process (my arguments are explained in "Harmonization and Side Payments in Political Cooperation", American Economic Review 97 (3), 2007: 871-889 ) | rejected. This comment is interesting in the detail but in general, but the article on which it is based operates with a different definition of centralization than that adopted in this section, and the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11575 | 13 | 24 | | | | The authors stress the degree of international cooperation and focus on the distinction between centralised (global) and decentralised (local) policies. Nonetheless, other combinations may be fruitful to mention. Especially, global centralised but thin policies that are combined with local decentralised policies should be considered (Cf. David Miller "Global Justice and Climate Change", Tanner Lectures, 2008; Elinor Ostrom “Green from the Grassroots” (Project Syndicate, June 12, 2012). | taken into account. Nuance in the rlationship between centralized and decentralised account has been dealt with as in response to #524. ostrom peer-reviewed article dealing with the same |
| 6583 | 13 | 24 | 15 | 24 | 33 | EU-ETS and pledge and review should not be in same term. Separate them in terms of legally bindingness. | reject. A) the criteria of legal bindingness is not central to the definition of centralised-decentralised in this typology. B) the figure and discussion has nuanced that the boundaries |
| 5312 | 13 | 24 | 15 | 24 | 33 | It is implied here that only multilateralism is the legitimate approach to international cooperation. It may be useful to include the prominent typology used in the international relations literature regarding international cooperation: multilateralism, bilateralism, unilateralism, minilateralism, exclusive multilaterialism, inclusive multilaterialism. Another important point is to show that all approaches may enhance international cooperation. | rejected. Comment mistaken that the section privieges multilateralism. Proposed alternative typology has no supporting citation and the source is not |
| 5306 | 13 | 24 | 24 | 24 | 24 | "normative notions of fairness…": Is there any non-normative notion of justice and fairness at all? I would suggest to make the storyline here clearer, saying that targets-and-timetables has been coupled with notions of fairness (…) which are normatively laden leading to (XXXX, e.g. complexity, delays in decision making, unreachable goals). | taken into account. Text revised, removing the word "normative", replacing with "specific". The implied evaluation of fairness questions - that they lead to delays, etc, is not |
| 13924 | 13 | 24 | 34 | 24 | 39 | It is not sure that the single classification criteria "central organization and management" is sufficient. International approaches to cooperation can contain different permutations along multiple axes: multilateral vs. plurilateral/unilateral geometries of participation; targets and timetables or policies and measures, or both; deep or shallow coordination and management. The single criteria of central organization and management makes it difficult to reflect the actual variety of international regimes (e.g. Kyoto, EU climate and energy package), and the evolution of the international regime from Kyoto to Copenhagen and Cancun. | taken into account. The figure introduces a second dimension (cooperating over means vs ends), which corresponds to some of the other axes mentioned in the comment here. Some of these are also dealt with elsewhere, notably the question of participation in 13.3. IT is correct that there are multiple axes along which approahces might be analysed. |
| 16371 | 13 | 24 | 34 | 24 | 39 | Could build out analysis of harmonisation options, including agreement of international standards (through ISO or otherwise). For carbon markets, see Prag et al (2012 forthcoming) Making Markets (OECD/IEA Information paper, www.oecd.org/env/cc/ccxg). | accepted. Standardisation example incorporated. The Markets example not incorporated since other comments (#525, for example) point out that the section is already over-reliant on market- |
| 16239 | 13 | 24 | 34 | 24 | 39 | Would it make more sense to fold this section into the next one, on Decentralized Architectures and Coordinated National Policies? It fits well under that theme. | taken into account. The new figure emphasises that the boundaries between the three types are porous, |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14657 | 13 | 24 | | | | Aren't decentralized architectures more than just linking? For example, Pizer's chapter in the Aldy and Stavins 2007 book discusses bottom up pledge and review that may involve implicit targeting of domestic programs to a common (or similar) carbon price without explicit linking. And this is one paper that builds on the work of Schelling, which may be worth referencing in this sub-section as well. Are there lessons from the emergence of the international trade regime that would be relevant here? For example, at Bretton Woods, there were negotiations for an International Trade Organization, and unlike the World Bank and IMF, those talks failed. Instead, a bottom-up system of bilateral and small regional trade agreements emerged that established norms and trust that yielded some four decades later the Uruguay Round culminating in the World Trade Organization. | In Section 13.4, taken into account. Section reorganized. This subsection edited to restrict the meaning of "linking" to the meaning in the comment, while making clear that policies could be connected in a variety of ways. Other examples introduced in response to other comments. Pizer reference consulted but not incorporated here.<br><br>In Section 13.3, the text has been revised to refer as well to highly decentralized architectures of only implicitly coordinated national policies, distinct from linkages. But this |
| 16240 | 13 | 24 | 42 | | | Suggest adding a second sentence to this paragraph: "A virtue of more decentralized approaches is that they accommodate a wider range of interestrs and circumstances across jurisdictions, attracting participation even under heterogeneity." | In Section 13.4, reject. This discussion more appropriate for 13.13.<br><br>In Section 13.13, Taken into account - this notion is incorporated in Section 13.13 with relevant references to the |
| 3664 | 13 | 25 | 10 | 25 | 43 | Is there no special FAQ-section foreseen in the text? Please consider to intergate in a separate chapter. | Noted |
| 13640 | 13 | 25 | 15 | | | I think "legitimacy" is subjective, and I'd use another term. If legitimate includes actually being effective at reaching agreements with measurable environmental impact, the UNFCCC is anything but. | taken into account. The comment is mistaken that legitimacy is a "subjective" term - there is a large and elaborate literature in political science on legitimacy as an empirical concept. The sentence has been revised to make clear |
| 8185 | 13 | 25 | 18 | 25 | 19 | This is not true. Many other institutions (e.g. the G20, MEF, etc) host negotiations on climate change. | accepted. Text revised accordingly. |
| 11453 | 13 | 25 | 19 | 25 | 24 | The treatment of the use of smaller, exclusive gatherings outside of the UNFCCC to advance UNFCCC negotiations should be more nuanced, because questions of legitimacy will arise with respect to these smaller groups. | rejected. The text refers to 13.5 which disucsses these, including the different legitimacy questions they raise, in detail. Text added to refer also to figure 13.1 |
| 6569 | 13 | 25 | 21 | | 23 | Add the Clean Energy Ministerial (CEM) as one of the examples. | rejected. There is a longer more inclusive list in section 13.5 and 13.12 and in figure 13.1. The list presented |
| 12806 | 13 | 25 | 26 | 25 | 28 | This paragraph summarizes shortly most of the important results of the literature about the impact of integrating adaptation on agreements in an appropriate way. Nevertheless, a discussion paper from Eisenack/Kähler (2012) leads to new insights with regard to the effect of integrating adaptation on overall mitigation. The model of Eisenack/Kähler (2012) is based on the results of Ebert/Welsch (2012) and indicates that unilateral action (with respect to mitigation and adaptation) leads to Pareto improvements (i.e. increased total mitigation) if a type of country with a certain damage and benefit structure exists. References: Eisenack, K and L Kähler (2012): Unilateral emission reductions can lead to Pareto improvements when adaptation to damages is possible, Oldenburg Discussion Papers in Economics, http://www.vwl.uni-oldenburg.de/download/DP_V-344_12.pdf and Ebert, U and H Welsch (2012) Adaptation and Mitigation in Global Pollution Problems: Economic Impacts of Productivity, Sensitivity, and Adaptive Capacity. Environmental and Resource Economics 52, 49-62). | In Section 13.4, Noted. comment more appropriate for section 13.3.1 (page 18, lines 27-36).<br><br>In Section 13.3, References added in 13.3.1 in the paragraph on adaptation, mitigation and participation. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12807 | 13 | 25 | 26 | 25 | 28 | The definition of "policy architecture" is quoted without detailed and formal definition (as on p. 19 l. 43). You may like to make a cross reference or to avoid this technical term, maybe by "basic policy sturcture". | accepted. Reoss-reference inserted. |
| 16194 | 13 | 25 | 29 | | | The FAQ is the first mention of "politically pragmatic". The chapter would be strengthened if information related to this important concept were more sytematically referenced to this term. See also comments above on democratic deficit concerns. | taken into account. :"plitically pragmatic" is replaced with "institutionally feasible" which is a criteria for evaluating the |
| 8308 | 13 | 25 | 36 | 25 | 38 | Mention that harmonizing national policies can also be achieved by coordinating GHG regulations (e.g., Canada and U.S. on vehicle fuel efficiency regulations) | Taken into account. too much detail for the FAQ, but discussed in relation to 13.4.3.2 (old section number - section |
| 13641 | 13 | 25 | 38 | | | Again, negotiated carbon prices could be developed through a very multilateral approach. (Note I would use the term "negotiated" rather than "harmonized." The prices don't have to be similar; the differences just have to be mutually acceptable.) Think of tariff rate quota negotiations under GATT as an example. | taken into account. Too much detail here for the FAQ, but the variation in how centrally organised such price |
| 9046 | 13 | 25 | 4 | | 8 | Developing countries have consistently opposed non-multilateral policies (including border tax adjustments) justified as climate change policies. This chapter on international cooperation should recognize the fact the use of policies in other areas, such as trade, for climate change purposes have not been acceptable to developing countries. | Taken into account, though in section 13.8. See Tax border adjustments. |
| 10034 | 13 | 25 | 4 | 25 | 5 | The example of "cap and trade linked with carbon tax" should be deleted completely. Levying "carbon tax" and "cap & trade" simultaneously is not meaningful and would fail to reduce CO2 emission because carbon tax and cap & trade are theoretically same mechanism to reduce CO2 emission, as described in (Clive, 2007, page4-5). This literature is listed in the No5 line of this table. | taken into account. The comment reflects a misunderstanding of the text, which is about the situation where one jurisdiction has a tax, and another has an ETS (as in current negotiations between Australia and the EU), and |
| 11452 | 13 | 25 | 4 | 25 | 8 | The reference to linking sub-multilateral policies through trade mechanisms (such as import allowance or border tax adjustments) or carbon trading could be dangerous in terms of the implication that such sub-multilateral linkaging could take place independent of what might happen in terms of multilateral negotiations. This could give rise to increased national actions on establishing border tax adjustment measures on the grounds of climate change, something that many developing countries have consistently opposed. | Taken into account, though in section 13.8. See Tax border adjustments. |
| 11793 | 13 | 25 | 5 | | | Delete the example. Sedction 3.8.3 describes there is no need for combination of carbon tax and cap&trade. | reject. Not clear what 3.8.3 refers to (it is not 13.8.3, which doesn'T discuss this). The comment is also mistaken in the same way as #555 - the paragraph does |
| 6041 | 13 | 26 | 10 | 26 | 11 | Technically isn't the EU ETS a supra-national policy rather than a set of national policies? | Taken into account - text revised for |
| 16374 | 13 | 26 | 10 | 26 | 25 | Recommend moving whole para on "achievements" of KP to section 13.13. Also, it is no longer reasonable to say that CDM project documents project over 2bn CERs to be issued by end 2012. It may be more useful to use this point to emphasise that i) info in project documents is not always reliable and ii) a range of factors have meant that on average (with key exceptions) CDM projects have been less effective than expected (factors including tech problems, monitoring difficulties, process delays etc). | Taken into account- 13.5.1.1 on CERs, topic also relevant to 13.13 - consider in combination with comment 597 |
| 2414 | 13 | 26 | 10 | 26 | 25 | Comment on section: To talk about the key achievements of the Kyoto Protocol here is to pre-empt the performance assessment at the end of the chapter, especially in relation to the CDM. ETS and CDM are only achievements if they have been effective in bringing about emission reductions. | Taken into account with comment 593, text revised to be covered in section 13.13, s.t. ongoing drafting |
| 12026 | 13 | 26 | 10 | 26 | 25 | It should be shown why Kyoto Protocol as compared to Montreal Protocol failed to involve or retain major emitters. Analysis of the differences of incentives between two systems should be included. | Taken into consideration - text revised in 13.5.1.4 |
| 8758 | 13 | 26 | 11 | 26 | 11 | The EU ETS covers 30 countries, noty just the 27 EU member states. | Accepted - text revised |
| 8759 | 13 | 26 | 21 | 26 | 21 | The quantity of CERs issued by ther end of 2012 may be about 1.1 billion (1 billion have been issued), but not close to 2 billion. | Taken into account with comment 593, text revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8096 | 13 | 26 | 26 | 26 | 31 | In saying the pledges under the Copenhagen Accord are inadequate in achieving 2 degrees, is that because the commitments only go to 2020 or because the level of the 2020 commitments precludes subsequent reductions consistent with 2 degrees. These two points often get confused in discussions of "adequacy" and it would be useful to clarify both here and in the executive summary where this is referenced. | Accepted - text revised to clarify |
| 14348 | 13 | 26 | 26 | 26 | 27 | This sentence omits the fact that several developing countries also pledged absolute emission reductions (e.g. Marshall Islands, Antigua Barbuda, PNG, Moldova) and a couple even pledged carbon neutrality (e.g. Costa Rica, Maldives). | Accepted - text revised to reflect diversity of pledges |
| 11454 | 13 | 26 | 26 | 26 | 31 | References to the Copenhagen Accord are not needed. The Copenhagen Accord does not have the same official nature as an instrument of the UNFCCC COP as compared to the Cancun outcome (decision 1/CP.16). | Taken into account - reference to the Accord is retained, but its legal status |
| 4969 | 13 | 26 | 34 | | | {Add} The Durban {session of the} conference | Rejected - stylistic preference |
| 4970 | 13 | 26 | 36 | | 37 | for clarity, it would be reasonable to add that the extension of the KP (if any) will be anyway w/o the participation of the USA (as a "non-Party" to the KP) | Accepted - additional text added |
| 6849 | 13 | 26 | 41 | 26 | 42 | The 2010 Article of mine cited here is one in a series of articles deconstructing the climate negotiations: L. Rajamani, The Cancun Climate Change Agreements: Reading the Text, Subtext and Tealeaves, 60(2) INTERNATIONAL & COMPARATIVE LAW QUARTERLY 499-519 (April 2011) & L. Rajamani, 'The Durban Platform for Enhanced Action And the Future of the Climate Regime', 61(2) Int'l & Comp. L. Qtrl'y 501-518 (April 2012) | Accepted - reference included |
| 14347 | 13 | 26 | 6 | 26 | 7 | I am not sure that there are any other climate agreements. How can the UNFCCC be compared when no other comprehensive system exists? | Accepted - text revised |
| 4720 | 13 | 26 | 1 | | | Section 13.5 describes various elements about what is going on but provides little analysis of which are the best strategies, institutions, etc. Having a clearer sense of what the literature suggests are better or worse strategies and approaches would seem beneficial here. In short, this section is too descriptive and not sufficiently analytic. | Taken into account - new subsection added titled "Advantages and disadvantages of different forums." |
| 16373 | 13 | 26 | | | | Suggest reorganising this section as the categories listed by subsection are not very coherent: 13.5.1.1 could be better entitled Negotiations under UNFCCC, and could include those "coalitions" currently listed in their own subsection but which are really only relevant under UNFCCC (umbrella, EIG, BASIC). 13.5.1.2 could be other UN forums relevant to climate (and should include UNCSD/Rio+20 and World Bank/IFC). Next would be good to have other international state-level partnerships (as 13.5.1.3) including not only the other groupings currently under 13.5.1.2 but which would be better made distinct from UN (eg MEF, G20, G8) plus others not mentioned such as G77. 13.5.1.4 could then cover other relevant international institutions (but please see specific comment on OECD/IEA below). | Taken into account - further sub-headings included to organise the text. |
| 11591 | 13 | 26 | 5 | 27 | 39 | This should include the Vienna Convention on protection of the Atmosphere and the Montreal Protocol on ODS.As it is its only a discussion on the UNFCCC. | Taken into account - both protocols/conventions are discussed in |
| 6999 | 13 | 26 | | | | I'd like to see this section summarize what we know about what the ETS and CDM have achieved in terms of global emission reductions. This means a rigorous analysis, which takes into account what countries would have done in the absence of these initiatives and trade leakage. The ETS is impressive from an institutional perspective, but has it had much effect in terms of emission reductions? The CDM, of course, has more serious problems, some of which are discussed in the chapter. | Taken into account- 13.5.1.1 on CERs, 13.6.1.1. on ETS Mt - topic also relevant to 13.13 - consider in combination with comment 589 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10815 | 13 | 26 | | 27 | | This section is a bit dissapointing. It simply goes negotiating session by negotiating session, rather than providing a sense of the broader debates. Even on individual sessions, it provides little insight into the key moments and key debates. In anybody's book, since AR4, Bali, Copenhagen and Durban have been the key moments. It would be worth structuring the section around these focal points, their substantive implications and the debates on the political import and implications of these moments. There are statements of interpretation in the section but in a scattered and ill organized way. Perhaps it woudl be useful to hark back to other organizing frameworks: bindingness, burden sharing, and implementation mechanisms, for example, and sort out the implication of each key session according to these. It would lend more coherence to the chapter.This section appears disconnected from previous sections. | Taken into account - text revised with some changes to organsation; first section reatins descriptive tone and new subsection with more analysis added on "Advantages and disadvantages of different forums." Focusing on only some points, for example excluding Cancun, would not be balanced. |
| 16196 | 13 | 26 | | | | Note that the discussion of emissions trading is very uncritical and does not reflect the literature on this. In particular, empirical analysis of the impact of emissions trading on actual GHG emissions and CDM impacts on sustainable development in non-Annex I countries are highly relevant. | Taken into account - combined with comment 587 - topic relevant to 13.13 |
| 11455 | 13 | 26 | | 27 | | The entire section in relation to the climate agreements under the UN seems to imply that the lack of mitigation ambition in the UNFCCC is due to its policy architecture or design rather than to the lack of political will among the Parties that were supposed to have mitigation ambition in the first place. It conflates a failure in implementation as equivalent to a flaw in the policy design. The discussion should be more nuanced. If the argument is that the UNFCCC's policy design itself is flawed, then there should be arguments saying why this is so. But if the failure being pointed at is the lack of political will or failure of implementation, then arguing that such are due to a design flaw should not be done unless a strong causal link is made between design flaw and implementation failure. Such a link has not been established in this case. | Taken into account - text added in new 13.5.1.3 "Advantages and disadvantages of different forums." |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6590 | 13 | 26 | 10 | 26 | 14 | Especially for projects for energy saving, it is difficult to work for CDM.<br>It is necessary to establish new frame work to evaluate contributions of technology transfer seeing following analysis.<br><br>Quote>><br>The CDM under the Kyoto Protocol is generally believed to lower economic barriers with the introduction of climate friendly technologies. According to authors' experiences in promoting energy saving projects under the CDM scheme in China since 2005, however, CDM procedure is extremely complex and its socalled additionality check is excessively strict in validating a qualifying project. Additionality check requires an investment analysis. For a project to be qualified as ''CDM'' there is a need to show that the investment will not be decided without CO2 credit.<br>Economic or environmental additionality is a typical item.<br>''Economic additionality'' in CDM context, for example, is used in the following manner. If a certain project is profitable enough to invest without an economic benefit of CDM credit, this project is not appropriate as a CDM project due to being recognized as a business-as-usual project (IGES, 2010). As the initial investment in steel sector is generally too large to be paid back by the economic incentive accruable by CDM credits, there have been many cases where energy saving technologies were adopted by steel companies in developing countries, without waiting for CDM Executive Board's decision, which were frequently rejected later (an example of the rejected CDM application is available in UNFCCC (2010)). Even in such cases, steelmakers can still get benefit from energy saving investments primarily by lowering their energy costs. Typically, an energy saving investment yields an annual saving of 20–30% (depending on the price of energy) relative to the initial investment. Even if a project is qualified<br>under the CDM scheme, the value of the resulting credits will be much smaller than the benefit of the energy cost reduction by a factor of 10. For a typical smaller CDQ facility, an initial investment is about f3.5 billion per facility and the annual reduction in energy consumption (crude oil equivalent) is approximately 14,000 t-crude oil/year. The annual energy saving benefit is about 28% of the initial investment (Refer to NEDO (2008)). This means CO2 reduction is approximately 0.1million t-CO2/year and the value of the CO2 credit (if calculated at f1000/t-CO2) is only about one-tenth of this benefit. Since the value of credits is only a minor factor concerning the investment decision, the benefit of removing the economic barrier through CDM would probably not be significant. In order to promote technology transfer, it is necessary to establish a new framework to evaluate contributions of technology transfer from developed to developing countries in more practical manner than that of current CDM. In addition, the length of the CDM procedure presents major risks for project owners, letting them cast doubts on the reasons for the very existence of the CDM scheme.<br><br>For citation: Okazaki T, Yamaguchi M (2011). Accelerating the transfer and diffusion of energy-saving technologies steel sector experience - lesson learned. Energy Policy 39. 1296-1304 | Rejected, outside the scope of this section, CDM treated elsewhere |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6591 | 13 | 26 | 10 | 26 | 14 | Add following 7 problems of CDM. CDM has both good and bad points.<br><br>Quote>><br>1.The Clean Develop Mechanism's (CDM) credits, CERs, are worth the same as EU ETS credits and can be submitted by ETS installations instead of EUAs. CERs are generated by extra-EU emission reducing projects to be sold on, to incentivise green investment, especially in developing nations. The EU is effectively offloading its ETS obligations in a 'do as I say, not as I do' move.<br>2.The CDM is a 'zero sum' mechanism. For example, a CDM project reducing emissions by 1,000 tCO2e will generate 1,000 CERs, which can be bought by ETS installations to allow the emission of 1,000 tCO 2.<br>3.The CDM is vulnerable to corruption. A study of the top five UN-accredited CDM validatory bodies found that on a scale from 'A' (very good) to 'F' (very poor), none scored higher than 'D'.<br>4.A 4,000MW coal plant in Gujarat, India, has received CERs because it is marginally less polluting than other coal stations. This is despite the fact it emits 26 million tonnes of CO2 per annum, will do so for at least 25 years, is India's third largest source of emissions and is the 16th largest worldwide.<br>5.Industrial gas credits reap huge profits. HFC-23 generates 11,700 credits per tonne destroyed at approximately €12, but costs only €0.17/tCO2e to destroy: a 7,000 per cent markup. As a result, some companies are creating HFC-23 just to destroy it in order to generate credits. If the scheme did not exist, these emissions would never have been produced.<br>6.This is especially rife in China where, because it is so lucrative, the government<br>taxes CDM revenues at 65 per cent, expecting to generate £1.7 billion by 2013.<br>7.While gas credits have been banned from May 2013, lobbying led to a delay in the ban and 412 million credits are still waiting to be issued through the scheme.<br><br>For citation: David Merlin-Jones (2012). CO2.1 Beyond the EU's Emissions Trading System. 17-27 | Rejected, outside the scope of this section, CDM treated elsewhere |
| 6584 | 13 | 26 | 14 | 26 | 22 | Delete from "As of 31..." to "...2012)". These contents has been already covered on chapter 14. | Taken into account – policy chapters discussed distribution of assessment of mechanisms in Wellington explicitly, and agreed that issues related CDM |
| 6570 | 13 | 26 | 24 | | 25 | Specify the "levels consistent with the lower stabilization levels assessed by Metz et al.". | Accepted - text revised to lowest level, specifying 450 ppm, and referencing |
| 16195 | 13 | 26 | 4 | | | Incorporate reference to the benefits of reporting (actions, emissions) under the UNFCCC and COP measures, which are substantial. You can't regulate what you haven't measured. | Taken into account - text on MRV elaborated - includes reporting and more |
| 6806 | 13 | 26 | 43 | 26 | 45 | Reference must be made to one of the drawbacks of Copenhagen Accord, namely that it is not a legally binding agreement, but rather a political agreement, and its failure to ensure commitments for all states in an equitable manner and to ensure continuity of Kyoto Protocol and the UNFCCC. | Accepted - text revised to give clarity |
| 4313 | 13 | 26 | 43 | 26 | 45 | Sentence implies that there were two different but equal views on Copenhagen. However, analysis shows that Copenhagen was perceived as the major failure in/of international climate politics. (no source) | Taken into account - along with comment 584 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6585 | 13 | 26 | 46 | 26 | 47 | Indeed, Cancun save the multilateral process.<br>A top down, legally binding type of international treaty does not work effectively because of a following reason.<br><br>Quote>><br>The author would like to focus on the nature of a top-down, legally binding treaty. The Kyoto Protocol is an example under which Annex I countries have legally binding numerical targets23. It is the author‟s view that this type of international treaty does not work effectively. Take Canada‟s case for example. Legally speak-ing, Canada should have purchased credits, say, from Russia and by doing so, it could comply with its reduction target. It did not. Instead, it simply announced one year before the Kyoto period started that it would be impossible for Canada to comply with the target. In the Protocol, there were no penalty provisions. A legal-ly binding international agreement without any penalty provision will be toothless. On the other hand, if it has a penalty provision, the United States is unlikely to join. Lawrence Summers, recalling his experience as U.S. Secretary of Treasury, writes on international emissions trading as follows: As one who has sought, with mixed success, to induce the US Congress to support transfers in low hundreds of millions of dollars to international financial organizations at a time when the US economy was imperiled by international financial instability, I am skeptical that US policy would ever contemplate transfers in the billions of dollars. I fear this kind of political constraint may be every bit as real as the various natural constraints imposed by the laws of chemistry and physics (Summers 2007).<br>This means that the U.S. Government would not spend taxpayers‟ money to comply with its target under the treaty24. To sum up, any legally binding treaty without a penalty would not work effectively, but the United States would not join any legally binding treaty with a penalty, making the treaty ineffective. In this connection, what kind of agreement will be reached to reflect “a protocol, legal in-strument or an agreed outcome with legal force” decided at COP 17 in Durban is yet to be seen.<br><br>For citation: M.Yamaguchi (2012).Climate Change Mitigation, A Balanced Approach to Climate Change. 34-35 | Taken into account - topic relevant to 13.4 |
| 5307 | 13 | 26 | 5 | 26 | 6 | The first sentence ("due to ist universal…") is the exact repitition of the sentence on line 15 on page 25. | Taken into account - repetition may be |
| 14658 | 13 | 27 | 13 | 27 | 17 | Recommend referencing the discussion of Durban and CBDR from the Aldy and Stavins 2012 Science article. | Accepted - text revised |
| 11341 | 13 | 27 | 13 | 27 | 17 | This paragrph seems oddly out of place - mixing process and principle | Taken into account - covered in section |
| 11457 | 13 | 27 | 13 | 27 | 17 | Given the importance of the principle of CBDR for developing countries in the climate change context, this paragraph should be substantially expanded in order to give wider scope for a discussion of the application of the principle in international climate change agreements. | Taken into account - covered in section 13.2 |
| 5308 | 13 | 27 | 17 | 27 | 17 | Winkler, 2010: either wrong citation (+Beaumont) or missing in the reference. Hertel 2011 is also missing in the reference. | Accepted - citations corrected |
| 4952 | 13 | 27 | 18 | | 39 | The subselection of the institutions is unclear and misguiding. There are two other funding mechanisms (Special Fund and LDC Fund), there is the basic "external" funding institution (the GEF). Moreover, the concrete negotiations have been undergoing in very specific institutional settings, namely in ad hoc (i.e. temporary) negotiating frameworks (AGBM for the KP, Ad hoc WGs for the new agreements since 2005 and 2007 or more recently the one related to the mandate from the "Durban Platform for Enhanced Action". | Taken into account with comments 622 and 623 - text revised to add clarity, unnumbered sub-heading added |
| 8761 | 13 | 27 | 18 | 27 | 18 | The introductory sentence does not relate to the rest of the paragraph, which deale with the Adaptation Fund. A number of specialised bodies of varying composition have been established including the CDM Executive Board, the JI Supervisory Committee, the Technology Committee, Adaptation Committee and Standing Committee (finance). Most of these bodies have voting rules so, unlike the COP, they are not constrained by the need for consensus. | Taken into account with comments 621 and 622 - text revised to add clarity |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 14349 | 13 | 27 | 18 | 27 | 39 | This paragraph omits the many institutions created in Cancun: the Climate Technology Center and Network, the Adaptation Committee, etc… It also states that the Green Climate Fund is "under the Convention," which it is not. | Taken into account with comments 621 and 622 - text revised to add AC and CTC&N; GCF - text revised to clarify |
| 8760 | 13 | 27 | 20 | 27 | 20 | The 2% levy is applied to CERs issued (not CER transactions) for most, but not all, CDM projects. | Accepted - text revised; 2% levy already addressed correctly in 13.11, removed |
| 6338 | 13 | 27 | 26 | 27 | 27 | Check context. "This" does not connect with previous sentences . Therefore, it is difficult to understand the meaning of "this". | Accepted - text revised |
| 11792 | 13 | 27 | 3 | 27 | 5 | International coorperation has brought about not policital agreement but recognize. It shoud be amended to correct expression. | Taken into account - combined with comment 604, 609, text revised |
| 6464 | 13 | 27 | 3 | 27 | 5 | In Cancun, the Parties did not agree to quatify the climate stabilization objective of 2 degrees Celcius, but just recognized the scientific view. Therefore, the sentence should be changed to, for example;<br>“In Cancún, parties to the UNFCCC reached a political agreement that deep cuts in GHG emissions are requried accroding to scientific view to hold the increase in global temperature below $2^0$C above pre-industrial levels (UNFCCC, 2010)”. | Taken into account - combined with comment 604, 608, text revised |
| 8097 | 13 | 27 | 3 | 27 | 8 | Suggest noting the number of countries that put forward mitigation commitments under the Cancun Agreements and their share of global emissions. | Accept - text revised |
| 9520 | 13 | 27 | 3 | | | Please, replace political agreement with international goal.(Decision1/CP16, paragraph4) | Taken into account - combined with |
| 10669 | 13 | 27 | 3 | 27 | 5 | Refer my comment No. 3. | Noted |
| 3181 | 13 | 27 | 3 | 27 | 8 | p.27, lines 3-8. IN fact, most scenarios that are connected to reality DON'T deliver 2 degrees. That probably should be acknowledged, and cross refs added to the chapter (6?) that deals with the impossibility (or not) of various goals. Also, fyi the official goal now is "1.5 or 2 degrees" not just 2 degrees. (Some countries are trying to lower the goal to 1 degree, which is proof that reality is no obstacle to a bold-sounding goal, but so far the 1 degree is not regularly repeated as an official-type UNFCCC goal.) | Rejected; 1.5 degrees was included and comment makes judgement on what is realistic |
| 6113 | 13 | 27 | 3 | 27 | 4 | The expression "In Cancún, parties to the UNFCCC reached a political agreement to quantify the UNFCCC’s climate stabilization objective in terms of a limit to temperature increases of $2^0$C above pre-industrial levels" is not correct. Actual wording of the Cancun agreement (Decision 1/CP.16 is "Further recognizes that deep cuts in global greenhouse gas emissions are required according to science, and as documented in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, with a view to reducing global greenhouse gas emissions so as to hold the increase in global average temperature below 2 °C above preindustrial level". Dr. Pachauri said at the IPCC scoping meeting plenary (held in July 2009 in Venice) on the declaration of L'Aquilla G8 Summit that the leaders of G8 have agreed to 2 degree target. The wording was "We recognise the broad scientific view that the increase in global average temperature above pre-industrial levels ought not to exceed 2°C". I have pointed out that this is not the correct interpretation. They did not agree but they recognized. Not only Dr. Pachauri but nobody else did not argue back against at the plenary. As a matter of fact, I had many LAs supporting my argument (later thruough coffee break). Though the wording is a little bit different between G8 and Cancun Agreement, the substance or essense is the same. IPCC report should not interprete the wording in its own way. Therefore please rewrite as "In Cancún, parties to the UNFCCC reached a political agreement to recognize the UNFCCC’s climate stabilization objective in terms of a limit to temperature increases of $2^0$C above pre-industrial levels". This is very important point. | Taken into account - combined with comments 604, 605, 609, 611 |
| 16197 | 13 | 27 | 30 | | | Effectiveness and environmental impacts are additional important criteria. | Accepted - text revised |
| 5241 | 13 | 27 | 30 | | | The coalition for climate and clean air (CCAP, The Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants, http://www.unep.org/ccac/) could also be mentioned in the text. | Taken into account - already mentioned in section 13.5.1.4 "International |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 6339 | 13 | 27 | 35 | 27 | 37 | This sentence is not exact. The Adaptation Fund, established under the Kyoto Protocol, exists before the Copenhagen and Cancun conferences. In addition, it might not be appropriate to rename the UNFCCC process as the "Kyoto/Copenhagen/Cancun process": other important confences in which key decisions were adopted by the UNFCCC are ignored, such as the Marrakech Conference (where the main architecture to implement the Kyoto Protcol was adopted), the Montreal Conference (where the Kyoto Protocol entered in force) and the Bali Conference (where the process that led to the the Copenhagen and Cancun results started). The new Technology Committee would avoid fragmentation in technology matters, but not in adaptation policy. It might not be appropriate, to cite an UNFCCC source to back this sentence as it stands now. | Accepted - text revised to improve accuracy and clearer structure |
| 14659 | 13 | 27 | 8 | | | These analyses all assume zero geoengineering/SRM. | Taken into account - text revised |
| 11456 | 13 | 27 | 9 | 27 | 12 | This paragraph should simply copy and paste paragraph 2 of decision 2/CP.17 rather than try to paraphrase it so as to avoid any interpretative controversies in the future arising from the IPCC report. | Taken into account with comment 614 - text rephrased, but IPCC assessment |
| 6573 | 13 | 27 | 10 | | 11 | Correct the description, as in UNFCCC Decision 1/CP.17 COP only "Decides that the Ad Hoc Working Group on the Durban Platform for Enhanced Action shall complete its work as early as possible but no later than 2015 in order to adopt this protocol, another legal instrument or an agreed outcome with legal force at the twenty first session of the Conference of the Parties and for it to come into effect and be implemented from 2020" but not "agreed to reach and agreement by 2015 [...]". | Accepted - text revised. |
| 6571 | 13 | 27 | 3 | | 5 | Correct the description, as in Cancun Agreements COP only "recognizes that deep cuts in global greenhouse gas emissions are required [...], with a view to reducing global greenhouse gas emissions so as to hold the increase in global average temperature below 2 degrees C above preindustrial levels [...]; also recognizes the need to consider [...] strengthening the long-term global goal [...], including in relation to a global average temperature rise of 1.5 °C" but not "reached a political agreement to quantify the UNFCCC's climate stabilization objective [...] of a limit to temperature increase of 2 degrees C [...], with the expressed possibility of strengthening it further to 1.5 degrees C". | Taken into account - text revised, but without repeating precise legal text in IPCC assessment |
| 6572 | 13 | 27 | 9 | | | Specify a reference paper for "the Durban Platform for Enhanced Action". | Accepted - reference included |
| 10816 | 13 | 27 | | 30 | | The section on other climate related forums (fora?) would also benefit from some intellectual work to categorize and sort the various forums being described. Apples and oranges are too frequently lumped together. For example, to go from MEF to IRENA (which I would not include in this section) - lines 20-35 --without any discussion of how these differ and how they fit into a larger framework mis leads the reader. Relevant axes might be: extent of explicit linkage with UNFCCC- strong connection vs weak connection; narrow sectoral focus vs. broad meta focus. This woudl result in a four box diagram. For example, the REDD+ agreement would be UNFCC related and sectoral. The World Bank's programs would be non-UNFCCC and sectoral; the MEF would be non-UNFCCC and broad, and so on. I think forums like the MEF and G-20 deserve special commentary and discussion as parallel and perhaps complementary fora operating at the political rather than the technical level since there is much written on their usefullness and salience. I would also argue that there is a category of important discussions that are highly relevant to climate change but are not explicitly articulated as such. These include ongoing discussions on global energy governance (see Cherp, A., Jewell, J. and Goldthau, A. (2011) 'Governing Global Energy: Systems, Transitions, Complexity', Global Policy, 2 (1), pp. 75–88. Goldthau, A. and Witte, J. M. (2009) 'Back to the Future or Forward to the Past? Strengthening Markets and Rules for Effective Global Energy Governance', International Affairs, 85 (2), pp. 373–390. and Dubash and Florini, "Mapping Global Energy GOvernance". Global Policy Volume 2 . Special Issue . September 2011. | Taken into account - section divided by unnumbered headings and order revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18433 | 13 | 28 | | 29 | | There is bias against smaller structures of negotiation, such as MEF or G20 (pag 28, last paragraph, pag. 29 last paragraph). The disadvantages of these kinds of instruments are highlighted. There are treated as complementary negotiation forums to the UNFCCC, and not as potential alternatives.<br>In conclusion, the chapter is good, it does acknowledge the fragmentation of climate governance since 2007, but it fails to highlight that the fragmentation is, in part, due to the failures of intergovernmental schemes, especially the UNFCCC. | Taken into account - this will be addressed in new subsection added titled “Advantages and disadvantages of different forums.” |
| 8186 | 13 | 28 | 20 | 28 | 21 | This is not correct. The MEF has not been focused on clean energy technology policy. | Accepted - text revised |
| 13642 | 13 | 28 | 22 | | | It was actually the Major Emitters Meetings | Accepted - text revised |
| 14660 | 13 | 28 | 29 | | | This discussion of the MEF ignores the L'Aquila Leaders Declaration of 2009. This was a negotiated agreement, and included several elements worth referencing in this chapter. First, it represents the first time that leaders of developed and developing nations embraced a 2 degrees C objective. It represents the first time that developing countries agreed that their emissions should peak and decline. And it included a pledge to double energy R&D. | Rejected - the L'Aquila declaration was by G8 leaders, not MEF, and it is cited in the chapter |
| 17672 | 13 | 28 | 32 | 28 | 35 | It would be valuable to get some evaluation of IRENA: How successful is the process so far? Are there any first results to report about IRENA acitivites? | Taken into account - to be included in 13.13, subject to ongoing drafting and |
| 7407 | 13 | 28 | 41 | 28 | 41 | The G20 refered to "inefficient" fossil fule subsideis, which implies that not all fossil-fuel subsidies are bad. | Accepted- text revised |
| 14661 | 13 | 28 | 43 | | | The G-20 leaders agreed to phase out, not reduce, fossil fuel subsidies. | Accepted - text revised |
| 13192 | 13 | 28 | 43 | | | the statement "…though in subsequent meetings it has given much less attention to climate and energy." seems to be too strong, mainly taking into consideration that in Seoul (2010), leaders announced their commitment to fight against climate change, addressing it as an urgent priority for all nations. Leaders reaffirmed the objective, provisions, and the principles of the UNFCCC. They welcomed the work of the High-Level Advisory Group on Climate Change Financing established by the UN and supported and encouraged the delivery of fast-stat finance commitments (G-20, 2010). In Cannes (2011), leaders recalled the commitment made by developed countries to assist developing countries to mitigate and adapt to the impacts of climate change, and requested Finance Ministers to report at the next Summit on progress made on climate finance (G-20, 2011). Also in 2011, a report coordinated by the World Bank and the IMF entitled "Mobilizing Climate Finance: A Paper prepared at the request of G20 Finance Ministers" was presented to the G-20. Moreover, in their Communiqué of April 2012, Finance Ministers established a study group to consider ways to effectively mobilize resources to fight climate change. In Los Cabos (2012), leaders welcomed the creation of that study group and asked to provide a progress report to Finance Ministers in November 2012 (G-20, 2012). In this sense, I recommend removing that statement and incorporate in the paragraph that begins in line 36 some of the above information.<br>References: G-20 (2010). The Seoul Summit Document. G-20 (Group of Twenty), Seoul, PA. 66. Available at http://www.g20.utoronto.ca/2010/g20seoul-doc.pdf. G-20 (2011). Cannes Summit Final Declaration – Building Our Common Future:<br>Renewed Collective Action for the Benefit of All. G-20 (Group of Twenty), Cannes, PA. 63. Available at http://www.g20.utoronto.ca/2011/2011-cannes-declaration-111104-en.html. G-20 (2011). Mobilizing Climate Finance: A Paper prepared at request of G20 Finance Ministers. Coordinated by the World Bank and the IMF. Available athttp://www.g20-g8.com/g8-g20/root/bank_objects/G20_Climate_Finance_report.pdf.<br>G-20 (2012). Leaders Declaration. G-20 (Group of Twenty), Los Cabos, PA. 71. Available at http://www.g20.utoronto.ca/2012/2012-0619-loscabos.html. | Accepted - text revised |
| 11794 | 13 | 28 | 44 | 28 | 46 | G8 leaders didn't agree but recognize 2 degree target.It shoud be amended to correct expression. | Taken into account - combined with comment 643, text revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 9521 | 13 | 28 | 44 | 28 | 46 | Please, replace 'agreeing' with 'recognising the importance of a view'. ( Para 65, http://www.g8italia2009.it/static/G8_Allegato/G8_Declaration_08_07_09_final%2c0.pdf) | Accepted - text revised |
| 10670 | 13 | 28 | 44 | 28 | 46 | Refer my comment No. 3. | Rejected - unable to locate comment |
| 6114 | 13 | 28 | 45 | 28 | 46 | The text describes "culminating in the G8 leaders agreeing on 2°C as a goal for the limit to temperature increases (G8, 2009)". This is misinterpretation of the wording. Actual wording is "We recognise the broad scientific view that the increase in global average temperature above pre-industrial levels ought not to exceed 2°C". When Dr. Pachauri said at the IPCC scoping meeting plenary (held in July 2009 in Venice) on the declaration of L'Aquilla G8 Summit that the leaders of G8 have agreed to 2 degree target, I have pointed out at the plenary that this is not the correct interpretation. leaders did not agree but they recognized. Not only Dr. Pachauri but nobody else did not argue back against at the plenary. Therefore the wording should be changed to "culminating in the G8 leaders recognizing the the importance of broad scientific view that temperature increase ought not exceed 2°C (G8, 2009)". | Accepted - text revised |
| 6340 | 13 | 28 | 5 | 28 | 10 | It might worth to mention the regional banks. The African, American and Asian regional banks also have supported some adaptation initiatives. | Accepted - additional text added to 13.5.1.2 |
| 11458 | 13 | 28 | 9 | 28 | 10 | The reference to “direct international flows of finance” should be reworded as the flows being referred to would be ODA rather than other types of finance flows (such as investments) | Accepted - text revised |
| 6574 | 13 | 28 | 32 | | | Add the Clean Energy Ministerial (CEM) somewhere after MEF. | Accepted - text revised to include |
| 6575 | 13 | 28 | 44 | | 46 | Correct the description, as in G8 Leaders Declaration (2009) Leaders only "recognize the broad scientific view that the increase in global average temperature above pre-industrial levels ought not to exceed 2°C" but not "agreeing on 2°C as a goal for the limit to temperature increases". | Accepted - text revised |
| 15441 | 13 | 29 | 10 | | | DELETE: "may" All of the these treaties / agreements are relevant for geoengineering, including ENMOD. While ENMOD was created to deal with hostile uses of weather modification, the expected unequal regional impacts of some geoengineering techniques will make determining whether motivations are hostile, or not, less straightforward. According to Article 5 of the ENMOD treaty, Parties are under an obligation to consult one another and cooperate in solving any problems that may arise in relation to the Convention. If, for example, a geoengineering experiment by one Party perturbed the precipitation patterns of another country (a risk of SRM, for example), such an act could be considered hostile without necessarily being an act of war or even having military involvement. (The text of the ENMOD treaty is online: http://www.fas.org/nuke/control/enmod/text/environ2.htm) | Rejected - original text is more conservative, as literature is not definitive that all agreements apply to geoengineering, nor where intended for that purpose |
| 12552 | 13 | 29 | 13 | | | The word “statement” is not fully accurate and should be changed to “decision.” This was included in Decision X/33 of the 10th Conference of the Parties of the CBD. http://www.cbd.int/climate/geoengineering/ | Accepted - text revised |
| 15442 | 13 | 29 | 13 | | 14 | DELETE: "...which adopted a statement at its COP 10 in October 2010 calling for a moratorium on geo-engineering (Tollefson, 2010)" REPLACE WITH: "...agreed a moratorium on all geoengineering activities that may affect biodiversity at its COP 10 in October 2010 (CBD, COP 10 Decision X/33 paragraph 8(w) [online] http://www.cbd.int/decision/cop/?id=12299)." | Taken into account - joined with comment 652, text revised |
| 6042 | 13 | 29 | 21 | | | I don't think the term "geoengineering" appears in the earlier discussion. It might be good to introduce it then since readers may be more familiar with this term than SRM or CDR. | Rejected - WGIII specifies terminology that described the distinction should be |
| 11343 | 13 | 29 | 21 | | | Section 13.4.2 does not deal with geoengineering and its governance. It merely refers a bit to SRM. If you are going to deal with geongineering then you need to do so more fully. You will find discussions of geoengineering governance in the chapters on Space Law (Lyall), Environmental Law (Redgewell) and Law of the Sea (Rayfuse) in Rayfuse, R. and Scott S. V. (eds.), International Law in the Era of Climate Change (Edward Elgar, 2012). See also Rayfuse R. and Warner, R., 'Climate Change Mitigation Activities in the Ocean: Turning up the Regulatory Heat' in Schofield C and Warner R. (eds) Climate Change and the Oceans: Gauging the Legal and Policy Tides in the Asia Pacific Region (Edward Elgar, 2012). See also the various publications by Karen Scott on geoengineering. | Rejected - guidance to WGIII is to refer to SRM, and ch 13 deals with aspects related to international cooperation, hence scope is narrow |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18367 | 13 | 29 | 22 | 30 | 2 | This is an important discussion but may better be merged with section 13.3.1. | Taken into account - new subsection introduced and thereby highlight |
| 15387 | 13 | 29 | 22 | | | This pretty much get it right | Noted |
| 11592 | 13 | 29 | 22 | 29 | 34 | The UNFCCC is the only international forum where climate change action can be evaluated for compliance and that is why I believe other institutions dealing with climate change try to associate themselves with the UNFCCC. Its wrong to say it has failed. There is almost universal membership.The required actions have implications for development hence the sensitivities and the foot dragging by certain parties | Noted |
| 15664 | 13 | 29 | 22 | 30 | 2 | It would be useful to mention the possibility of an intermediate approach between universal (or 'inclusive') multilateralism and "club" approaches (also known as "exclusive minilateralism"), namely "inclusive minilateralism", for example in the form of a smaller council _within_ the UNFCCC chosen in a representative fashion. This proposal is outlined in Eckersley, R. 2012. Moving Forward in Climate Negotiations: Multilateralism or Minilateralism? Global Environmental Politics 12 (2):24-42. | Taken into account - new figure to be introduced to make clear different points on continuum from de- to centralised architectures. |
| 13643 | 13 | 29 | 23 | | | It wasn't just resistance to costly measures that doomed negotiations; it was the insistence on them by the EU and others. Talks at COP6 collapsed because the EU did not accept offers by the US that now would be considered quite ambitious. | Rejected - interpretive comment, no literature provided, beyond remit |
| 4953 | 13 | 29 | 5 | | | Actually, there are so many similar multinational / intergovernmental forums: so either it should be indicated that all the above are a few examples, or ? – e.g. Arctic Council, forums initiated by the UNSG on climate change, OECD and IEA are also extensively dealing with these issues etc-etc. (IEA and OECD are mentioned later in another context on p.30). | Taken into account -at outset of 13.5.1.2 |
| 15439 | 13 | 29 | 5 | | | At end of line 5, INSERT: The WPCCC declaration also called for a ban on geoengineering, due to the many and significant environmental, social and political disruptions it is expected to cause. Geoengineering was also addressed as a potential warfare instrument and an intensifier of climate injustice. | Rejected, WPCCC declaration does not mention a ban on geoengineering; IPCC WGIII addressing solar radiation |
| 15074 | 13 | 29 | 5 | | | Add a reference to CD Stone, 1972, Should Trees Have Standing? Toward Legal Rights for Natural Objects, S. Cal. L. Rev. 450. | Accepted - reference included; seminal ones suggested plus a more recent one |
| 2304 | 13 | 29 | 6 | 29 | 7 | There is no regime for SRM and CDR, only a very loose regime complex. | Accepted - text revised |
| 15440 | 13 | 29 | 6 | | 7 | DELETE: "The regime of SRM and CDR related fora has also begun to take shape and is similarly comprised of many institutions." It is an overstatement to suggest that something called "the regime of SRM and CDR" exists. The only regulations on geoengineering are the moratoria established at the Convention on Biological Diversity (CBD) on ocean fertilization (2008), extended to all geoengineering activities that may affect biodiversity (2010) and at the London Convention/Protocol (which has limited membership as compared to the CBD -- 87 States are Parties to the London Convention; 42 States are Parties to the London Protocol; 193 States are Parties to the CBD), which holds that, given the uncertainty surrounding negative impacts, ocean fertilisation other than 'legitimate scientific research' should not be permitted. The London Convention/Protocol has established an assessment framework, including criteria for determining legitimate scientific research.<br>REPLACE WITH: Several mulitlateral fora have recently begun to take up the issue of SRM and CDR. | Accepted - text revised |
| 18438 | 13 | 29 | | | | There is no reference to Hartwell Paper and Climate Pragmatism approach in the discussion regarding the feasibility of a comprehensive, integrated regime (pag 29, par 3). | Rejected - peer-reviewed literature addresses issues and is assessed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16375 | 13 | 30 | 11 | 30 | 20 | Several factual inaccuracies in this para. The IEA is in fact an autonomous agency of the OECD, so this should be stated without making them sound like independent institutiosn. IEA was established as a response of OECD countries to the oil shocks, not a "consortium of oil-importing countries". IEA membership requirements do include a minimum oil stocks level which has restricted some OECD members from also being full members of IEA (notably Mexico). OECD has recently granted membership to Korea, Chile, Israel, Slovenia and Estonia and is in accession talks with other developing countries, all of which might become IEA members in due course. OECD and IEA have been jointly supporting the UNFCCC negotations since 1993 throught the Climate Change Expert Group (CCXG, formerly Annex I Expert Group AIXG, see www.oecd.org/env/cc/ccxg ), the work of which directly influenced several aspects of the KP and ongoing agreements. OECD also has a long history of broader climate analysis, most recently OECD Environmental Outlook to 2050, REF, as well as the 2009 document currently cited. IEA is already the world leader in gathering energy and emissions data, including the flagship publication World Energy Outlook. So it would be great if this para could recognise both organisations as already contributing heavily to global knowledge on energy and climate, with a more direct potential influence on member governments than NGOs. | Taken into accout - comment joined with comments 661,672, 673 to add clarity |
| 11459 | 13 | 30 | 11 | 30 | 20 | The identification of the IEA and the OECD as “potentially relevant institutions”, while couched as examples, gives priority to the institutions of developed countries and could have the unintended effect of granting IPCC recognition to these institutions as potential alternative multilateral governance or negotiating forums on climate change away from the UNFCCC. This should be avoided as the UNFCCC remains the sole legitimate universal multilateral negotiating forum on climate change. | Accepted, text revised |
| 14662 | 13 | 30 | 15 | | | IEA membership is determined by OECD membership. Thus, it includes several oil exporting nations, such as Norway, Mexico, and the UK (which may have transitioned from net exporter to net importer by now). OECD membership has expanded to nations as their incomes increase and as they satisfy other policy conditions. Would be more appropriate to refer to recent entrants as middle income (e.g., Chile). | Taken into accout - comment joined with comments 661,671, 672 |
| 6043 | 13 | 30 | 21 | 30 | 34 | There are other links to MEAs that could be discussed as well…e.g. the Biodiversity Convention and the Convention to Combat Desertification. | Taken into account - CBD in 13.5.1.2 |
| 4954 | 13 | 30 | 21 | | 31 | The relation between these legal instruments and their provisions (on ODS and on GHGs) has not been so smooth as it is described here .. | Accepted, text revised |
| 13644 | 13 | 30 | 3 | | | There are several other institutions with potential roles to play. The IMF, for example, has done recent work on ways in which fiscal policy (e.g. carbon taxes) can mitigate climate change: http://www.imf.org/external/Pubs/FT/books/2012/climate/climate.pdf | Taken into accout - joined with comment 667 to include more institutions in 13.10.2 |
| 6850 | 13 | 30 | 36 | 30 | 40 | Durban, Cancun, and Copenhagen are under the UNFCCC and Kyoto negotiations. It would be inaccurate to place them like this. | Accepted - text revised |
| 11593 | 13 | 30 | 38 | 30 | 38 | The bracketted part, these are all UNFCCC for a. | Text revised - as with 676 |
| 8841 | 13 | 30 | 41 | 30 | 9 | It is important to start this paragraph mentioning the Group 77 and China, which is the largest and one of the more active and determinant coallition of countries in the UNFCCC negotiations. It is constituted by 131 developing countries. The Group of 77 is the largest intergovernmental organization of developing countries in the United Nations, which provides the means for the countries of the South to articulate and promote their collective economic interests and enhance their joint negotiating capacity on all major international economic issues within the United Nations system, and promote South-South cooperation for development. | Accepted - text revised to include G77 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6341 | 13 | 30 | 41 | 31 | 9 | The mentioning of country grouping in the climate change process is politically sensitive and needs to be handle with care. The following comments and suggestions try to address this issue: 1) As a general principle, it would be convenient that If the members of some coalitions of coutries are mentioned, the members of all coalition should be also mentioned to avoid possible perceptions on differentiation, except these coalitions with large memberships for obvious reasos. 2) Norway, Russian Federation and Ukraine are missing in the Umbrella Group. 3) In the particular case ofthe Environmental Integrity Group, in which it is mentioned that is the first coalition of industrialized and developing countries, the membership (Switzerland, Republic of Korea and Mexico) should be mentioned to inform the reader the scope of this particular coalition. 4) Although it is might not worth to mention all numerous members of the Coalition of Rainforest Nations a brief description on this coalition would inform better the readers. 5) The groups of Least Developing Countries (LDC) and the African Group, both very active in negotiations and with a membership of around 50 countries each, must be mentioned, likely at the begining of the paragraph as the AOSIS. 6) Several other groups also work together in the climate change process, including countries from the Organization of Petroleum Exporting Countries (OPEC)and a group of countries of Central Asia, Caucasus, Albania and Moldova (CACAM). | Accepted - text revised to reflect sensitivity to the description; but space does not allow full listing of all groupings |
| 11460 | 13 | 30 | 41 | 31 | 9 | The identification of negotiation coalitions in the climate negotiations makes no mention at all of the biggest primary negotiating group for developing countries – the Group of 77 and China composed of 133 developing country Parties of the UNFCCC, of which AOSIS is a sub-group. The section also ignores the existence of regional groups that have tended to act as such – i.e. the African Group and the Arab Group – and also makes no mention of the Least-Developed Country (LDC) Group. Furthermore, the section mischaracterizes the political nature of some of the coalitions that it refers to – i.e. the Cartagena Group and the BASIC group of countries are political groupings that meet regularly but do not officially negotiate as their own groups in the UNFCCC negotiations. | Text revised, as with comment 679 |
| 14664 | 13 | 30 | 43 | | | The Umbrella Group, when created for the 1997 climate talks, included more than JUSCANZ countries. For example, it included Russia, and I believe Ukraine. | Text revised |
| 12477 | 13 | 30 | 43 | 30 | 43 | Please note that the Umbrella Group consists of more countries than the JUSCANZ, hence they are not the same. | Taken into account - joined with comments 677 - 680 - text revised |
| 4971 | 13 | 30 | 43 | | 45 | {Add} ".. and New Zealand {and some other developed countries})" ~ because Switzerland, Norway also attended that informal meetings (so it was also called JUSSCANNZ), moreover, Russia and Ukraine sometimes also participated. .. "first coalition of {a few} industrialized and developing countries" | Taken into account - joined with comments 677 - 680 - text revised |
| 14350 | 13 | 30 | 43 | 30 | 44 | The Umbrella Group is not also known as JUSCANZ, as it also includes other members, including: Norway, Russia, Ukraine, and Kazakstan. | Taken into account - joined with comments 677 - 680 - text revised |
| 10618 | 13 | 30 | 11 | | | The IEA (and the OECD with which it is linked) may be promising contributors to data collection. However, as I mention in my comments on Chapter 7 (Energy), the international energy regime is quite fragemented, and the IEA/OECD are hampered by the fact that their membership is mostly developed, oil-consuming countries -- rather than oil-producing countries (e.g., Saudi Arabia) or emerging big consumers (e.g., China, India). For an overview, see: [Colgan, J, T van de Graaf, and R. Keohane. 2012. Punctuated Equilibrium in the Energy Regime Complex. Review of International Organizations. 7(2): 117-143.] | Accepted - text revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 10620 | 13 | 30 | 21 | | | The international regime dealing with ozone depletion is one of the most promising partners for the climate regime, in part because the Kyoto Protocol explicitly states its relationship (particularly, concerning the division of labor in substances regulated) vis-a-vis the earlier Montreal Protocol of the ozone regime. But the report misses the fact that the burgeoning international forests regime also may be a partner for the climate regime in the future -- consider, for example, two new institutions launched within the last 5 years: the Forests Carbon Partnership Facility (FCPF) launched by the World Bank, and the UN Collaborative Initiative on Reducing Emissions from Deforestation and Forest Degradation (UN-REDD) launched by the United Nations. For an overview of how various environmental regimes fit together, see: [Johnson, T., and J. Urpelainen. 2012. A Strategic Theory of Regime Integration and Separation. International Organization 66(4): 645-677.] [ABSTRACT: States frequently disagree on the importance of cooperation in different issue areas. Under these conditions, when do states prefer to integrate regimes instead of keeping them separate? We develop a strategic theory of regime integration and separation. The theory highlights the nature of spillovers between issues. Positive spillovers exist when cooperation in one issue area aids the pursuit of objectives in another issue area; negative spillovers exist when cooperation in one issue area impedes this pursuit in another issue area. Conventional wisdom suggests that both positive and negative spillovers foster greater integration. We argue that negative spillovers encourage integration while positive spillovers do not. States integrate not to exploit positive spillovers but to mitigate negative spillovers. To test our theory, we examine the degree of integration or separation among four environmental regimes: climate, deserts, forests, and ozone.] | Taken into account, section 13.5.1.4 |
| 14663 | 13 | 30 | | | | Would also be worth referencing the IMF and World Bank. The former has been active on fossil fuel subsidies and has recently advocated for carbon taxes. The latter has been active in climate finance through the CIFs. These organizations, in contrast to the IEA and OECD, do have near universal participation/membership. | Taken into account - 13.10.2 includes World Bank, to add IMF |
| 17673 | 13 | 30 | 11 | 30 | 20 | In this section, I missed other UN bodies and the Bretton Woods institutions that contribute to the debate with analytical work and reports (besides IEA and OECD), e.g. UNEP, UNDP, UNCTAD, World Bank, etc. | Taken into account - 13.10.2, 13.11.1.2 |
| 11143 | 13 | 30 | 28 | 30 | 31 | Please add USA/Canada/Mexico proposal | Accepted, reference added |
| 7408 | 13 | 30 | 3 | 30 | 34 | Not only IEA, but institutions such as OPEC are also relevant for climate change issues | Taken into account - section 13.5.1.4 |
| 4721 | 13 | 30 | 3 | | | Although it is addressed later in the chapter, the authors should point out that the major other "potentially relevant institution" is the WTO. | Accepted, text revised to include cross-reference to 13.8 |
| 5309 | 13 | 30 | 35 | 31 | 9 | It would be worthwhile to introduce a typology of coalitions. While others are issue related (AOSIS), some are process oriented (G77 and China). While some coalitions are inherited from other domains in the international system (G77, G20, G8, OPEC) some have been established in the climate change context and during the climate negotiation process (AOSIS, BASIC). Important is to see whether these coalitions are actually complementing each other or competing among each other (see mutually exclusive membership between coalitions). To my view, they are complementing each other, and therefore claims regarding the fragmentation of blocs of both developed and developing countries should be questioned. | Accepted, text revised |
| 5310 | 13 | 30 | 36 | 30 | 40 | The comparison between coalitions and subgroups or clubs is not appropriate or is unclear, because two different analytical levels are chosen to show the difference between the two. Coalitions are groups of countries presenting coordinated positions in the international treaty. Does it mean that subgroups or clubs do not present positions in the international treaty? On line 39, subgroups and constrated as countries seeking to regulate GHG emissions in their region of the world. Are coalitions for instance OPEC, EU not seeking to regulate GHG emissions at all? | Accepted - text revised to give clarity |
| 8187 | 13 | 31 | 20 | 31 | 20 | "global corporations": Why just "global" ones? They attempt to influence single-country corporations too. | Accepted - text revised |
| 17674 | 13 | 31 | 25 | 31 | 27 | Another good citation for price differentiation in the realm of voluntary markets is: Conte, M. N. and Kotchen, M. J.: 2010, Explaining the Price of Voluntary Carbon Offsets, Climate Change Economics 1(2), 93–111. | Accepted - reference included |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 6342 | 13 | 31 | 27 | 31 | 28 | The section 13.12 does not describe how certification schemes have been used in CDM. Bibliographic sources are needed to back this statement. | Accepted - text revised |
| 6045 | 13 | 31 | 29 | 31 | 32 | Theses initiatives are also discussed in ch. 15. | Accepted - text revised |
| 8188 | 13 | 31 | 37 | 31 | 37 | "regional (i.e. multi-country)": I would delete regional. Multi-country efforts are often not regional. | Rejected - stems from the plenary- |
| 8189 | 13 | 31 | 38 | 31 | 39 | "Generally, regional collaboration has been triggered by the setup of an international regime": I would describe this as the view of one author; it is far from clear that it is generally true. | Accepted - softened the language to not make a "general" satement |
| 11690 | 13 | 31 | 41 | | | The title of the section 13.6.1 is "interaction of Regional and International Carbon Markets", it may understand as interations between the regional and international markets, however, in the following contexts more are discussing on EUETS and linkage to other like CDM or more on EU ETS itself, and more discussions on WCI itself, so the section title is easy to cause confusion | Taken into account: adjusted the headings to make the content of the sextion clearer |
| 16377 | 13 | 31 | 41 | 31 | 46 | There are numerous other EU policy integration initatives besides carbon markets (eg energy efficiency labelling, building efficiency standards etc etc) so this should be recogised in the first sentence. Also, would be good to note that WCI is sub-national but involves sub-national jurisidictions in more than one country, and may therefore have implications for national emissions accounting under UNFCCC (see Prag et al. (2011), Tracking and Trading:EXPANDING ON OPTIONS FOR INTERNATIONAL GREENHOUSE GAS UNIT ACCOUNTING AFTER 2012, http://www.oecd.org/env/climatechange/49101167.pdf) | Rejected - outside the scope of the chapter. It deals only with the interlinkages to international cooperation not a full assessment of the systems |
| 15725 | 13 | 31 | 42 | 31 | 43 | "Due to the scale effects that occur when carbon markets are enlarged, carbon markets have been the primary means of regional policy integration": better: "may" be primary means of regional policy integration. So far there are only plans, the EU-Norway ETS link, the only existing link so far... | Accepted |
| 4955 | 13 | 31 | 44 | | 45 | Some countries were involved in the ETS after its pilot phase, i.e. from 2007 (Cyprus, Malta; and also Bulgaria and Romania as these two became EU-members later). Besides Norway, 2 more non EU Member States also joined the ETS (Iceland, Liechtenstein), as it is correctly referred to later. There is a national ETS in New Zealand. | Taken into account - Iceland and Liechtenstein now included in text. |
| 8762 | 13 | 31 | 44 | 32 | 2 | National ETS are operating in the EEA (EU ETS covering 30 countries), Switzerland, New Zealand and Japan all of which are linked to Kyoto units. Many more are proposed. At a sub-national level, RGGI and Alberta have operating systems, although neither is linked to other systems. This chapeau needs to introduce what follows. The EU ETS clearly needs to be discussed. It is not clear why California should be discussed in preference to other systems. If experience with linking is the subject, then Japan and NZ should be discussed. | Taken into account: refer to section where other national systems are described |
| 10211 | 13 | 31 | 44 | | | Should it be EU Emissions Trading System or EU Emission Trading Scheme (see e.g. p. 32, l. 3)? | Accepted |
| 12478 | 13 | 31 | 45 | 31 | 45 | Please note that the EU ETS is linked with the system of all the countries in the European Economic Agreement (EEA), which consists of all the 27 countries in the EU pluss Norway, Iceland and Lichtenstein. | Accepted - text reflects this |
| 15075 | 13 | 31 | 45 | | | As noted above, the new Australian carbon policy will link to the ETS by 2018 | Taken into account: refer to section where other national systems are |
| 12922 | 13 | 31 | 45 | 31 | 45 | Should mention the Australian ETS and agreement to link with EU ETS. | Taken into account: refer to section where other national systems are |
| 11461 | 13 | 31 | 5 | 31 | 9 | The characterization of the “Climate and Clean Air Coalition” should be nuanced in that it is not a negotiating coalition in the UNFCCC climate negotiations context, but rather a coalition for dialogue and discussion outside of the UNFCCC context for the States and non-State partners thereof. | Accepted - text revised |
| 11104 | 13 | 31 | 1 | | | Please consider adding the following sentence after Nhamo, 2010, in order to capture the recent event. "In 2012, a new coalition is formed among 30-40 like-minded developing countries, including China, India, Saudi Arabia, and other Asian, Latin American, Middle East, and African devolping countries. The group requests developed countries to reduce their emissions more aggressively and provide large-scale financial and technological assistance to developing countries. Among BASIC countries, Brazil and South Africa do not join it." | Accepted, text revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16376 | 13 | 31 | | | | I wonder about the utility of this sub-section as it is; given that there is a whole section on pub-priv and priv-priv arrangements (13.12) might be best to keep this discussion for that section | Rejected - section makes clear that typology and placement - "The first two (dealing directly or indirectly with private sector initiatives) will be dealt with in |
| 17117 | 13 | 31 | 29 | | | It should be acknowledged that ICLEI´s climate programmes have started in 1993 whereas C40, majority of which also are members of ICLEI, have started only in 2005. This chapter does not have any acknowledgement of the global climate advocacy efforts of local governments that has focused through Local Government Climate Roadmap in 2007. A major outcome of the process was the Global Cities Covenant on Climate - the Mexico City Pact which has an international secretariat and regularly monitors progress of signatories. carbonn Cities Climate Registry in an important effort of local governments for measurable, reportable, verifiable climate action, which captures information of more than 170 cities worldwide as of July 2012. Recognition of local governments as governmental stakeholders in para.7 of Cancun Decisions is also important reflection of all these efforts in to UNFCCC processes. | Taken into account - text revised to incorporate suggestions |
| 10817 | 13 | 31 | 29 | 31 | 35 | It will be important to coordinate with Ch 15 on this discussion, since many of these initiatives are also covered there. | Noted |
| 4722 | 13 | 31 | 36 | | | This section also seems far more descriptive than analytic. | Taken into account - Section 6 has been |
| 18663 | 13 | 32 | | | | Page 32: Description of EU ETS (2/3 page), fair but too general. No direct reasoning on the effects or price level. | Rejected - outside the scope of the chapter. It deals only with the interlinkages to international cooperation |
| 13646 | 13 | 32 | | | | It would be worth pointing out that leakage is likely to be greater in subnational arrangements than in national approaches because both capital and labor are more mobile within economies. | Rejected - outside the scope of the chapter. It deals only with the interlinkages to international cooperation |
| 8763 | 13 | 32 | 15 | 32 | 16 | During the 2005-2007 period Norway had a unilateral link with the EU ETS as well as the CDM. Norway did import some EUAs but neither Norway nor the ERU ETS used CERs during that period because they were more expensive than the domestic allowances. | Rejected - outside the scope of the chapter. It deals only with the interlinkages to international cooperation |
| 4237 | 13 | 32 | 19-20 | | | There were no limits on CER/ERU use during the pilot phase, but there was never any possibility to import these credits since the international transaction log had not yet been created and linked to the EU ETS registry. | Reject - comment could not be verified |
| 4238 | 13 | 32 | 20-21 | | | Forestry credits are indeed not allowed, but other credits were also banned. I don't recall the specifics but there is a negative list that includes large hydro and some other types of mitigation projects. | Taken into account - relates to large hydro |
| 2415 | 13 | 32 | 22 | 32 | 26 | Comment on specific text: My understanding of the EU position is that no CERs can be used in the ETS DURING THE THIRD TRADING PHASE (2013-2020) from projects registered after 2013 unless the projects are in LDCs. See Article 11a Directive 2003/87. Also, my understanding is that CERs from new projects in non-LDCs will be accepted after 2013 where the EU has concluded a bilateral agreement with the country in question regulating their level of use. No agreements of this kind have so far been concluded. | Accepted |
| 4239 | 13 | 32 | 23-24 | | | The provision referred to on these lines applies to the third phase, not the second as implied by the sequencing of statements. | Accepted - rephrased |
| 4240 | 13 | 32 | 27 | | | It should be stated that the 1.74% annual decline in the EU ETS cap continues indefinitely beyond 2020. | Accepted |
| 4973 | 13 | 32 | 28 | | | .. that is a 20% overall reduction by 2020 compared to the 1990 level. | Accepted |
| 16379 | 13 | 32 | 29 | 32 | 34 | Note that EU ETS HAS become more centralised in its later phases (see Prag et al, (2012 forthcoming), Making Markets www.oecd.org/env/cc/ccxg ). For the final two sentences, see my comment above (noting also that the ITL exists for international movements outside of Europe too; it's the link between the ITL and the EU system (CITL, now EUTL) that is important for this point) | Accepted - text reworded |
| 12027 | 13 | 32 | 3 | | | The effects of later participation of East European countries should be described together with analysis of marginal abatement costs among members. | Rejected - outside the scope of the chapter. It deals only with the interlinkages to international cooperation |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 6343 | 13 | 32 | 33 | 32 | 34 | It might worth to mention that the international transaction log has been created under the UNFCCC. Although it was developed with a close collaboration with the EU, this log is not part of the EU ETS. | Accepted - text reworded |
| 4241 | 13 | 32 | 34 | | | It is not accurate to say that the International Transaction Log has been created for the purpose of enabling the coupling of AAUs with EUAs. The ITL exists independently to record and effect all transfers of Kyoto units, just as the Community Independent Transaction Log exists to transfer EUAs. The linkage between the two ensures that AAU's accompany EUAs when the latter are traded across member-state borders. Moreover, if the member-state has not met the Kyoto requirements for enabling trading, AAUs cannot be traded and therefore EUAs are similarly restricted in the EU ETS from being traded across borders. | Accepted - text reworded |
| 8764 | 13 | 32 | 35 | 33 | 2 | The purpose of this section is not clear. It could be dropped. If you keep it add a reference to Haites and Mehling, Linking existing and proposed GHG emissions trading schemes in North America, Climate Policy, v. 9, n. 4, 2009. | Rejected - This section is plenary-approved |
| 8191 | 13 | 32 | 36 | 32 | 36 | "strong": This seems like a value judgment that is not supported. Recommend deleting. | Accepted - rephrased |
| 4972 | 13 | 32 | 4 | | | {Add} The EU ETS is the key means for the Europe{an Union} .. | Accepted |
| 8190 | 13 | 32 | 4 | 32 | 4 | This claim requires a citation. | Taken into account - now sais: "The EU ETS was designed as the key means". |
| 16378 | 13 | 32 | 4 | 32 | 5 | Whilst EU ETS is indeed independent of UNFCCC, would be worth noting that it was designed to operate embedded within international emissions trading (i.e. until 2012 EUAs are created by converting AAUs). Although from 2013 the unit link will be less direct (EUAs will be created rather than converted from AAUs), the point is still important as it affects Europe's position in the KP negotiations - it would be easy to continue KP because the infrastructure is all set up via the EU ETS systems. | Taken into account - rephrased to be more accurate: "although the system could exist independent" |
| 16951 | 13 | 32 | | | | Given the topic of the chapter, I think it would be worth saying that the European Commission intervention cut the allocations proposed in National Allocation Plans by almost 10% in total, and that the principal legal basis for doing so (in relation to the western European countries) was compliance with the EU's Kyoto Protocol targets. The Member States accepted this ruling (note that the Commission rulings on the New Member States used the other legal provision (preventing hidden subsidies) and these were contested.<br>I'd guess this has been written up elsewhere but for one account see Carbon Trust (2007), EU ETS Phase II allocation: implications and lessons (The Carbon Trust, report CTC715, London). □ | Accepted - issue and literature added |
| 17675 | 13 | 32 | | | | After this section, I missed some evaluation of the EU-ETS (criticisms, potentials for improvement, planned reforms, etc.) | Rejected - outside the scope of the chapter. It deals only with the interlinkages to international cooperation |
| 13925 | 13 | 32 | 29 | 34 | 42 | The political underpinings of the ETS also relate to the fact that EU-ETS is embedded in a broader suite of policies addressing multiple agendas (See Huberty, M., "Green growth as necessity and liability: The political economy of a low-carbon energy systems transformation in the European Union", Berkeley Roundtable on the International Economy, Working Paper no. 200, 2011; Haug, C. and A. Jordan, "Burden sharing: distributing burdens or sharing efforts?", in A. Jordan et al (eds), "Climate Change Policy in the European Union: Confronting the Dilemmas of Mitigation and Adaptation?", Oxford, Oxford University Press, 2010. | Rejected - outside the scope of the chapter. It deals only with the interlinkages to international cooperation not a full assessment of the systems |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 6586 | 13 | 32 | 29 | 32 | 31 | Delete "than decentralised approaches" or express bad points of EU ETS clearly.<br>Other decentralised approaches should NOT be compared to EU ETS since EU ETS has not only good points but also bad points such as following problems.<br><br>Quote>><br>The EU's Emissions Trading System (EU ETS) is the flagship mechanism by which the EU hopes to reduce its carbon dioxide ($CO_2$) emissions via the principle of cap-and-trade.<br>It has run from 2005 and will continue at least until 2020. However, it has failed to have the impact hoped for and is not the cheapest method by which to lower $CO_2$ emissions. It needs dismantling and replacing, while retaining the same aim of providing emission<br>reductions at the lowest necessary cost.<br><br>Why it fails to reduce net global emissions<br><br>There has been a huge over-allocation of credits via under-ambitious targets. The 2012 caps for 20 member states, including the UK, are higher than the measured emissions in 2005. Many companies will not need to make any reductions in their emissions<br>until 2016-18 so even the tightening of the EU ETS in 2013 fails to have a real effect.<br><br>The over-allocation of free credits is leading to huge windfall profits as companies pass through the non-existent credit cost to consumers or sell their credits if unrequired. The power sector alone is likely to have made €16-€50 million by passing on non-existent costs to consumers.<br><br>The EU ETS actually risks raising global emissions. Companies whose competitive<br>advantage has been undermined by the EU ETS emigrate to countries with slacker emission regulations and then the EU imports their products. In the UK this means that from 1990-2005, while production of carbon has fallen by 15 per cent, carbon consumption has actually gone up by around 19 per cent via imports.<br><br>Whether the price of EU ETS credits rises or falls, emissions will not be lowered. A rise will result in carbon leakage and, if the price falls, it will be cheaper for companies simply to buy credits rather than install emission abatement equipment.<br><br>The operation of the Clean Development Mechanism (CDM), a source of offsetting<br>credits for the ETS, is racked with corruption and profiteering, involving billions of pounds. All five main project validating bodies failed UN accountability tests.<br><br>The CDM's subsidies for emission reductions mean some emissions are being deliberately created to be destroyed and generate CDM credits. The gas HFC-23 generates 11,700 credits at €12 per tonne destroyed, but costs only €0.17/t$CO_2$e to destroy: a 7,000 per cent markup | Rejected - outside the scope of the chapter. It deals only with the interlinkages to international cooperation not a full assessment of the systems |
| 2934 | 13 | 32 | 34 | | | add a reference to Maljean-Dubois & Tabau, 2010 for : S. Maljean-Dubois, A.-S. Tabau, « Non-compliance Mechanisms: Interaction between the Kyoto Protocol System and the European Union », European Journal of International Law, 2010, vol. 21, pp. 749-763 | Accepted - issue and literature added |
| 10818 | 13 | 32 | 32 | | 33 | This is really a sub-national initiative. But I can see the problem, since there are so few cases of large scale carbon markets, it is hard not to talk about this. Ch 15 has an equivalent problem - that chapter talks of the California case, but the EU ETS is outside its scope. | Taken into account - WCI is transnational, so belongs in this section |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4236 | 13 | 32 | 8-9 | | | The sentence in these two lines suggests that the ETS was an optional or negotiable part of the accession negotiations. I believe this is incorrect. The ETS had been enacted before any of the new member-states acceded to the EU and was therefore part of the acquis communitaire. New member states would have been aware that the ETS was part of the price of joining the EU since the final agreement on the ETS Directive in 2003 and the accession negotiations were contemporaneous; however, unless corrected by some one much closer to the accession negotiations than I, whether or not the new member-states would be subject to the ETS was not a matter of negotiation. | Accepted - point here is that the ETS was expanded, not the negotiations |
| 11691 | 13 | 33 | 20 | 35 | 25 | In this section, the section structure is laid out differently compared to other sections, it starts with an "overview" then a special sub-sector on "linkages between the Kyoto instruments and national policies", I think this section can be further extended to include more materials, or put more sub-titles to make the structure more clear | Accepted. Text revised, headings streamlined. |
| 10212 | 13 | 33 | 33 | 33 | 38 | Examples on how international and national climate policy, or centralized vs decentralized political structure, matters would be interesting. | Noted. |
| 6344 | 13 | 33 | 38 | 33 | 38 | It is not clear for a reader what does means "the consensus culture in Netherlands" in comparison with the centralized and descentralized national policy structures mentioned in this paragraph. | Rejected. Literature cited adequately explains the term. |
| 4975 | 13 | 33 | 38 | | | it was also centralized in Hungary but with the participation of many scholars from different disciplines (e.g.: Climate change and Hungary: mitigating the hazard and preparing for the impacts, 2010, ISBN 978-963-508-605-4 http://www.vahavahalozat.hu/files/vahava-2010-12-korrigalt-2.pdf | Rejected. The example does not add significant additional information. |
| 10213 | 13 | 33 | 42 | 33 | 46 | This sencence is difficult to read and unclear | Accepted. Text revised. The sentece is broken into three sentences. |
| 4974 | 13 | 33 | 6 | | | " It included countries that had not ratified the Kyoto Protocol, " it was valid only for the USA and for a while for Australia .. | Rejected - current text correct |
| 6115 | 13 | 33 | 9 | 33 | 9 | After "(Heggelund and Buan, 2009).", add "The Asia-Pacific Partnership for Clean Development and Climate was globally expanded from 7 to 24 countries and formerly taken over in July 2010 by the Global Superior Energy Performance (GSEP). (Okazaki et al. 2012). For citation Okazaki, T., Yamaguchi, M., Watanabe, H. Ohata, A., Inoue, H. Amano, H. (2012), Technology Diffusion and Development. In: Climate Change Mitigation, A Balanced Approach to Climate Change. M. Yamaguchi, (ed.), Springer, London pp. 179-221. | Accepted - text added |
| 16380 | 13 | 33 | | | | Might be better to cove the Asia-Pacific partnership in section 13.5 above. | Rejected - placement correct |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 6587 | 13 | 33 | 3 | 33 | 9 | Add the description of GSEP.<br>After the final meeting of theAPP in April 2011 activities of Cement, Power Generation and Transmission and Steel Task Force were formally inherited to the GSEP.<br><br>Quote>><br>Transition from the APP to the GSEP<br>The GSEP was launched as one of the key initiatives that came out of the Clean Energy Ministerial meeting in 2010 and has also been accepted as a task group under the International Partnership for Energy Efficiency Cooperation(IPEEC).4 The objective of the GSEP is to reduce global energy use by encouraging industrial facilities and commercial buildings to pursue continuous improvements in energy efficiency and promoting public–private partnerships for cooperation on specific technologies or in individual energy-intensive sectors.5 In addition to the majority of the APP countries, 6 GSEP members will include Denmark, the European Commission, Finland, France, Mexico, Russia, South Africa and Sweden.<br><br>Like the APP, the GSEP adopts a working method based on sector-specific working groups. In the GSEP, members do not have to participate in all<br>the working groups. The aim is to provide a forum for public–private dialogue and cooperation, involving the public, private and academic/research sectors in order to exchange information on improved technologies and create practical projects through public–private partnerships in a bottom-up manner.7 It started with six working groups, covering 1) certification, 2) power, 3) steel, 4) cement, 5) cool roofs and pavements and 6) combined heat and power and efficient district heating and cooling (see Figure 1). In June and September 2011, the GSEP working groups organised the first workshops to define strategic objectives and discuss work plans.8 Among others, the GSEP Working Groups on Power, Steel and Cement will build upon activities initiated through the corresponding APP task forces. The groups will concentrate more on energy efficiency and environmental performance and expand the scope of participation.<br><br>For citation: Noriko Fujiwara (2012). Sector-specific Activities as the Driving Force towards a Low-Carbon Economy From the Asia-Pacific Partnership to a Global Partnership. CEPS POLICY BRIEF No. 262. Available at: www.ceps.eu/ceps/download/6569 | Accepted - text added |
| 7508 | 13 | 33 | 3 | 33 | 9 | It should be explained that main activity of the APP has been succesfully inherited to GSEP.<br><br>GSEP has been lauched as an official activity of the Clean Energy Ministerial meeting(CEM) and the International Partnership for Energy Efficiency Cooperation(IPEEC). GSEP is typical non-legally binding type international scheme and is applying methodology successfully developed by the APP and is expandin participation. APP type scheme has been proved effective to improve energy efficiency(Fujiwara(2012)and consequential reduction of CO2 emission from industry, which is main source of CO2 emission.<br>Noriko Fujiwara (2012). Sector-specific Activities as the Driving Force towards a Low-Carbon Economy From the Asia-Pacific Partnership to a Global Partnership. CEPS POLICY BRIEF No. 262. | Accepted - text added |
| 6576 | 13 | 33 | 4 | | 6 | Add a note that the activities of three sectoral task forces (one each for Power, Steel, and Cement) under APP were incorporated in the activities of the Global Superior Performance Partnership under the Clean Energy Ministerial (Fact sheet: Global Superior Performance Partnership, 2012). | Accepted - text added |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17116 | 13 | 33 | 10 | | | ICLEI - Local Governments for Sustainability is the correct name of the referred organization. However, I completelt disagree with this comment. ICLEI´s more thn 1200 members are from more tha 70 countries worldwide. ICLEI led initiatives like Mexico City Pact, carbonn Cities LCimate Registry and World Mayors Council on Climate CHange, as well as Local Government Climate Roadmap are truly global and have worllwide recognition. | Taken into account - name changed, added "global" |
| 13926 | 13 | 33 | 20 | 35 | 25 | This section should mention that, how and why new actors are lobbying for an acknowledgement of their role in fighting CC within UNFCCC agreements. See Lefevre, B., 2012, Incorporating cities into the post 2012 climate change agreements, Environment & Urbanization, Vol 24(2): 1–21 This paper examines the legal, political, technical, economic and financial implications of fitting commitments by cities into the post-2012 climate change agreement; Bentley, H., Zikman, S., 2010, Local Governments Key to Cancun Climate Talks, Natural Resources & Environment Volume 25, Number 2. | Taken into account. Covered in 13.5.2. |
| 11576 | 13 | 33 | | | | Focus is on efficiency. What about social commitment? David Miller argues for example that national politics may be more efficient (and legitimate) because people may be more committed and engaged (Cf. Miller 2008). | Rejected. Outside the scope of the Chapter. The WG may consider taking "social commitment" into account at a |
| 10819 | 13 | 33 | 22 | 38 | 33 | This section will also have to be closely coordinated with Ch. 15. IN terms of linkage, Xinyuan Dai "Global Regime and National Change" in Climate Policy 10(2010) may be worth referring to for other mechanisms of linkage. | Taken into account. Will continue coordination with Chapter 15 and ensure inclusion of the reference depending on agreement with Chapter 15 either in this |
| 16381 | 13 | 34 | 1 | 34 | 4 | Would be good to also include China's pilot ETS initiatives here, certainly an example of sub-national policy experimentation with a view to expanding to national level | Rejected. Outside the scope of this Chapter, although Figure 13.2 makes reference to these initiatives. Chapter 15 however might consider use of this along with such domestic laws including |
| 16382 | 13 | 34 | 14 | 34 | 16 | Note that some countries do both, eg many EU countries, such as Denmark CDM/JI programme via DEA | Accepted. Text revised. |
| 6116 | 13 | 34 | 18 | 34 | 18 | Add after (Michalowa and Buen,) "Also Japanese firms have commited to purchase credits of more than 300Mt/CO2 to comply with their commitments under Industry Voluntary Action Plan. The total purchase amount is estimated around $4.5-6 Billion for the Kyoto period (Yamaguchi 2012)". For citation, Yamaguchi M., Policies and Measures. In: Climate Change Mitigation, A Balanced Approach to Climate Change. M. Yamaguchi, (ed.), Springer, London pp. 129-159. | In Section 13.7, Accepted. Text revised.<br><br>In Section 13.13, quantificaton not included at this stage |
| 16383 | 13 | 34 | 19 | 34 | 25 | Note also political motivation to be ensuring emissions reductions "at home" both to promote home-grown technologies, ensure modernisation of the economy for future competitiveness, etc | Accepted. Text revised. |
| 10035 | 13 | 34 | 19 | 34 | 22 | This part should be deleted completely or revised to explain Japan's situation. Japan does not limit imports of Kyoto credits. Furthermore, artificially keeping carbon price high is contradictory for the original idea of using market mechanism. | Accepted. Text revised from "all" to "many". |
| 15727 | 13 | 34 | 19 | 34 | 10 | "All industrialized countries limit imports of credits generated by the Kyoto mechanisms for various reasons" Do you mean: limit imports into their cap- and trade schemes? I don't agree that all industrialized countries limit credit imports for national Kyoto target achievement. Austria eg purchases 75 Mio Kyoto credits, the majority of Austria's reduction requirement. | Accepted. Text revised. Also see response to comment no. 763. |
| 6117 | 13 | 34 | 19 | 34 | 19 | "All industrialized countries" is incorrect. Change this phrase to "Some industrialized countries". USA and Japan did not limit imports of credit for several reasons. Also this paragraph (from lines 19-31) is so much inclined to European Situation. This kind of expression will be appropriate for Chapter 14. | Accepted. Text revised. also see response to comment no. 763. |
| 8765 | 13 | 34 | 2 | 34 | 2 | Why is RGGI ignored? | Accepted. Text revised. Figure 13.2 already shows RGGI. In addition RGGI |
| 8192 | 13 | 34 | 2 | 34 | 2 | It is not clear that the "most notable" example of sub-national experimentation is in California. It may be the "most notable" within the United States, but I would be careful in making this claim globally. | Accepted. Text revised. |
| 15076 | 13 | 34 | 2 | | | RGGI should be mentioned here. | See the comment to response comment |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12971 | 13 | 34 | 20 | 34 | 20 | It seems that the authors endorse the idea that keeping the price high induced technological innovation in the country, and that this is good. This is debatable and I suggest the authors should rephrase the sentence to convey this message. | Rejected. There is no endorsement of any particular policy in the text. It is drawn from the literature cited already. An additional paper by Alex Bowen is cited as well. There is literature |
| 12972 | 13 | 34 | 20 | 34 | 22 | Why should environmental effectivenes be lower if emission reductions occur in other jurisdictions? If additionality is satisfied, it does not really matter where emission reductions occur. It additionality is not satisfied (or only partially satisfied) it is a different story. Maybe it is sufficient to delate "or" at line 22. | Accepted. Text revised. |
| 12989 | 13 | 34 | 20 | 34 | 22 | Why should environmental effectivenes be lower if emission reductions occur in other jurisdictions? If additionality is satisfied, it does not really matter where emission reductions occur. It additionality is not satisfied (or only partially satisfied) it is a different story. Maybe it is sufficient to delate "or" at line 22. | Accepted. Text revised. |
| 6047 | 13 | 34 | 22 | 34 | 24 | The example of limits on AAUs doesn't really fit with the point being made which is focused on the use of credits from the CDM and JI. | Rejected. This comment is not relevant, as the point made is a separate one. |
| 4976 | 13 | 34 | 23 | | 24 | .. but it did not exclude the opportunity for an EU Member State to transfer such credits (AAUs) to/from another Member State (therefore at national level but not at company level, i.e. outside the ETS). | Rejected. The length given to the treatment of EU-ETS is adequate. This |
| 12809 | 13 | 34 | 23 | 34 | 25 | Can you provide more detailed reason for "more attractive" | Accepted. Text revised. |
| 15728 | 13 | 34 | 23 | 34 | 25 | "For example, the European Union has prohibited the import of Assigned Amount Units into the EU-ETS in order to prevent the use of surplus units from countries in transition, colloquially called “hot air” (A Michaelowa and Buen, 2012)" Important to mention that A1 countries use AAUs from Green Investment Schemes for national target achievement. Japanese companies use AAUs for meeting their voluntary targets...see eg Tuerk A., Frieden D., Sharmina M., Schreiber H., and D. Ürge-Vorsatz; 2012: Green Investment Schemes: First experiences and lessons learned http://www.joanneum.at/climate/GIS.html | Accepted - text revised |
| 12001 | 13 | 34 | 25 | | | Note that leakage has been assumed widely and researched extensively, including by the meth panel and found to be non-existing based on the assessed evidence. The EU has taken a decision to ban these projects based amongst other an assumption rather than evidence. Today, these emissions are again emitted freely, so we have cheap abatement technology, transferred from Annex I countries, having solved a problem within a few years which the Montreal Protocol has not been able to solve in decades and we through the whole thing out rather than fix it. This is a scientific report i.e. the current state of evidence needs to be mentioned rather than the 2011 hypotheses by Schneider ("... due to possible emissions leakage").<br><br>Otherwise, the CDM presentation is very good. It should also be mentioned under its contributions that it is at the basis of the South Korean and the Chinese Emissions Trading Schemes. | Rejected. Not supported by the peer-reviewed published literature. |
| 8766 | 13 | 34 | 26 | 34 | 31 | Literature relating to the regional distribution of CDM projects is reviewed in the Impacts report prepared for the CDM Policy Dialogue. See http://www.cdmpolicydialogue.org/ | Accepted. Reference added. |
| 5916 | 13 | 34 | 26 | 34 | 31 | Cross-reference CDM in ch 7, ch 16, and specifically ch 14.3.4.3 re geographical distribution of CDM projects. | Noted. No text revision is necessary in this chapter. Coordination with other chpaters, however, is an ongoing |
| 8193 | 13 | 34 | 26 | 24 | 31 | The relevance of this passage to the rest of the discussion is not clear. | Noted. No text revision is necessary in this chapter. Coordination with other chpaters, however, is an ongoing |
| 12973 | 13 | 34 | 26 | 34 | 31 | It is not clear why an uneven distribution of mitigation action across countries would motivate a limit to imports of credits. In general, I don't think it is appropriate to introduce here problems of the CDM. | Accepted. Geographic distribution is important and the placement is adjusted so that the idea stands alone in a |
| 17676 | 13 | 34 | 26 | 34 | 31 | Here, I would mention that the EU-ETS was reformed exactly in this direction, i.e. by restricting the trade to CERs from LDCs. It is mentioned in another section, but I would at least reference here to this section or mention it again. | Accepted. Text revised. Necessary citation provided. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16384 | 13 | 34 | 26 | 34 | 31 | I would question whether the discussion of geographical distribution of CDM is relevant here | Accepted. See response to 777 above. |
| 12808 | 13 | 34 | 32 | 34 | 40 | This para could be rephrased, also some coherences should be provided in order to better inform the reader on the main point. | Noted. |
| 16385 | 13 | 34 | 33 | 34 | 35 | This sentence is not very clear; I know what you mean, but the phrasing makes it difficult to understand. Suggest instead: "The EB decided that the effects of new policies implemented in host countries should not be considered when assessing the additionality of new projects, to avoid perverse incentives etc...". Would also be good to note in this para that the consideration of impacts of policy measures is an important issue when considering future market mechanisms (see Prag et al (2011), KEEPING TRACK: OPTIONS TO DEVELOP INTERNATIONAL GREENHOUSEGAS UNIT ACCOUNTING AFTER 2012 http://www.oecd.org/env/climatechange/48125645.pdf). | Accepted. Text revised. |
| 8767 | 13 | 34 | 46 | 34 | 46 | It is useful to distinguish unilateral and bilateral duirect links. All existing links are unilateral. They are easy to implement. Bilateral links are difficult to implement and none is yet in place although Australia and the EU announced their intention to implement one between 2015 and 2018. | Rejected. The chapter dealt with unilateral and bilateral linkages although no definition was advanced as it was not |
| 16386 | 13 | 34 | 46 | 34 | 46 | It seems the subsequent discussion covers direct/indirect linkage of ETSs in general; suggest therefore deleting reference to Kyoto mechanisms from this sentence | Accepted. Text revised. |
| 7000 | 13 | 35 | | 39 | | You might want to look at Barrett (2011) for a discussion of the use of trade restrictions in climate agreements. I think they could be used strategically in some very narrowly focused agreements.<br><br>Barrett, S. (2011). “Rethinking Climate Change Governance and Its Relationship to the World Trading System,“ The World Economy, 34(11): 1863-1882. | Noted. Comment will be taken up in 13.8 |
| 3468 | 13 | 35 | | | | Figure 13.2 is not completely accurate (US did not puu out of 2nd period Kyoto but of first period two; what does white and red stripes stand for?; ) | Accepted. Figure will be adjusted. |
| 6577 | 13 | 35 | | | | Explain "Japanese bilateral mechanism" either in Figure 13.2 or in 13.4.1.3 Flexibility mechanism. (MOEJ Initiatives on Bilateral Offset Credit Mechanism for Mitigating Climate Change, 2012) | Accepted. Text revised. See response to comment 787. |
| 16387 | 13 | 35 | | | | Nice figure, but given the tenuous current nature of the Japan bilateral offset system it seems to get undue coverage in this map; as far as I know, the countries marked have only had feasibility studies of varying degress of detail, so cannot really be considered projects. Would also be good to have a bit more definition on the China pilots, and of course the EU-Aus link (I realise this happened after the first draft was written). | Accepted. Figure will be revised. Also see response to comment 787. |
| 15729 | 13 | 35 | | 35 | | Figure 13.2. Cap and trade schemes and linkages: you mean Cap and trade schemes with existing and possible linkages? | Taken into account -- title changed to "Cap and trade schemes with existing |
| 6345 | 13 | 35 | 10 | 35 | 25 | There are comparisons between diferent kind of linkages without specifying what of these linkages have been implemented in practice and what are the linkages prepared or suggested by scholars that have not existed yet. This information should be provided. | Rejected. The text is clear. |
| 8771 | 13 | 35 | 10 | 35 | 12 | A unilateral direct link does nothing if the linked units are not the marginal supply -- in that case the linked units are a form of price cap although the exact price is not known. With a bilateral link the benefits mentioned occur (subject to restrictions on use of the linked units). In addition a bilateral link value also reduces leakage, output losses in countries with the ETS, and lower welfare losses. See ALTERNATIVE APPROACHES FOR LEVELLING CARBON PRICES IN A WORLD WITH FRAGMENTED CARBON MARKETS, Elisa Lanzi, Jean Chateau and Rob Dellink, OECD Environment Directorate, 2012. | Accepted. Text revised. Citation included. |
| 13647 | 13 | 35 | 10 | | | Offsets are fundamentally different in carbon tax regimes than in cap and trade. They are tax expenditures. | Rejected. Not relevant for this |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16388 | 13 | 35 | 10 | 35 | 25 | Important additional references on linking are Dellink et al (2010), "Towards Global Carbon Pricing: Direct and Indirect Linking of Carbon Markets", doi : 10.1787/5km975t0cfr8-enand Elis and Tirpak (2006),LINKING GHG EMISSION TRADING SCHEMES AND MARKETS http://www.oecd.org/environment/climatechange/37672298.pdf. Would also be good to add a final para to this section, discussing the impact of regional linking of ETSs on international emissions accounting both under KP and broader FCCC agreements (eg see Prag et al (2011), Prag et al. (2011), TRACKING AND TRADING:EXPANDING ON OPTIONS FOR INTERNATIONAL GREENHOUSE GAS UNIT ACCOUNTING AFTER 2012, http://www.oecd.org/env/climatechange/49101167.pdf). This would also provide a nice link back to the KP systems, where the section begins by discussing. | Accepted. Reference added on the first point. Second point needs more research. |
| 4234 | 13 | 35 | 13-14 | | | Ditto comment above (page 6, line 32); second time this incorrect statement is made. | Noted. Will be responded in the revisions to the Executive Summary. |
| 12810 | 13 | 35 | 2 | | | Check wether "pull-out…"-symbol is not better placed after "links" | Accepted. Figure will be changed. In the changed version Tokyo will be |
| 4243 | 13 | 35 | 21-23 | | | What is the difference between a reciprocal unilateral link and a bilateral link (referred to in the preceding sentence)? I don't think there is any. The two sentences seem to concern mostly the formality of the agreement by which mutual recognition is achieved. | Accepted. Text clarified. |
| 10214 | 13 | 35 | 23 | 35 | 25 | Expand on indirect linkage; how dies it work? | Taken into account. Detail is contained |
| 12811 | 13 | 35 | 29 | 36 | 1 | The different levels of interaction of climate and trade are mentioned without any further description of the effects or conclusions derived from this information. The implications of this statement are not self-evident and should be explained- Otherwise the sentence does not provide any additional information nor does it help to structure the chapter. | Taken into account: examples provided. |
| 9294 | 13 | 35 | 3 | | | A minor comment. The projects under Japanese bilateral mechanism also include Djibouti, Ethiopia, Kenya, Maldives, Moldova, Mozambique and Myanmar,<br>References<br>http://www.meti.go.jp/press/2012/04/20120426004/20120426004.pdf (in Japanese)<br>http://www.meti.go.jp/press/2012/07/20120726002/20120726002.pdf (in Japanese)<br>http://www.meti.go.jp/press/2012/07/20120726003/20120726003.pdf (in Japanese)<br>http://www.nedo.go.jp/content/100495085.pdf (in Japanese)<br>http://gec.jp/main.nsf/en/Activities-Climate_Change_Mitigation-adopt2012 | Accepted. Figure will be changed. |
| 12479 | 13 | 35 | 4 | | | The figure shows "Projects under Japanese bilateral mechanism". We can't fine any place where this mecahnism is explained. Please consider to include some information about the mechanism in the text, if it's to be included in the Figure. | Accepted. Text revised in 13.7.3 |
| 6048 | 13 | 35 | 5 | 35 | 6 | The Norway- EU ETS link doesn't appear in Figure 13.2 | Rejected. The figure treats only present |
| 8768 | 13 | 35 | 5 | 35 | 5 | Norway had a unilateral direct link with the EU ETS during 2005-2007 -- Norwegian firms could use EUAs for compliance, but EU ETS installations could NOT use Norwegian allowances for compliance. The Chicago Climate Exchange also had a unilateral direct link with the EU ETS, but they terminated that link when the price of phase I EUAs fell to just above the price of CCX allowances. | Rejected. The figure treats only the current and future situation. |
| 15077 | 13 | 35 | 6 | | | The Australian system will now (as of August 2012) be directly linked to the ETS by 2018. | Accepted. The figure will reflect this |
| 8769 | 13 | 35 | 7 | 35 | 7 | Switzerland and Japan also have ETS that accept Kyoto units for compliance. They could also be used in RGGI if the price rose above $10/ton CO2. These systems all accept ERUs, most CERs and, for Australia and NZ, RMUs, so not just the CDM. | Noted, although it is unclear if the figure can accommodate all this detail. Over to Axel! |
| 8770 | 13 | 35 | 8 | 35 | 9 | Estimates of compliance cost savings are provided in the Impacts report prepared for the CDM Policy Dialogue. See http://www.cdmpolicydialogue.org/ | Accepted. Reference added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4242 | 13 | 35 | 8-9 | | | A finding that "EU demand has driven the price of CDM credits" does not directly lead to an implication that costs were reduced in the EU ETS. The surrender of CERs implies that these credits are less costly on the margin than EUAs or internal abatement, but the co-movement of EUA and CER prices and the cost savings from the use of CERs are two different things. Whether the cost savings from CER use are substantial also depends on the quantity of CERs surrendered in addition to whatever is the reduction in price. I would suggest that little is known about the price-quantity relationship for abatement in the EU ETS so that the finding of "substantial" cost savings seems to me unsubstantiated. No doubt there are some, but whether they are substantial is another matter. | Accepted. Text clarified. |
| 5687 | 13 | 35 | 2 | 35 | 3 | Figure 13.2 identifies several cap-and-trade regimes that I did not see mentioned in the text (e.g., RGGI, Korea, Taiwan). It would be helpful to mention these briefly, if they are shown on the map. | Noted. Reference is made although detailed treatment is in Chapter 15. |
| 14253 | 13 | 35 | | | | One should note the important consequence of trade as pointed out by Brian Copeland, e.g., "Free Trade and Global Warming: A Trade Theory View of the Kyoto Protocol" (with M. Scott Taylor), Journal of Environmental Economics and Management, 49 (2005): 205-34. | Taken into account: reference included. |
| 15389 | 13 | 36 | | | | Either explain what is in yellow or don't even include it | Rejected: Unfortunately, this comment cannot be related to the text. |
| 6118 | 13 | 36 | 10 | 36 | 10 | After The Kyoto Protocol, "(UNFCCC, 1998)" is unnecessary. Remove it. | Accepted and changed |
| 2303 | 13 | 36 | 13 | 36 | 30 | This discussion could be further improved by citing Victor (2011) who says that he now views trade sanctions as "essential" to effective climate change mitigation. On the whole, this paragraph gives a balanced view, unlike the paragraph on p. 19. | Accepted: Reference included including additional nuanced view. |
| 10215 | 13 | 36 | 13 | 36 | 25 | References lacking | Taken into account, new references |
| 11462 | 13 | 36 | 20 | 36 | 22 | The reference to "economic analysis of trade issues typically assumes that there are gains from free trade based on countries' comparative advantages and that government intervention tends to create inefficiencies, albeit with some exceptions" highlights only the orthodox neoliberal economists' view. It disregards a growing body of empirical evidence that highlights the flaws in such assumptions. | Taken into account: However, lack of space precludes to survey the entire lietrature on non-orthodox approaches. We have phrased this sentence now |
| 2416 | 13 | 36 | 25 | 36 | 29 | Comment on specific text: The language of 'trade sanctions' is loaded . It immediately sounds like a bad thing. Trade measures might be a more neutral phase. When does something become a trade sanction? Already there are all sorts of trade measures in place: product standards e.g. CO2 emissions from cars or from energy-using equipment; process standards e.g. biofuels; application of EU-ETS to flights taking off from or landing in EU. All of these simply involve the application of domestic law to imported goods or services and this happens all the time across many sectors without anybody talking about trade sanctions. | Accepted, phrasing has been changed in accordance with reviewer's suggestion. |
| 11463 | 13 | 36 | 25 | 36 | 27 | The reference to "trade sanctions or trade enticements could be used to address free-rider problems of international agreements – specifically participation and/or compliance problems" has no empirical backing. It is not clear whether or not trade measures could, in fact, engender improved compliance. Having the IPCC refer to such use of trade measures could give rise to future trade-related disputes in the event that States use such IPCC reference as the "scientific" imprimatur for the adoption of such trade measures. | Taken into account; phrasing is now more careful. Note, however, that some other comments had to be taken into account when changing this paragraph. |
| 14665 | 13 | 36 | 27 | | | There is an Aldy, Orszag, and Stiglitz 2001 paper that calls for trade sanctions to promote participation and compliance. Full cite in the Aldy, Barrett, and Stavins 2003 13+1 Climate Policy paper. | Taken into account in so far as additional literature has been considered regarding this issue. However, given space |
| 2417 | 13 | 36 | 31 | 36 | 32 | Comment on specific text: Suggested addition to text: ….consistent with principles of non-discrimination and other WTO discplines such as the 'necessity' test. WTO law does not only discipline discriminatory measures. For example the TBT Agreement provides that technical regulations should not be more trade restrictive than necessary to achieve a legitimate objective. | Rejected: The text says a central issue which implies that this is not the only issue. However, non-discrimination is an important issue as the referee confirms |
| 2169 | 13 | 36 | 31ff | | | Maybe it would make sense to compare fairness aspects w.r.t. those related to climate policy and those related to trade policy (see e.g. Suranovic, S.M. (2000)World Economy. | Rejected: Though this is an interesting idea, section 13.8.1 is on WTO-related issues to climate change. Fairness is an |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16952 | 13 | 36 | | | | Actually this conflates two rather distinct topics and if possible with the constraints, I would suggest to separate them. One is the literature on production vs consumption accounting. The other concerns instruments and how they relate to WTO. It would be a great pity if the former – accounting - issues got complicated politically by mixing them up with the latter. | Taken into account: we have seperated both issues. |
| 10617 | 13 | 36 | 41 | | | An overview of WTO-permissible environmental instrument is provided in [Johnson, T., and R. Brewster. 2012. Information Revelation and Structural Supremacy: Explaining the International Trade Regime's Perceived Hostility to Environmental Policy. Duke University, Durham NC. 28 pp.] [ABSTRACT: The World Trade Organization (WTO) offers numerous instruments for privileging environmental goals over freer trade. What explains these instruments' common form, with use conditional on states' revelation of private information about environmental policies? We emphasze the WTO's need to mitigate industrialized countries' fear of "trade at all costs" and developing countries' fear of "green protectionism." And why is the WTO nevertheless accused of hostility toward environmental goals? Trade law is unusual, because states submit to third-party dispute resolution. This "structural superiority," combined with the WTO's information-revealing mechanisms, means that TRADE officials apply TRADE law to assess the appropriate balance of trade and environmental goals. Thus, the WTO's perceived hostility is fueld not only by actual rulings -- but also by the WTO being in a position to issue rulings at all. We demonstrate with the General Agreement on Tariffs and Trade (GATT) and the Sanitary and Phytosanitary (SPS) Agreement.] And section 13.8 also would benefit from acknowledging the wider debate in which the Johnson & Brewster article engages: whether the World Trade Organization (particularly, its dispute settlement body) is an appropriate institution for addressing environmental issues -- or whether environmental issues would be better served by a forum (and dispute settlement body) of their own. Other research in this debate includes: [Conca, K. 2001. The WTO and the Undermining of Global Environmental Governance. Review of International Political Economy 7(3): 487-496.]; [Keleman, D. 2001. The Limits of Judicial Power: Trade-Environment Disputes in the GATT/WTO and the EU. Comparative Political Studies 34(6); 622-650.]; [Neumayer, E. 2004. The WTO and the Environment: Its Past Record Is Better than Critics Believe, but the Future Outlook Is Bleak. Global Environmental Politics 4(3): 1-8.]; [Thomas, U. 2004. Trade and the Environment: Stuck in a Political Impasse at the WTO after the Doha and Cancun Ministerial Conferences. Global Environmental Politics 4(3): 9-21.]; [Shaffer, G, and J. Trachtman. 2012. Interpretation and Institutional Choice at the WTO. Virginia Journal of International Law. 52: 103-153.] | Taken into account: all references have been carefullt checked and cited if appropriate. It is clear that this an interesting but also highly complex issue which cannot be discussed in its entire dimension in the text. Section 13.8.1 tries to hint at least at the most important issues, though admittedly at a very superficial level. |
| 11464 | 13 | 36 | | 37 | | Some of the discussion relating to the various WTO-related issues identified in this section should also be further expanded by the inclusion of discussions or references to Martin Khor, The Climate and Trade Relation: Some Issues (Research Paper 29, South Centre, May 2010), in order to provide more balance to the discussion. | Taken into account: reference has been checked for additional information and useful information has been included, given our strict space limitations. Reference needs to be approved |
| 12812 | 13 | 36 | 32 | 36 | 32 | You might like to consider giving introduction like the following paragraph: "There are two basic approaches to discuss WTO concerns in conjunction with the given climate regime: First, to analyze the compatibility between existing WTO-rules and climate change rules (legality), second, to analyze the potential of normative changes, either of WTO rules or of the climate regime in future (policy dimension). [It might also be helpful to add a new headline here "13.8.1.1 Border Adjustment Measures" or at least a new paragraph and then to introduce with:] Further, there are two types of Border Adjustment Measures: import-related and export-related Border Adjustments since it depends on this categorization which norms apply on Border Adjustments (i.e. that Border Adjustments can consist of a combination of export and import measures but it is also possible that Border Adjustments are based on only one of these types either. | Taken into account: even though we have not introduced new headings (as they are determined by the IPCC guiding rules), we have given BAMs a much more prominent role, expanding on this issue, trying to give a balanced view on the economc, legal and political issues. Needless to say, space restrictions required to sketch only roughly the main arguments |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12813 | 13 | 36 | 32 | 36 | 32 | The elimination of quantitative restrictions (article XI GATT) could be added in the introductory sentence because chapter 13, section 13.8.1, line 47 refers to non-tarrif barriers as well and not only the non-discrimnation rules. Kateryna Holzer considers article XI GATT as one important basis for the jurisprudential evaluation of Border Adjustments, too (see Holzer, Kateryna, Perspectives for the Use of Carbon-related Border Adjustments in Preferential Trade Agreements, NCCR Climate Research Paper 4/2011, Bern 2011, p. 8). | Rejected: Though interesting, and certainly a possibility to account for environmental issues in WTO/GATT, the introductory sentence refers to WTO-folks and their view. |
| 16050 | 13 | 36 | 36 | 36 | 37 | need more evidence to justrify that WTO agreements, annexes are pertinanet to climate change | Rejected: section 13.8 provides plenty of evidence why WTO is pertinent to |
| 18439 | 13 | 37 | | | | Pag 37 par 5: I think the paper dodges the problem of embedded emission in exports, presenting it as an ethical issue. Maybe it should be some kind of guide in how to deal with the subject in this part. | Taken into account; we are now more explicit about the issues involved in embbed emissions. However, the issue has to be discussed in other chapters |
| 3757 | 13 | 37 | 25 | 31 | | unclear | Rejected: formulation seems clear; however, paragraph has been relocated |
| 16389 | 13 | 37 | 25 | 37 | 31 | Could be interesting to note here that the UNFCCC system has built up a system of national emissions targets, and correspodning inventory reporting processes, which provide a certain impetus to remain national-level emissions accounting, rather than a consumption-based system | Accepted: suggestion has been integrated in the rewriting of this paragraph which has been relocated |
| 6346 | 13 | 37 | 29 | 37 | 31 | It might be necessary to explain the use of the adjective "ethical" in this context or to consider deleting it. It might be also necessary to make reference to chapter 14 where is presented information on "embedded GHG emissions" at regional level. | Accepted: suggestion has been integrated in the rewriting of this paragraph which has been relocated |
| 6119 | 13 | 37 | 29 | 37 | 31 | This is not necessarily 100% ethical issue. For example the issue has something to do with equity, burden sharing as well as who should pay mitigation cost. Suggest to rewrite. | Accepted: suggestion has been integrated in the rewriting of this |
| 14254 | 13 | 37 | 30 | | | Is this an "ethical" issue? I would consider it a highly technical issue, instead. | Accepted: suggestion has been integrated in the rewriting of this |
| 12814 | 13 | 37 | 30 | 37 | 30 | The question whether emissions should be based on importing or exporting countries is indeed ethical if we think about the related responsibility principle. But it can be an economic question, too (Droege, Susanne, Using Border measures to address carbon flows, in: Droege, Susanne (Ed.), Do border measures have a role in climate policy?, in: climate policy, Consuming and producing carbon: what is the role for border measures, Routledge, pp. 1191-1201). | Accepted: suggestion has been integrated in the rewriting of this paragraph which has been relocated within section 13.8. |
| 16953 | 13 | 37 | 32 | | 45 | The paragraph notes that these issues are “especially problematic and consequential ..”. Given this, the paragraph really needs to be more precise an in particular its final sentence is very problematic. I believe the literature shows consensus that whether “border measures” are compatible with WTO depends entirely on the question of what kind of border-related measures and how they are designed (this was the main message of the WTO’s own study). The most simplistic – a straightforward inclusion of specific carbon-intensive imports into a trading scheme benchmarked on the basis of product only – clearly satisifies both the core GATT criteria (non-discrimination and MFN) and is directly analogous to excise duties which most countries already do: it thus does not even need Article 20 exemption. There is then a broad panoply of measres that involve more or less PPM / discriminatory / exemption requirements.<br>The essential point to communicate in this paragraph is that there are in fact two entirely different discourses: one on how to ‘level’ carbon costs at the border; and the other how to ‘leverage’ action in other countries. The former is intrinsically non-discriminatory in intent. The latter is explicitly discriminatory, and thus infinitely more contentious. Legally they are entirely different discussions and should not be confused. For details see the Carbon Trust report, Tackling Carbon Leakage: specific approaches in a world of unequal carbon prices (2010), which is also being written up as an academic article by Grubb and Das for the Journal of World Trade. | Taken into account: We agree that this paragraph did not convey enough message. The paragraph has been substantially expanded, though it still has to remain rather superficial due to space limitations. However, we hope that now the main arguments are clear, with the message that BAMs can be in line with WTO-GATT, but there is also a political dimension which requires also support from non-Annex B countries for implementation. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8772 | 13 | 37 | 32 | 37 | 45 | See ALTERNATIVE APPROACHES FOR LEVELLING CARBON PRICES IN A WORLD WITH FRAGMENTED CARBON MARKETS, Elisa Lanzi, Jean Chateau and Rob Dellink, OECD Environment Directorate, 2012 for as comparison of the effects of linking and border adjust mechanisms. | Taken into account: study has been studied and cited. |
| 15078 | 13 | 37 | 36 | | | Another study examining the role of border tax adjustments is WJ McKibbin and PJ Wilcoxen, "The Economic and Environmental Effects of Border Tax Adjustments for Climate Policy," in L Brainerd and I Sorkin, (eds), Climate Change, Trade and Competitiveness, The Brookings Institution, pp. 1-34, 2009. | Taken into account: study has been studied and cited. |
| 14666 | 13 | 37 | 42 | | 43 | Recommend citing Aldy and Pizer 2009 Pew report in context of econometric studies on competitiveness. I'm not positive the papers cited here are econometric in their methods. | Taken into account: study has been studied and cited. We also corrected "econometric" to "empirical" and include |
| 11692 | 13 | 37 | 43 | 37 | 45 | The authors note that " There has been less consensus in legal-institutional studies …", it is better to provide more discussions, and why there are less consensus, what are the major differences | Taken into account: the phrasing has been changed as our previous statement was not illuminating as the referee |
| 13927 | 13 | 37 | 32 | 37 | 45 | For a comprehensive analysis on WTO rules and border adjustments, see Tamiotti, L., "The legal interface between carbon border measures and trade rules", Climate Policy, 11(5), 2011. | Taken into account: reference was already included but reference has been studied again carefully to see whether |
| 12815 | 13 | 37 | 36 | 37 | 40 | To arrange the research on Border Adjustment Measures you may like to consider a structure sub-dividing the arguments since: "It makes a difference for WTO law compatibility how the climate protecting measure is structured. An ETS-Border Adjustment Measure underlies different requirements than a Border Tax Adjustment (cf. Holzer, Kateryna, Proposals on Carbon-Related Border Adjustments: Prospects for WTO Compliance, in: Carbon & Climate Law Review 2010, S. 51-64). Even if Border Adjustment Measures do not a priori violate WTO law their justification (legality) depends on several questions: judicial and technical respectively economical ones. Judicial emphasis is to be put on a) the question which agreements apply to which type of measures, b) the question how to resolve WTO law-internal conflicts if several WTO-Agreements apply to the same measure, c) how to avoid WTO law-external conflicts or at least how to reduce conflicts between trade and climate protection norms within the existing international law d) the Like products question in the different WTO-Agreements, especially concerning the production methods that cannot be retraced in the final product (non-product-related process and production methods) and e) the necessity criteria respectively the criteria of disguised restriction within the climate-related exceptions (article XX GATT) of WTO-law. Technical and economic questions directly affecting legality questions are a) the relevance of carbon leakage, b) the measurement of the effectiveness of carbon leakage policies, eg. Border Adjustment Measures, c) the determination of the carbon footprint within all the uncertainties when monitoring climate politics in foreign countries and within the limits of international law's sovereignity of other states, d) the estimation of the costs of Border Adjustment Measures." (see for these emphases: Holzer, Kateryna, Proposals on Carbon-Related Border Adjustments: Prospects for WTO Compliance, in: Carbon & Climate Law Review 2010, pp. 51-64; McGrady, Benn, Necessity Exceptions in WTO Law: Retreaded Tyres, Regulatory Purpose and Cumulative Regulatory Measures, in: Journal of International Economic Law 2008, pp. 153-173; Du, Michael Ming, The Rise of national regulatory Autonomy in the GATT/WTO Regime, in: Journal of International Economic Law 2011, S. 639-675; Condon, Bradley J., Climate Change and unresolved Issues in WTO Law, in: Journal of International Economic Law 2009, pp. 895-926; Veel, Paul-Erik, Carbon Tariffs and the WTO: An Evaluation of Feasible Policies, in: Journal of International Economic Law 2009, pp. 749-800). | Taken into account: references have been considered and critically investigated whether additional information should be included. The paragraph on tax-border adjustment has been restructured. However, the nuanced arguments on the legal compatibility of various policy measures and WTO/GATT rules, though very interesting, would require too much space. As we have included all suggested reference, we hope the interested reader will find sufficient references on this subject. |
| 11693 | 13 | 38 | | | | It notes: there have been doubts about their potential effectiveness, why? Please explain what Epps and A. Green concern for this | Taken into account - text revised |
| 7409 | 13 | 38 | 31 | 38 | 47 | Because of the difference in entitlements and obligations under WTO vs UNFCCC, please cite the literature that argues for discussion of climate change trade-related issues under UNFCCC rather than under WTO. | Taken into account - WTO-interactions are discussed at length in 13.8.1 and a reference to Whalley (2012) has been |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 11465 | 13 | 38 | 31 | 39 | 11 | The discussion in this section relating to WTO-based options with respect to the institutional architecture for address trade-climate interactions is based almost entirely on just one study (Epps and Green 2010). The suggestions raised by Epps and Green, while academically relevant, have not, by and large, been discussed in the WTO. | Combined with comment #6347 |
| 8773 | 13 | 38 | 9 | 38 | 20 | See Market-Based Instruments for International Aviation and Shipping as a Source of Climate Finance, Keen, Parry and Strand, Policy Research Working Paper 5950, World Bank, 2011 and Haites, Linking emissions trading schemes for international aviation and shipping emissions, Climate Policy, v. 9, n. 4, 2009, pp. 415-430. | Taken in consideration: reference cited. |
| 6851 | 13 | 38 | 9 | 38 | 20 | There have been questions raised about the CBDRR- compatibility of the EU ETS extension to aviation. See Joanne Scott and Lavanya Rajamani, 'EU Climate Change Unilateralism', European Journal of International Law 23(2) 469-494 (2012) | Taken inconsideration; reference cited with qualification as suggested by referee. |
| 4723 | 13 | 38 | 3 | | | Annex VI of MARPOL under IMO appears to be one area in which GHGs might be addressed. | Taken into account: additional reference have been cited and the part on the IMO has been expanded slightly. Other suggestions may be interesting but |
| 6347 | 13 | 38 | | 39 | | A diverstification of sources might benefit this section. Five or the eleven bibliographic cites correspond to the same authors. | Rejected: to the best of our knowledge the literature is scarce on further development of the WTO-GATT rules to make them compatible with environmental objectives, though there is an extensive discussion whether the |
| 7410 | 13 | 39 | 12 | 39 | 14 | Provide more assessment of the literature comparing unilateral to multilateral climate policy arrangements and trade measures. These elements will prove very important within the newly bottom-up approach to climate change policy architecture. | I am note sure whether I get the point. Unilateral trade measures to supprt climate policy by a subgroup of countries have been dealt with under BAMs, an |
| 8194 | 13 | 39 | 12 | 39 | 12 | "have received little attention thus far": From whom? They have received attention from policymakers. Perhaps this refers to scholars? | See comment 845. |
| 7135 | 13 | 39 | 12 | 39 | 14 | There has been an intense discussion on the Convention on that issue, particularly under the “shared vision” LCA negotiation, there is not a Decision on that because position remain divided, but the fact is that a group of G 77 countries has been elaborating in the need to address that from the Convention, due to the worries of trade being used as protectionism. That discussion also came under the “sectoral approach” negotiation, with developing countries concerned with the use of harmonized standards and concepts like a level playing field for international competitiveness, which again would open the door to protectionist trade measures against developing countries’ products. The discussion is also linked to the economic and social consequences of response measures under 1(b)(vi). So it has not been a minor issue under the Convention, and, at that moment, discussions are still ongoing. | See comment 845. |
| 11466 | 13 | 39 | 12 | 39 | 13 | The reference to “there has been some interest in adopting a prohibition on the use of unilateral trade measures, such as offsetting border measures” should be further expanded considering that this is an issue that is likely to face the climate-trade community in the near future and is one that many developing countries in the context of the UNFCCC climate negotiations have already expressed support for such adoption as part of the negotiated outcome in the Ad-Hoc Working Group on Long-Term Cooperative Action (AWG-LCA) of the UNFCCC. | See comment 845. |
| 6852 | 13 | 39 | 14 | | | Is it not worth referring to the numerous Indian proposals on prohibiting unilateral trade measures here? | Taken into account: this section has been rewritten; the critical views of develpoing countries about trade measures is now mentioned under BAMs, though not with explicit reference |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6348 | 13 | 39 | 17 | 39 | 17 | Use UNFCCC secretariat rather than UNFCCC alone. | Accepted, text revised. |
| 8195 | 13 | 39 | 34 | | | "Technology" is undefined in this section. It seems to refer variously to physical capital (not just ideas embedded therein) and to ideas themselves. It would make sense to either define the term or to be clear in the various passages about which definition is being used. This section also seems to neglect the tension that many countries find between promoting technology transfer and national competitiveness. It is difficult to understand technology transfer discussions without including this force in one's model. | Taken into account - any revisions to text are pending Glossary decisions and contents. |
| 11467 | 13 | 39 | | 40 | | The section on the rational for mechanisms for technology development, transfer and diffusion contains no reference at all on the fact that under Art. 4.5 of the UNFCCC, technology transfer is an explicit treaty commitment on the part of Annex I Parties. Furthermore, under Art. 4.7 of the UNFCCC, compliance by Annex I Parties with such a commitment could, inter alia, spur increased levels of implementation by developing countries of their own UNFCCC commitments (such as on mitigation and adaptation). The existence and importance of such treaty commitments would be a very important element of the rationale for having such technology transfer mechanisms at the multilateral level. | Taken into account. The chapter text already mentions this point explicitly in section 9.3.2, though not in section 9.1. An U872insertion has been made in the first sentence of section 9.3.2 to refer specifically to Article 4.5. Also see response to comments 900 and 901. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6588 | 13 | 39 | 35 | 40 | 13 | In order to remove "implicit cost"(such as preferences, perceived risk and Transaction, Information and research cost) for technology transfer, information sharing based on technologies and experts is essential as a first step. Good example is steel sectoral approach such as APP, GSEP and worldsteel etc.<br><br>Quote>><br>The steel industry's ''voluntary'' sectoral approach for technology transfers and diffusion has been examined based on the bottom-up approach in APP and briefly at the ''worldsteel'' activities (mandatory sectoral benchmark approach and its effect on technologies will be examined in the following section). It is the authors' belief that advancing industry's voluntary sectoral approach supported by governments' policies as stated in (2) above can effectively remove barriers for technology transfer and diffusion. APP is a framework that brings together the public and private sectors, and still a prime example of the voluntary sectoral approach by individual industries. APP has eight task forces, including the steel sector. The eight task forces are cleaner fossil energy, renewable energy and distributed generation, power generation and transmission, steel, aluminum, cement, coal mining, and buildings and appliances. This approach is explained from a practical standpoint followed by an examination of its effectiveness.<br>The APP steel task force has three major activities that are called ''flagship projects'': sharing information on technologies,<br>establishing a common methodology for targets setting and increasing the implementation of technologies. One of the highest priorities is compiling an energy efficiency database using a uniform method for all seven APP member countries. That database provides the foundation for establishing targets<br>and taking measures to secure them. Finally, task force members discuss the methodology for establishing targets that will be ambitious yet open to re-examination as required. In addition, the task force sends experts to, where needed, such as China and India, to help improve energy efficiency. As a result, there have been several concrete cases of technology transfers. Benefits are starting to be seen in the form of technology transfers and other activities. For example, in China, companies are installing equipment based on evaluations made at steelworks about desulfurization technology for sintering exhaust gas and energy saving technologies like CDQ. In this context, technologies have been transferred on a commercial basis. To be specific, actual achievements in APP Steel Task Force, which is basically in the category of voluntary sectoral approach, are in the followings. (1) Sharing information on the energy saving technologies and local environmental technologies in the SOACT handbook has been established. (2) A common evaluation methodology for energy efficiency of steelworks and a common APP 7 nations' database have been established. (3) A common methodology for target setting has been established. (4) A common methodology for expert diagnosis at the site has been established, including pre-study survey sheets, actual site visit and reporting with recommendation to a particular steelworks visited. (5) Some steelworks in China, after diagnosis and recommendation, have already decided to invest energy saving technologies and also denitration technology. Next to the APP is the sectoral voluntary approach of the ''worldsteel''. This approach has four elements: data collection, technology transfers, development of innovative technologies and promotion of eco-product. The fundamental concept is to establish suitable targets for each country's steel sector in the post-Kyoto framework through negotiated agreements with respective governments. The voluntary sectoral approach of the steel industry is very ''flexible and soft'' in comparison to, for example, the | Rejected - too much detail about a particular industry and based to a great extent on work of APP which has been disbanded. |
| 15391 | 13 | 40 | | 41 | | This gets it | Noted - no change needed. |
| 7411 | 13 | 40 | 35 | 40 | 37 | Does it follow from the statement that incentives to scale-up fossil-related technologies such as CCS is not warranted. | Taken into account - sentence revised for greater clarity. |
| 6120 | 13 | 40 | 35 | 40 | 35 | Is reduce (not increase) incentive correct? | Taken into account - sentence revised |
| 7412 | 13 | 40 | 38 | 40 | 45 | Provide a review of pros and cons to the use of such market-based mechanisms for mitigation and adaptation on/for developing countries in relation to energy prices, energy access, sustainable development, burden sharing, distributitive and spillover implications. | Taken into account - points are addressed in other sections of this chapter (13.11 and 13.13). |
| 17677 | 13 | 40 | 13 | | | After this section, I missed some evaluation: What technology-oriented agreements are there already? What processes are currently ongoing under the UNFCCC and in other fora? How successful are these processes so far? Etc. | Taken into account - covered in section 13.9.4 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3178 | 13 | 40 | 1 | | | sections 13.9.2 and 13.9.3. For my taste these sections are overly focused on IP and not enough on other fundamentals such as protection of property, sanctity of contracts, etc. There's a ton of practical (and to some degree academic—such as in the int' finance, int'l investment law and some of the international political economy literatures) experience with how these kinds of factors actually drive investment outcomes and diffusion of technology. Somewhere WG3 should deal with that—if not here then (better) in the industry chapter (chapter 10, which is devoid of most real world industrial concerns) or the finance chapter (chapter 16, which is a mess). □ | Taken into account - text revised with sentence and reference added at the beginning of section 13.9.3. Also note that the point is already made in this section including in the second paragraph of 13.9.2.<br><br>Not covered in section 13.11 |
| 6589 | 13 | 40 | 26 | 40 | 31 | Not only pricing on GHG but also following voluntary action should be added. For example, voluntary industry sectoral approach follows 4 steps.<br><br>Quote>><br>Through discussions in this paper, pros and cons in sectoral voluntary approach has become apparent. This approach should be applied as one of the several measures taken to compliment other policies. In view of the fact that there are few studies on this approach, however, the authors have tried to draw readers' and policymakers' attention to the importance of voluntary sectoral approach based on the steel industry's actual experience in various international forums. The success of the approach will depend on the four factors discussed below, which can be applied<br>to other industries.<br><br>First is the sharing of information. Companies must make information about established technologies (best available technologies<br>and best practices) readily available. Accessibility to information about the latest development is also imperative. For example, all companies must follow benchmarks that use common definitions for diffusion ratio, unit energy consumption and other parameters. This category should also include identifying<br>any barriers to the widespread implementation of technologies and determining the potential for reducing CO2 emissions.<br><br>Second is the establishment of challenging numerical targets on a voluntary basis. These targets should include intensity goals as well as goals for the diffusion rate of technologies.<br><br>Third is to utilize communications, especially among experts, promoting more widespread use of technologies to achieve the set targets. For example, engineers from many countries should create a forum to evaluate existing technologies, and to encourage the implementation of more advanced technologies. Model projects could be conducted if necessary.<br><br>Fourth is the setting up and sharing of, a common long-term vision. Companies would need to follow a unified program for developing innovative technologies (such as participation in the ''worldsteel'' CO2 Breakthrough Program).<br><br>The authors would like to add a word about international standardization here. Creating a database is one of the most critical elements of the voluntary industry sectoral approach. This information must be collected using indicators based on a single.<br><br>For citation: Okazaki T, Yamaguchi M (2011). Accelerating the transfer and diffusion of energy-saving technologies steel sector experience - lesson learned. Energy Policy 39:P1296-P1304 | Rejected - because these issues are addressed in chapters 14 and 15 and are not international issues for this chapter |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13596 | 13 | 40 | 38 | | 45 | While international carbon markets may be helpful there are many who question their effectiveness (focused on financing equipment and less on socio-technical fit and being incorporated into the innovation process and heavily skewed towards emerging economies) see Byrne et al (2012) chapter 7 energy pathway in low carbon development the need to go beyond technology transfer in Ockwell and Mallett (eds) (2012) and (2007) Forsyth World Development on cross sector partnerships also updated version in Chapter 18 of Ockwell and Mallett (eds) (2012) | Taken into account - text revised in section 13.9.2, 5th para, 1st sentence |
| 8196 | 13 | 41 | 13 | 41 | 13 | "financing": Do you mean financial transfers or something else? Unclear. | Taken into account - text revised with clarification of meaning of sentence. |
| 6853 | 13 | 41 | 17 | 42 | 16 | Not sure what the policy is on including references to submissions - but some reference to among others, Indian submission on IP ( and in particular their proposal to treat CC like HIV and allow for compulsory licensing) might provide context to this discussion. | Taken into account - text revised by adding sentence and reference in section 13.9.3.1 at end of first paragraph. |
| 9157 | 13 | 41 | 18 | 42 | 16 | M&A is another way of international tech transfer - Indian steel and Chinese wind power/ PV are examples. | Taken into account - text revised to include international M&As |
| 9158 | 13 | 41 | 18 | 42 | 16 | It should be noted that more than half of PV are produced in developing countries. | Rejected - not a necessary addition to |
| 16390 | 13 | 41 | 2 | 41 | 5 | Very relevant here is the OECD's policy framework for green infrastructure investment. See Corfee-Morlot et al (2012, forthcoming), Towards a Green Investment Policy Framework: the Case of Low-carbon Climate-Resilient Infrastructure. Email virginie.marchal@oecd.org for info | Taken into account - reference added. |
| 13597 | 13 | 41 | 21 | | 27 | the literature referenced in Chapter 15 is not exclusive to low carbon -- so wondering if it's also useful to point out some that pertain to clean tech / low carbon (e.g. Dechezleprêtre et al 2010 http://ideas.repec.org/f/pde570.htmland Abdel Latif (2012) in Ockwell and Mallett (eds) 2012 | Rejected - not a necessary addition to the paragraph. |
| 6349 | 13 | 41 | 28 | 41 | 40 | It would be necessary to add bibliographic sources that indicates that IPR might act as a barrier for technology transferin order to provide a balanced view of this very controversial matter. There are literature sources from scholars of some developing countries that supports this view. | Rejected - discussion is already balanced in several paragraphs. |
| 12553 | 13 | 41 | 28 | | | “Stronger” IP may well impede effective technology diffusion for climate response, and there is substantial literature and debate on this point. IP is not a normative continuum from “weak” to “strong.” It requires a balancing of interests. | Rejected - discussion is already balanced. Seems balanced in several paragraphs. |
| 7373 | 13 | 41 | 28 | 41 | 40 | This passage is focused on technology transfer in the context of market transactions. That should be clarified and space given to consider the role of IPRs in non-market-based technology transfer possibilities. | Taken into account - text revised by adding sentence in section 13.9.3.1 at |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4004 | 13 | 41 | 9 | 42 | 16 | Without having any empirical proof at hand, I am convinced that the underlying thesis of the authors is correct that strong IP protection increases technology transfer, whereby strong IP protection in my view as a patent law expert contists particularly of two aspects: a) a patent prosecution system allowing foreigners to apply for patents and to register patents under internationally harmonized and clear conditions, and, b) a strong system to forbid patent infringements effectively and quickly. Both aspects are the basis of strong IP protection in any country.<br><br>One of the treaties administered by WIPO is the PCT (Patent Cooperation Treaty) which supports applicants to extend their (national) patent applications to all countries which are members of the PCT. The Paris Convention is another treaty which goes beyond this and laid down several principals in patent law the member states agreed to comply with.<br><br>I also support the idea that the link between strong IP protection and licenses may be stronger than strong the link between IP protection and exports, as licensing typically, at least very often, is accompanied by the provision of know how which is necessary or helpful to distribute the licensed products by licensee in its country.<br><br>However, as it is up to the patent owners, if there is a technology transfer by R&D agreements, by (cross-)licensing agreements or cooperations, it is up to the international community to find incentives for patent owners to share their knowledge. Compulsory licenses will in most cases not be a solution. They can be a solution, if the inventors manage to implement an invention as standard specification and if the law (typically jurisdiction) confirms that there is a right for a compulsory license, however such right will never be for free. | Noted - no change needed. |
| 14255 | 13 | 41 | | | | One may here discuss the important relationship between IP-agreements (TRIPS) and the ideal design of climate agreements, since they are both influencing the incentive to develop new technology (e.g., I discuss this relationship in a recent working paper, Harstad, Bård, 2012, "The dynamics of climate agreements"). | Taken into account - point is already made in section 13.8 and cross reference to 13.8 has been added in 13.9.3.2 at end of first para, but |
| 11664 | 13 | 41 | | | | The relationship between IPRs and technology transfers also depends on the characteristics of industries, products and technologies. For example, Ivus (2010) groups industries into patent-sensitive and insensitive to examine the impacts of stronger IPRs on exports. Reference: Ivus, O. (2010) Do stronger patent rights raise high-tech exports to the developing world? Journal of International Economics, 81(1), pp.38-47 | Taken into account - text revised by adding sentence and reference at end of 1st para in section 13.9.3. |
| 11144 | 13 | 41 | 14 | 41 | 16 | This paragraph appears to draw an unreferenced conclusion (use of word "impediment") prior to the discussion of IPR in section below. | Rejected - point is addressed in other sections of the chapter. |
| 7509 | 13 | 41 | 6 | 42 | 31 | Climate-friendly technologies are often energy efficient technologies naturally with profit in industry field. Proper IP protection is indispensable to accelerate climate-friendly technology. A lot of energy efficient technologies were tranfered to developing countries and imitated. | Noted - no change needed. |
| 3179 | 13 | 41 | 6 | | | sections 13.9.2 and 13.9.3. For my taste these sections are overly focused on IP and not enough on other fundamentals such as protection of property, sanctity of contracts, etc. There's a ton of practical (and to some degree academic—such as in the int' finance, int'l investment law and some of the international political economy literatures) experience with how these kinds of factors actually drive investment outcomes and diffusion of technology. Somewhere WG3 should deal with that—if not here then (better) in the industry chapter (chapter 10, which is devoid of most real world industrial concerns) or the finance chapter (chapter 16, which is a mess). | Taken into account - text revised with sentence and references added at the beginning of section 13.9.3. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 7001 | 13 | 41 | | | | Patents promote technological development, but as you know they also limit the use of new technologies by setting price above marginal cost. I am aware of no theorem supporting the view that patent arrangements should be harmonized. The extension of the patent system (as under TRIPS) may stimulate some new technological development, but it will also have redistributive effects, with no advantages for efficiency (much of this investment in R&D would have occurred with more limited patent protection). There should be some mention of approaches like “prizes,” which promote R&D without granting patent protection. These require that the goal of technological development be pre-specified—a clear weakness. However, they also allow new technologies to be sold at marginal cost (assuming competitive markets, of course), helping to spread the new technologies. This is especially important if R&D into new energy technologies is aimed at providing the global public good of climate change mitigation. We want these technologies to spread. | Taken into account - text revised by adding paragraph at the end of 13.9.3.1. |
| 11468 | 13 | 41 | | 41 | | The section on IPRs makes a case stating that stronger IP protection fosters exports, FDI and technology licensing to middle income countries. This section (in page 42, line 10) also states that “IP protection has elicited innovation without significantly impeding technology transfer, although problems could arise if new, very broad patents were granted that impede the development of future, more efficient technologies.” In stressing that stronger IP protection could foster technology transfer, the section completely disregards other studies that have highlighted the barriers that IPRs pose to technology transfer. Examples of such studies are Martin Khor, Climate Change, Technology and Intellectual Property Rights: Context and Recent Negotiations (Research Paper 45, South Centre, June 2012) and Carlos Correa, Mechanisms in International Cooperation in Research and Development: Lessons for the Context of Climate Change (Research Paper 43, South Centre, March 2012) | Taken into account - text revision in response to comment 877 (i.e. new paragraph added at end of 13.9.3.1 ) is also responsive to this comment - but suggested references in the comment are not in refereed soruce. |
| 4637 | 13 | 41 | 18 | 41 | 21 | Add the following phrase after the words "GHG-reducing technologies": Apart from the intellectual property regime remedying the problem of public goods, producers of innovative products can internalize some of the benefits of their research efforts by requiring purchasers to enter into long term contracts and licensing agreements that prohibit reproduction of the product and dissemination of information embodied in the product. | Taken into account - text revised to include suggested sentence. |
| 6805 | 13 | 41 | 18 | 41 | 21 | Add the following phrase after the words "GHG-reducing technologies": Apart from the intellectual property regime remedying the problem of public goods, producers of innovative products can internalize some of the benefits of their research efforts by requiring purchasers to enter into long term contracts and licensing agreements that prohibit reproduction of the product and dissemination of information embodied in the product. | Taken into account - text revised to include suggested sentence. |
| 7789 | 13 | 42 | 17 | | 25 | In addition to the current description on the options which contribute to technology transfer, also address that international public-private partnership by sector played an important role for technology transfer.<br>(Okazaki and Yamaguchi, “Accelerating the transfer and diffusion of energy saving technologies -steel sector experience-lesson learned. Energy Policy 39,pp.1296-1304, 2011) | Taken into account - text revised and reference added |
| 8774 | 13 | 42 | 18 | 42 | 31 | There is extensive analysis of the contribution of the CDM to technology transfer. Most analyses are based on statements in the project documents. Technology Transfer and the<br>Clean Development Mechanism (CDM), Erik Haites, Grant A. Kirkman, Kevin Murphy and Stephen Seres, Chapter 9 of Ockwell and Mallett, eds., Low-Carbon Technology Transfer, Routledge, 2012 is the mosrt recent publication, but an updated paper will appear in a special issue of Climate Policy on technology transfer in 2013.<br>A second approach is to use duplicate papetnts as a measure of technology transfer via all channels and then test whether CDM makes a significant contribution. Hascic and Johnstone, CDM and international technology transfer: empirical evidence on wind power, Climate Policy, v. 11, n. 6, 2011, pp. 1303-1314 applies that approach. | Taken into account - reference added to 13.13. |
| 6121 | 13 | 42 | 25 | 42 | 25 | After "World Bank, 2008a)", add the following sentence. "It is also noteworthy that international public private partnership by sector played an important role for technology transfer (Okazaki and Yamaguchi 2011)". For citatione purpose, refer to Okazaki T, Yamaguchi M (2011) Accelerating the transfer and diffusion of energy-saving technologies steel sector experience – lesson learned. Energy Policy 39:1296–1304 | Taken into account - text revised and reference added in section 13.9.4.1. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3267 | 13 | 42 | 26 | 42 | 31 | This paragraph on the UNFCCC and TT should be updated to better reflect the current state of the negotiations on technology transfer, which have in fact moved beyond calling on "developed countries to finance the transfer of technology to developing countries" in the context of the technology mechanism agreed to in the Cancun Agreements that establish a Climate Technology Center and Network. [Note that as this is mentioned in chapter 14 reference could instead be made to 14.3.3.2.] Would suggest also adding a few lines clarifying the role of the private sector vs. governments in technology transfer in the context of international cooperation and agreements, so as to frame the following section. | Taken into account - reference added to 14.3.3.2, and discussion of role of private sector is already in several places in 13.9. |
| 18019 | 13 | 42 | 27 | 42 | 27 | More language be reflected including Art. 4.5 of the UNFCCC request the Annex II developed countries to " shall take al practicable steps to promote, facilitate and finance, as appropriate , the transfer of, or access to, environmentally sound technologies and knowhow to other Parites, particularly developing country Parties, to enable them to implement the provision of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties…" to reflect the nature of legally binding obligation for Annex II in this regard. | Taken into account - text revised in 13.9.3.2 2nd paragraph by using the word 'mandates' and adding direct quote from Article 4.5. |
| 11469 | 13 | 42 | 27 | 42 | 27 | The UNFCCC did not merely "called on developed countries to finance the transfer of technology to developing countries." Rather, under Art. 4.5 of the UNFCCC, developed countries listed in Annex II of the UNFCCC "shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and knowhow<br>to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties…." (emphasis added). The treaty language is mandatory (i.e. "shall") rather than discretionary (which is what the "called on" formulation in line 26 implies). | Taken into account - text revised in 13.9.3.2 2nd paragraph by using the word 'mandates' and adding direct quote from Article 4.5. |
| 13599 | 13 | 42 | 35 | | 38 | the focus is on intergovernmental initiatives -- which while important in some cases e.g. like Lewis (2010) on China Watson et al. (2011) also on China echo this view http://www.sussex.ac.uk/sussexenergygroup/research/growthinnovationdevelopingcountries/ukindiacollaborationjim in Phase II India they didn't play much of a role - in that case study suggesting a disconnect between govt-sanctioned endeavours and what's happening on the ground (Mallet et al (2009) | Taken into account - text revised to include reference to private-public partnerships 13.9.4.1 and in response to comment 902. Also role of private sector is discussed frequently in 13.9 |
| 8197 | 13 | 42 | 8 | 42 | 9 | Might also cite M Levi, E Economy, S O'Neil, and A Segal, "Energy Innovation", CFR Study, 2010. | Rejected - not refereed publication. |
| 3266 | 13 | 42 | 8 | 42 | 12 | The text says that "research to examine the role of IP rights in the specific context of climate-friendly technologies has been limited, but the Barton 2007 article draws upon several such original studies which could be examined in closer detail here. There have also been several since 2007 including studies looking at technology transfer in the wind industry to China, India and South Korea (Lewis, J. Building a National Wind Turbine Industry: Experiences from China, India and South Korea, Intl. J.Tech. and Globalisation 5:3.4: 2011, pp281-305) and in Chile (Pueyo, A. The Role of Technology Transfer for the Development of a Local Wind Component Industry in Chile, Energy Policy 39:3: 2011, pp 4272-4283) which may be relevant to this section. | Taken into account - text revised by adding clarifying phrase and adding three refereed journal articles. |
| 13598 | 13 | 42 | 8 | | 12 | Just to also highlight other studies -- (Comment 34) you'll see in Phase II (Mallett et al. 2009) a few more noted including Harvey (2008) a http://www.sussex.ac.uk/sussexenergygroup/documents/decc-uk-india-carbon-technology-web.pdf. And you'll see references in Chapters 5 and 6 of Ockwell and Mallett (eds) (2012). Krishna Ravi Srinivas has published other work in this area - most recently on agriculture to do with adaptation www.sawtee.org | Rejected - additional suggested references not needed. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4005 | 13 | 42 | 8 | 42 | 12 | I would like to emphasize that there might of course be problems in further technical development, if there is a key patent which cannot be bypassed. However, international patent law provides for the application of "dependent" patents, which openly admit that the key technology must be used, but, however, can comprise additional features for the technical development, which might make the key invention even more valuable. Very brought patents as mentioned in line 11 are typically reduced to a significantly smaller scope once it comes to discussions on the validity of such patents within annullity actions or infringement cases. Thus, this wording is, in my eyes, a bit too general. | Taken into account - text revised by adding phrase to clarify distinction in comment. |
| 11105 | 13 | 42 | 8 | | | (1) Please explain the reason whty research on IP's role in climate-friendly technologies is limited. To my understanding, it is because most of the related studies, including Barton (2007) cited in this section, only analyze selected cases qualitatively and do not provide quantitative econometric evidence.<br>(2) In addtion to Barton 2007, it may be useful to mention other studies and categorize them into three (a)studies that implies that IPRs are not significant barrier on technology transfer (Barton 2007, Copenhagen Economics 2009, Lewis 2007, Ueno 2009), (b) studies that implies that IPRs actually or potentially prevent technology transfer (South Centre 2009, Ockwell 2008), (c) studies that says it is inconclusive whether IPRs prevent technology transfer (UNEP/EPO/ICTSD 2010). Full citations are as follows:<br>Copenhagen Economics (2009). Are IPR a barrier to the transfer of climate change technology?, Copenhagen: Copenhagen Economics.<br>Lewis J. (2007). Technology Acquisition and Innovation in Developing World: Wind Turbine Development in China and India. Studies in Comparative International Development 42, 208-232.<br>Ueno T. (2009). Technology Transfer to China to Address Climate Change Mitigation. Resources for the Future Issue Brief 09-09. Available at: http://www.rff.org/RFF/Documents/RFF-IB-09-09.pdf.<br>South Centre (2009). Accelerating Climate-friendly Technology Innovation andn Transfer to Developing Countries: Using TRIPS Flexibilities under the UNFCCC. SC/IAKP/AN/ENV/1, Geneva, Switzerland: South Centre.<br>Ockwell D. (2008). UK-India Collaboration to Overcome Barriers to the Transfer of Low Carbon Energy Technology: Phase 2, Intellectual Property Rights and Low Carbon Technology Transfer to Developing Countries - A Review of the Evidence to Date.<br>UNEP, EPO, and ICTSD (2010), “Patents and clean energy: Bridging the gap between evidence and policy,” UNEP, EPO, and ICTSD. | Taken into account - text revised by adding clarifying phrase and adding three refereed journal articles. |
| 7413 | 13 | 42 | 17 | 42 | 31 | Also cite literature arguing that strict enforcement of IP policies creates a barrier to technology transfer to developing countries by increasing the cost of licensing . | Taken into account - text revision in response to comments 877 and 878 (i.e. new paragraph added at end of 13.9.3.1 |
| 16049 | 13 | 42 | 18 | 42 | 31 | need to elaborate more on technology transfer under the UNFCCC, incl. the current status of TT, the gap and means of bridging the gap. | Taken into account - text revised by adding sentence at end of 13.9.3.2 and |
| 17678 | 13 | 42 | 31 | | | After this section, I missed some evaluation: Are the 6 bio. US-$ enough? What else is needed for effective technology transfer? | Taken into account - text revised by adding sentence at end of 13.9.3.2 and |
| 13600 | 13 | 43 | | | | wondering if it would be helpful to flag the difficulty in trying to measure innovation / that R&D is still considered to be a key metric in which to do so | Noted. Innovation and R&D are relevant but not for this chapter. The comment is suggested to be sent to Chapter 5 or |
| 10216 | 13 | 43 | 18 | 43 | 20 | Was that goal reached? | Taken into account - text revised to include actual amount achieved relative |
| 8198 | 13 | 43 | 34 | 43 | 36 | Why is capacity building only useful to developing countries? | Accepted - text revised. |
| 13648 | 13 | 43 | 34 | | | This section ignores the potential for institution and capacity building for price based measures. For example, countries with solid tax administration measures could assist other countries in adopting exise taxes on carbon. Likewise there are bilaterals on the development of cap and trade measures. | Rejected - outside the scope of this chapter. The focus here is not on the capacity building for a specific |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 6350 | 13 | 43 | 35 | 43 | 39 | This sentence is not exact. Indeed, Article 10e of the Kyoto Protocol mentions explicitly "national capacity building". More important, although the Climate Convention does not mention explicitly capacity building, articles 4.1 (i) and Article 6 address education and training that are constitutive elements of capacity building. These articles also set the grounds for the further elaboration of capacity building in COP decisions, including the Marrakech accords. (Marrakech accords are part of the many decision adopted by the Parties in the UNFCCC and not something independient). | Accepted - text revised and combined with comments #908-912. |
| 4977 | 13 | 43 | 36 | | 39 | As a matter of fact: already UNFCCC: Art. 4.5 "support the development and enhancement of endogenous capacities", KP Art. 11/1 endorsing that provision. These were the initial general sources of reference for c.b.; there were two more specific areas, namely, for observations-research and education-awareness (that is the Art.10.e of KP). That is true that the Marrakech Accords introduced the details for addressing with this item. | Accepted - text revised and combined with comments #908-912. |
| 7136 | 13 | 43 | 36 | 43 | 37 | Convention do mention capacity building under the functions of the SBSTA, see Article 9 2.d | Accepted - text revised and combined with comments #908-912. |
| 16954 | 13 | 43 | 37 | | | I thought that both UNFCCC and Kyoto contained substantial articles and processes that could only be interpreted as “capacity building”?<br>IN this broad area, an important source of analysis of industry internaitonal flows and policy options are the Carbon Trust reports, Tackling Carbon Leakage: specific approaches in a world of unequal carbon prices (2010); and Global Carbon Flows (2011). The former suggests an evolutionary approach to international strategy that delineates in part along sectoral lines. □ | Accepted - text revised and combined with comments #908-912. |
| 12554 | 13 | 43 | 37 | | | The claim is made here that capacity building is not referred to in the UNFCCC or Kyoto Protocol. Article 9(2)(d) of the UNFCCC provides that the Subsidiary Body on Scientific and Technological Advice (SBSTA) shall “Provide advice ... on ways and means of supporting endogenous capacity-building in developing countries.” In the Kyoto Protocol, Article 10(b)(2) provides that non-Annex I Parties “shall seek to include in their national communications, as appropriate, information on programmes which contain measures that the Party believes contribute to addressing climate change and its adverse impacts, including the abatement of increases in greenhouse gas emissions, and enhancement of and removals by sinks, capacity building and adaptation measures.” Section 10(e) provides that all Parties shall “[c]ooperate in and promote at the international level, and, where appropriate, using existing bodies, the development and implementation of education and training programmes, including the strengthening of national capacity building, in particular human and institutional capacities and the exchange or secondment of personnel to train experts in this field, in particular for developing countries, and facilitate at the national level public awareness of, and public access to information on, climate change. Suitable modalities should be developed to implement these activities through the relevant bodies of the Convention, taking into account Article 6 of the Convention.” The extensive inclusion of programmatic work on capacity building in the Bali Action Plan and subsequent decisions was not therefore plucked out of thin air as the current draft language implies. | Accepted - text revised and combined with comments #908-912. |
| 6351 | 13 | 43 | 40 | 43 | 45 | The statements of this paragraph are not supported by any bibliographic cite. | Taken into account - additional references incorporated throughout |
| 11577 | 13 | 43 | 40 | 43 | 45 | Reference to chapter 4 about response capacity. | Accepted - text revised. |
| 10957 | 13 | 43 | 11 | 43 | 33 | Confer: Torvanger and Meadowcroft (2011), The political economy of technology support: Making decisions about carbon capture and storage and low carbon energy technologies, Global Environmental Change, 21(2), 303-312. Confer also: Fischer, Torvanger, Shrivastava, Sterner, Stigson (2012), How should support for climate-friendly technologies be designed?, Ambio, 41(Suppl. 1), 33-45. | Taken into account - text revised and references added at end of 13.9.4.2 end of 1st paragraph. |
| 15394 | 13 | 44 | | | | see separate file: "wdavidmontgomery - general comments on chapter 13 p44.doc" | The file suggested need to be checked but the revisor has not seen it. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8199 | 13 | 44 | 18 | 44 | 19 | "capacity-building agents know what works": I doubt that this is always true. | Accepted - text revised by introducing the original sentence in the reference |
| 6353 | 13 | 44 | 2 | 44 | 3 | The statement summarizing the views of Armitage, 2005; J.Barnett, 2008) needs to be exapanded. As it stands now is contradictory and does not provide information to the reader to understand the | Noted - Section 10 has been heavily revised, but this specific revision will be |
| 11470 | 13 | 44 | 25 | 44 | 25 | The assertion that the "climate regime provided capacity-building support to create an enabling environment …" is not supported by any empirical evidence or studies. In the context of the UNFCCC negotiations in relation to climate change actions-related capacity-building, there continues to be multilateral consensus among UNFCCC Parties that "gaps still remain in addressing the priority issues identified in the framework for capacity building in developing countries as contained in decision 2/CP.7" (see UNFCCC COP decision 13/CP.17) – i.e. that the support for capacity building provided by Annex II Parties continues to fall far short of what the expressed needs for capacity building are under the UNFCCC. | Accepted - text revised. |
| 6354 | 13 | 44 | 26 | 44 | 29 | The process of developing and implementing NAPAs by LDC and the preparation of national communications of developing countries supported by the Consultative Group of Experts from have been very important in enhancing capacity building on adaptation and mitigation in developing coutries. Consider to mention these two element that have been more instrumental in enhancing capacity building in developing countries. | Accepted - text revised for the first case. However, reference papers on the preparation of national communications of developing countries supported by the |
| 10217 | 13 | 44 | 29 | 44 | 32 | "require patience" is mentioned twice in this sentence | Accepted - text revised. |
| 6355 | 13 | 44 | 33 | 44 | 34 | Capacity building for REDD+ has also been important in supporting mitigation. | Accepted - text revised. |
| 4978 | 13 | 44 | 33 | | | It did not solely focused on CDM, but e.g. also to assist to monitor the ghg-emissions at national level, to develop national mitigation policies (lately the NAMAs, as already correctly referred to at the end of this para.). | Accepted - text revised. |
| 16391 | 13 | 44 | 33 | 44 | 34 | It could be argued that capacity building has focused on much more than setting up DNAs. Notably World Bank initiatives such as Carbon Market Dialogue but also many developed country initaitves working on emissions inventories, specific emissions factors in developing countries, devleoping robust national baseline scenarios (eg search for Danish Energy Agency baselines workstream) | Accepted - text revised. The World Bank's role has been referenced. However, refercenced papers on developed country initiatives on |
| 5688 | 13 | 44 | 1 | 44 | 8 | I do not see the connection between the social change theory discussed in this paragraph and any capacity-building designed to address climate change. In addition, the paragraph is very confusing. It seems to be referring to development aid, and suggests that such aid (1) cannot be expected accomplish development; and (2) can be effective under certain conditions. But what is the measure of development aid effectiveness, if not development? How is this relevant to aid targeted at climate change mitigation or adaptation? | Taken into account - Section 10 heavily revised |
| 5689 | 13 | 44 | 9 | 44 | 23 | Similar to lines 1-8, this paragraph just does not make sense here. By definition, investments in capacity-building for climate mitigation or adaptation would have an externally-imposed goal -- climate mitigation or adaptation. How would one operationalize "collective reflection, struggle and engagement with power relations" with respect to these goals? | Accepted - text revised by adding two explanation sentences in the papagraph, one at the top and one at the end, to facilitate understanding the meaning of |
| 16241 | 13 | 44 | 32 | | | Suggest adding the following two sentences at end of paragraph: "The most important source of multilateral funding for adaptation is the Global Environment Facility. Donations to its adaptation funds have been insufficient and, in general, demand for adaptation financing far exceeds the supply (Global , 2010, p. 89). The situation should improve with the newer Adaptation Fund, which is financed mainly by a tax on certified emission reduction credits generated under the CDM." Reference is to: GEF (2010). OPS4: Progress toward Impact. Global Environment Facility Evaluation Office, Washington, D.C. Available at http://www.thegef.org/gef/OPS4. | Noted. This section is on capacity building issue within the climate regime context. However, the comment is on financial issue and beyond the scope of this section. Therefore, it is suggested that this comment be sent to Chapter 16 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17096 | 13 | 45 | | | | the statement "international cooperation has brought about political agreement on limiting global temperature increase to no more than 2 degrees C above pre-industrial levels" is not factually correct. The Cancun Agreement specified that this will be achieved in conjunction with equitable access to sustaianble development. Ignoring the equity dimension of the negotiations around international cooperation is a serious gap in this chapter and affects other sections also. The differnt approaches in terms of burden sharing and resource sharing need to be specified. Please see my articles in 'Climate and Development' and 'Climate Policy'. | Taken into account - text has been completely restructured |
| 2170 | 13 | 45 | 11ff | | | Mabe some distinction could be made between Green Climate Fund (GCF) and the 100bn USD pledge (Cancun). At least it should be better explained how GCF and 100 bn USD pledge are related (and that they differ). | Taken into account - GCF now covered in section 13.11.1 .1 on UNFCCC-related vehicles, while 100 billion is |
| 8775 | 13 | 45 | 12 | 45 | 17 | Buchner, B., Falconer, A., Hervé-Mignucci, M., Trabacchi, C., Brinkman, M. (2011a) The Landscape of Climate Finance, A CPI Report, 27 October 2011 provides an essential overview of current climate finance. | Accepted - now cited in the intrduction (albeit full coverage only in Ch. 16.2.2.2) |
| 4980 | 13 | 45 | 20 | | | {Add} "Financial support is provided {}primarily to developing countries under .. ~ some GEF and SCCF sources can also directed to EiTs (and indeed there were quite a few such GEF-funded projects). | Accepted, - countries in transition now mentioned as possible recipients in |
| 8776 | 13 | 45 | 20 | 45 | 30 | Climate finance has no agreed definition, either overall or under the UNFCCC. Buchner et al estimate current climate finance at $97 billion per year. Under the UNFCCC Annex II Parties can provide finance through bilateral and multilateral channels. The last summary (UNFCCC, 2011) of Annex II reports of climate finance provided for the 6 years from 2005 through 2010 totalled $58.4 billion, an average of just under $10 billion per year. The funds mentioned in this paragraph are operating entities of the financial mechanism of the UNFCCC. The funds disbursed by those entities is less than $1 billion per year. In short climate finance under the UNFCCC is about 10% of total climate finance and climate finance channeled through the operating entities of the UNFCCC is less than 1% of total climate finance. | Taken into account - literature on definition of climate finance now cited. Numerical estimates of climate finance are covered in Ch. 16.2.2.2. |
| 2172 | 13 | 45 | 21 | 22 | | Maybe there should also be an explanation about the "development" aspects of SCCF and LDCF. | Rejected - discussion at this level of detail would blow up the text beyond the |
| 2171 | 13 | 45 | 25 | | | I suggest replacing "focusing on mitigation" by "focusing on global benefit augmentation". The GEF funding has global benefit orientation but is not only dedicated to climate but also to other fields (biodiversity etc.). | Taken into account - text has been fully restructured |
| 13193 | 13 | 45 | 28 | | | I suggest removing all the text after "Cancun" (line 28) and include the following: "…Cancun and launched at COP-17 in Durban. The GCF is linked to the commitment by developed countries to jointly mobilise $100 billion per year by 2020. At present, the Fund is preparing to begin operations. Together with the long term financing commitment, developed countries also committed to provide new and additional resources through existing international institutions, approaching $30 billion for the period 2010-2012. This short term pledge is known as “Fast-Start Finance”. | Taken into account - FSF and 100 billion now mentioned in introduction to section 13.11.1 |
| 7378 | 13 | 45 | 28 | 35 | 30 | In referencing "fast start financing" it would be useful to be explicit to the extent to which that represented "repackaged" ODA rather than new finance, as was detailed in the ACPC report of 2011, http://new.uneca.org/Portals/acpc/documents/Fast-Start-Finance-lessons-for-long-term-climate-finance-under-UNFCCC.pdf | Taken into account - question of new and additional covered in introduction to 13.11 |
| 6050 | 13 | 45 | 37 | 45 | 45 | It would nice to see something like this in the previous section. | Rejected - due to lack of clarity |
| 6356 | 13 | 45 | 38 | 45 | 38 | Delegated by whom? Not clear the meaning of the cited statement. | Taken into account - problematic text |
| 4979 | 13 | 45 | 4 | | | There was a rather significant multiyear program reaching very many countries by GEF addressing the national institutional capacities for the "Rio Conventions": "National capacity self-assessment for global environmental management (NCSA)" | Noted - discussion of the GEF in Section 11 has been revised |
| 6357 | 13 | 45 | 43 | 45 | 48 | This cited statement needs to be expanded. It is not clear for the readers the reasons behind. | Taken into account - text moved into section 13.11.2 on private finance and linked toquestion whether public |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13928 | 13 | 45 | | 47 | | This section should emphasis the necessity 1) to analyse the impacts of financing decisions, 2) to reallocate budget and redirect investments (instead of looking for new money). See for example for transportation sector Sakamoto, K., Dalkman, H., Palmer, D., 2010, A paradigm shift towards sustainable low-carbon transport. Financing the vision ASAP, ITDP | Rejected - section 13.11 does only look at international collaboration for financing, not the sector-specific impacts. These are discussed in |
| 10820 | 13 | 45 | | | | Somewhere in this section it would seem to be important to have a discussion on the tricky concept of financial additionality, the demand from some countries that climate finance not represent a deviation of funds fromd development expenditures, and the tricky conceptual and implementation issues this poses. | Taken into account - Stadelmann et al. (2011) discussion on baseline definition quoted in the introduction, and |
| 16392 | 13 | 45 | | | | This section is very important and deserves to be beefed-up and made more comprehensive. I would bring current section 13.11.4 right to the front - that is the crux of the issue, notably the important role of private sector capital, and how to leverage it effectively with public funds. A good reference to introduce the section could be Buchner et al. (2011), The Landscape of Climate Finance http://climatepolicyinitiative.org/wp-content/uploads/2011/10/The-Landscape-of-Climate-Finance-120120.pdf . In general would be good to highlight when you are talking about finance (structures to provide funding for upfront capital etc) and when you mean funding (the money flow itself). See my specific comments on subsections that follow | Taken into account - section deleted and relevant material shifted into the introduction. Buchner (2012) now cited, but the full coverage of that report is now in Ch 16.2.2.2 - thus not duplicated here. |
| 13930 | 13 | 45 | 11 | 47 | 39 | This section should mention the emergence of carbon markets at the local level (Local Emission Trading Schemes) and their links with regional carbon markets. See Kolher, G., Lefevre, B., 2011, Cities and Emission Trading Schemes, A comparative analysis, jointly, International Journal of Global Energy Issues, special issue "Carbon Markets: An International Perspective", vol 35, n°2/3/4 | Rejected - the reference is not relevant for international finance. It may be relevant for Ch. 15 |
| 12816 | 13 | 45 | 11 | | | The structure of subsection 13.11 is not clear because different dimensions of structuring the issue are used: subsections 13.11.1 and 13.11.2 refer to multilateral vs. bilateral climate finance while 13.11.3 refers to private sources of finance; lastly, subsection 13.11.4 provides a general overview about public and private finance of mitigation and adaptation. It would be better to follow a general structure (public vs. private flows), and create further subsections which deal with, e.g. bilateral vs. multilateral public sources. The structural relationship of subsection 13.11.4 is to be determined. As it provides an overview of public and private sources it might serve as an introductive part, i.e. at the beginning of 13.11 or 13.11.1. | Accepted - section now restructured into subsections on public and private flows, and text substantially rearranged. |
| 15665 | 13 | 45 | 12 | | 17 | The discussion of financing in the context of international cooperation would benefit from significantly elaborating the theoretical justifications for providing finance. Finance may not only create direct benefits (e.g. via low-cost mitigation in areas not suitable to market-based mechanisms) but may also create indirect benefits through generating trust in negotiations. Mitigation and adaptation finance show important differences in this regard, particularly due to their characteristics as global and primarily local / regional public goods respectively. For more on these issues see: Rübbelke, D.T.G. 2011. International Support of Climate Change Policies in Developing Countries: Strategic, Moral and Fairness Aspects. Ecological Economics 70 (8):1470-80. Indeed given the emphasis of the chapter it may make sense to focus this section (13.11) primarily on the role of finance in the context of broader international cooperation, and leave detailed discussion of funding arrangements to Chapter 16, in order to avoid overlap. | Taken into account - Reference Abadie et al. (2012) quoted regarding bias towards mitigation. Reference Rübbelke (2012) regarding adaptation financing should be covered in Working Group II.. |
| 16393 | 13 | 45 | | | | Would be good to see a fuller discussion of the GCF, higher up in the paragraph. It is likely to be much more important than the LDCF etc. Would be good to mention here too the $100bn commitment under the UNFCCC, and the difficulties with measuring and tracking progress (see Clapp et al (2012) Tracking climate finance: what and how, http://www.oecd.org/env/climatechange/50314405.pdf ). | Taken into account - 100 billion commitment now mentioned in Intro to section 13.11.1. So far no peer-reviwed literature on GCF performance exists. |
| 11471 | 13 | 45 | | 45 | | The treaty commitment of Annex II Parties to provide financing to developing countries pursuant to Art. 4.3 of the UNFCCC is completely ignored in this section, notwithstanding that such treaty commitment is the underlying multilateral policy regime basis for climate finance to take place. | Taken into account - this commitment has never been operationalized. Voluntary financing to the different |
| 17679 | 13 | 45 | 30 | | | After this section, I missed some evaluation: Was the money for the fast start finance really delivered? Was it additional? See e.g. BNEF – Bloomberg New Energy Finance (2011): Have Developed Nations Broken Their Promise on $30bn ‚Fast-Start' Finance? Bloomberg New Energy Finance White Paper. London: BNEF. | Rejected - this is covered in Ch. 16.2.2.2. However, emerging literature should be watched. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 14997 | 13 | 45 | 31 | | | This or the following section should address the World Bank's Forest Carbon Partnership Facility, which is emerging as a major locus of activity and potential funding for building capacity for implementing REDD+ strategies as well as consensus around key elements of those strategies. | Rejected - discussion at this level of detail would blow up the text beyond the allotted page volume. |
| 11594 | 13 | 46 | 1 | 46 | 35 | There should be a discussion on direct access and countries setting up insitutions to deal with climate funds | Taken into account - Section 13.11.1.1 mentions direct access |
| 6352 | 13 | 46 | 18 | 46 | 18 | This statement is valid for the Adaptation Fund only. The GEF Council does not have majority of developing countries members. | Accepted - text corrected |
| 4981 | 13 | 46 | 18 | | | GEF Council: of the 32 members 16 repr. developing countries (32=16+14+2 where 2 are from EiTs) | Accepted - text corrected |
| 15667 | 13 | 46 | 18 | | | The role of developing countries in GEF governance is not directly comparable to that under the Adaptation Fund. Whereas under the AF developing countries have an absolute majority, under the GEF developing countries have an equal number of seats (16) to the combination of "developed countries" (14) and "economies in transition" (2). Under the Green Climate Fund, economies in transition such as Russia, Poland, Hungary and the Czech Republic are classed as "developed countries", suggesting that the balance of representation under the GEF is more like the GCF than the AF. | Accepted - text corrected |
| 2173 | 13 | 46 | 25ff | | | The size of the funds (AF, LDCF, SCCF) should be stated in order to put them into perspective (against the recent funding pledges (Cancun). | Taken into account: Ch. 16.2.2.2 lists the current size of the funds |
| 15668 | 13 | 46 | 37 | | | The text could clarify that ODA is not just provided through bilateral channels, but may also be provided through multilateral channels. Indeed most of the multilateral channels referred to in the previous section (with the exception of the Adaptation Fund) are largely ODA-funded. Therefore any concerns about additionality would likewise apply to multilateral channels to the extent that they are ODA-funded. | Noted - Section 11 has been heavily revised. |
| 12555 | 13 | 46 | 40 | | | A useful reference is Robert L. Hicks, Bradley C. Parks, J. Timmons Roberts, and Michael J. Tierney, 2006. Greening Aid? Understanding the Environmental Impact of Development Assistance, Oxford University Press. | Taken into account - text on bilateral aid flows has been deleted, issue is covered in Ch. 16 .6.2.3 (albeit not with that |
| 2174 | 13 | 46 | 41 | | | With respect to the level of aid flows (mitigation) official data might be a better source?!? Or does such a source not exist (I am uncertain in this point)? | Taken into account - text on bilateral aid flows has been deleted, issue is covered |
| 15669 | 13 | 46 | 43 | | 46 | The concern about diversion of ODA is presented in a somewhat simplistic fashion. In principle it would be possible to avoid diversion as long as climate-related ODA is 'additional' to a business as usual level of ODA. Part of the difficulty is that it is practically complex to develop an accurate baseline. This is an area of public debate that is frequently muddied, and there is an opportunity for the IPCC to clarify these issues. For a nuanced discussion see: Stadelmann, M., J.T. Roberts, and A. Michaelowa. 2011. New and Additional to What? Assessing Options for Baselines to Assess Climate Finance Pledges. Climate and Development 3 (3):175-92. | Accepted- reference inserted in introduction |
| 8200 | 13 | 46 | 8 | 46 | 8 | There are formulaic approaches to allocation other than "performance based allocation". | Taken into account - Actual allocation modes of GEF and AF explained in |
| 15666 | 13 | 46 | 8 | | | Allocation of public finance may be "formulaic" without being "performance-based", e.g. if adaptation finance is allocated on the basis of a formula for vulnerability. | Taken into account - Actual allocation modes of GEF and AF explained in |
| 13194 | 13 | 46 | | | | I suggest incorporating in this Section some information about the Standing Committee, since it is another key financial outcome of the COP-16 | Rejected - discussion at this level of detail would blow up the text beyond the |
| 14998 | 13 | 46 | 1 | | | This and/or the preceding section should address the World Bank's Forest Carbon Partnership Facility, which is emerging as a major locus of activity and potential funding for building capacity for implementing REDD+ strategies as well as consensus around key elements of those strategies. The FCPF is distinctive for a decisionmaking body that includes strong representation from countries receiving funds as well as from the donors. | Rejected - discussion at this level of detail would blow up the text beyond the allotted page volume. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11472 | 13 | 46 | | 46 | | The section relating to bilateral climate finance conflates ODA with the required climate finance under Art. 4.3 of the UNFCCC. In doing so, such section reflects the practice of developed countries even if such practice is not consistent with the multilateral consensus that climate finance must be “new and additional” (see e.g. paragraphs 18, 95, 97 of COP decision 1/CP.16 and paragraph 59, and paragraphs 13 and 18(f) of Annex I, of COP decision 2/CP.17) | Taken into account - Section 13.11.1.1 addressed diversion of ODA. |
| 14999 | 13 | 46 | 36 | | | This chapter and/or chapter 16 should include discussion of the major bilateral commitments that some countries have made to climate mitigation. Norway's contributions to Brazil's Amazon Fund and to Indonesia to support REDD+ activities stand out in this regard as cases where a major bilateral investment is supporting significant mitigation activity and stimulating the development of climate mitigation policy and practice across an entire sector. | Taken into account - these aspects are covered in Ch. 16, as Ch. 13 will only cover fully international collaboration. |
| 12818 | 13 | 47 | 18 | 47 | 35 | The sentence of p. 35 ll. 18f. is repeated verbally on the same page l. 35. This might have happened because section 13.11 is not clearly structured and can be part of both subsections 13.11.3.2 (private sector flows) as well as 13.11.4 (sources of finance of mitigation and adaptation). Section 13.11 should be restructured as proposed in a previous comment. | Taken into account - text substantially restructured |
| 8777 | 13 | 47 | 2 | 47 | 14 | The revenue generated by the sale of CERs is estimated using the quantity of CERs transferred from the CDM registry - transferred to the buyer - and information on CER prices. Over 750 million CERs had been transferred from the CDM registry by the end of 2011. This was over 92 per cent of the CERs issued over the same period. The total revenue from the sale of CERs is at least $9.5 billion (primary market prices) and could be as high as $13.5 billion (secondary market prices). | Taken into account - numerical information on different instruments is covered in Ch. 16.2.2.2 |
| 10821 | 13 | 47 | 22 | 47 | 25 | This discussion of export credit agencies needs a sentence or two more to show how significant these agencies are to the landscape of finance, and the challenges of governing them and coordinating their functioning. Since AR4 the new challenge is the rise of ECAs outside the OECD, and therefore outside the OECD's Export Credit Arrangement, the existing governing mechanism. See Christopher Wright, Export Credit Agencies and Global Energy. Vol 2, special issue (September 2011). | Taken into account - ECAs are not an issue of international collaboration. Therefore, text has been deleted. |
| 8201 | 13 | 47 | 25 | 47 | 25 | Not everyone agrees that MBD efforts lack legitimacy. I would write "some argue…" | Taken into account - text has been |
| 18244 | 13 | 47 | 41 | | | “international responses to climate change depend on private sector action”, can have prescriptive interpretation. International response to climate change is part of a global effort of States within the framework of an international instrument, the United Nations Framework Convention on Climate Change (CMNUCC), and the international response will depend of the fulfillment of responsibilities and obligations established in this instrument, particularly the commitments of the Parties which are an Annex of the Convention. | Taken into account - text has been substantially rephrased. |
| 18021 | 13 | 47 | 41 | | | The reference that “international response to climate change depend on private sector again” is not consistent with the international agreement as well as the reality. | Taken into account - text has been substantially rephrased. |
| 18020 | 13 | 47 | 41 | 47 | 41 | Incorrect statements regarding the UNFCCC ‘s status. UNFCCC is widely recognized as the primary multilateral institution and center channel for climate negotiation as well as major forum for international cooperation. | [draft single response will be made in line for comment #983] |
| 16395 | 13 | 47 | 41 | 48 | 11 | This intro para is written as though the private sector are enemies of the climate "regime". Would be better to reprhase this in terms of economic incentives - the private sector recognises and responds to long-term trends in regulatory changes, as well as short-term regulatory requirements. | Taken into account - text has been substantially rephrased. |
| 11474 | 13 | 47 | 41 | 47 | 41 | The statement that “international responses to climate change depend on private sector again” implicitly shifts the legal obligation to spur climate change action away from States (where such obligation is currently located under the UNFCCC) to non-State actors. This could create questions of legal and policy accountability, considering that the locus of such obligations would then become diffused given the large number of private sector actors. It furthermore disregards the essential role that State regulation can play in terms of shaping private sector actions and activities. | Taken into account - text has been substantially rephrased. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 8202 | 13 | 47 | 43 | 47 | 44 | "private companies will generate most of the investment…." Not obvious that this is true given the large role of SOEs in some major emitters. | Taken into account - text has been substantially rephrased. |
| 6358 | 13 | 47 | 9 | 47 | 14 | The reference supporting this statement is missing. | Accepted - taxt deleted |
| 12817 | 13 | 47 | | | | There is little message, here. In case you have to shorten the chapter, you may find potential, here. | Accepted- text shortened significantly |
| 16394 | 13 | 47 | | | | This section would benefit from restructuring and expanding: call it Private sector finance. Market mechanisms should just feature as one mechanism governments have used to increase private sector action, rather than appearing on an equal footing with "private sector flows". Para on private flows (13.11.3.2) needs much more detail (eg sentences such as "financing will follow if policy makers continue to focus on climate change" need substantiating). More importantly, the discussion should be based around a discussion of how public finance can leverage the necessary finance flows, see Buchner et al and Clapp et al refs above. Socially responsible investment is just a small part of the funding pool that could contirbute to climate finance. See Kaminker et al (2012), Role of institutional investors in financing clean energy http://www.oecd.org/sd-roundtable/publications/50363886.pdf | Accepted - text restructured; sub-sections deleted. |
| 7414 | 13 | 47 | 15 | 47 | 25 | Under market based mechanism private sector flows will be directed to activities that result in highest returns, which may not be the activities that have the highest return from climate perspective. This makes comment 18 above more compelling inrelation to the role and scope of private sector financing to climate change. | Taken into account: leverage discussion added in section 13.11.2 |
| 11473 | 13 | 47 | | 47 | | This entire section relating to market mechanisms and private sector flows confuses the role of market mechanisms and private sector investments in climate change-related activities as climate finance under the UNFCCC. Private sector investment in carbon markets or in climate change-related activities are not climate financing that falls under Art. 4.3 and Art. 11 of the UNFCCC. Carbon market private sector investments, for example, such as the provision of financing in projects that generate carbon credits that can then be sold in the carbon markets are not climate financing but rather compensatory payments to the host country for assisting the investor's country in meeting its mitigation commitments by having the host country undertake emission reductions on behalf of the investor's home country. By conflating private sector climate-related investments as equivalent to Annex II Parties' climate financing, this section gives that impression that Annex II Parties may then comply with their treaty commitments on climate financing by taking the credit for their private sector's investments in climate activities in developing countries. | Rejected - the introduction to section 13.11. now specifies clearly that there is no universally accepted definition of climate finance. Section 13.11.2 provides the literature on leveraging private sector investment through different types of climate finance flows. |
| 7415 | 13 | 47 | 26 | 47 | 39 | Assess the adequacy of climate financing in view of the requirements (Copenhagen Accord) that such funding be additional, new, adequate,and predictable and the extent to which private finance may satisfy these requirements. | Taken into account - new and additional issue covered in the introduction to section 13.11 |
| 15670 | 13 | 47 | 27 | | 39 | The discussion of potential financing sources is extremely superficial and is perhaps best omitted and cross-referenced to the more extensive discussion in 16.2.3. | Taken into account - section deleted and references to Ch. 16 made in the |
| 15000 | 13 | 47 | 40 | | | Given the interest that has emerged in private sector contributions to international climate finance (governments have referred to private sector contributions as important to meeting the $100 billion pledged in annual climate finance for 2020), it would be particularly interesting if this section could provide some additional thinking about various means of stimulating private sector finance. | Some ideas on stimulating private sector finance have been added |
| 5691 | 13 | 47 | 40 | 49 | 9 | Some of the material in section 13.12 overlaps with the discussion in section 13.5.2. It is not clear to me which is the better place for the discussion of certification schemes, etc., but can these sections be combined and shortened? | Links with Section 13.5 made to avoid repetition |
| 3180 | 13 | 47 | 1 | | | section 13.13 is the most crucial section of this chapter but not possible to review at this stage. The material on CDM is repetitive from before. I worry about leaving 13.13 to the SOD when this is likely to be the most radioactive part of the chapter. | Comment not relevant to this sections |
| 6122 | 13 | 48 | 19 | 48 | 19 | Add after "McGee and Taplin, 2009" the following literature. " (Okazaki and Yamaguchi 2011)". For citatione purpose, refer to Okazaki T, Yamaguchi M (2011) Accelerating the transfer and diffusion of energy-saving technologies steel sector experience – lesson learned. Energy Policy 39:1296–1304. | The reference has been addded, since the paper is relevant and looks at the steel sector. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6123 | 13 | 48 | 20 | 48 | 20 | Add after "Fujiwara, 2012" the following literature. " (Okazaki et al. 2012). For citation Okazaki, T., Yamaguchi, M., Watanabe, H. Ohata, A., Inoue, H. Amano, H. (2012), Technology Diffusion and Development. In: Climate Change Mitigation, A Balanced Approach to Climate Change. M. Yamaguchi, (ed.), Springer, London pp. 179-221. | This reference has not been added as the comment does not suggest any new element highlighted by the literature |
| 9522 | 13 | 48 | 27 | 48 | 30 | Please, replace the whole paragraph with the following; International PPPs have a significant role to facilitate development and commercial deployment of low carbon technologies as governments remove barriers to the entry and provide stakeholders with new business frameworks and industries also demonstrate leadership through active involvement with regards to their technologies, investments and know-how. (ETP 2010, p52 and p469) | Elements of the proposed sentence have been merged with existing text and referenced. The reference has been included. |
| 6359 | 13 | 48 | 38 | 48 | 41 | This statement is valid for the voluntary carbon market, but not (at least entirely) for the carbon market supported directly by UNFCCC. The main registry for emission trading, CDM and Joint Implementation exchanges are based on the internatinal transactional log, that is not governed by private sector actors or NGOs. | The sentence has been rephrased accordingly |
| 4244 | 13 | 48 | 9-11 | | | The last sentence of this paragraph implies a connection that is not obvious. The setting of a target, especially if it is aspirational, does not have any necessary connection with the commitments of the "largest international companies." However, if governments have indeed taken action to internalize the externality, such as in a cap-and-trade system or a carbon tax, it is a matter of enforcement and not "commitment" by large international companies. Moreover, to the best of my knowledge, where carbon taxes have been implemented (Norway) or cap-and-trade systems instituted (EU ETS), I don't know of any cases in which large multinational companies are out of compliance in not paying the tax or surrendering permits. | This section has been accordingly been modified |
| 16396 | 13 | 48 | | | | This sub-section is interesting as it is but would benefit from further para on PPPs introduced to construct and maintain infrastructure in various countries, as this could be important for green investment (see Corfee-Morlot et al (2012 forthcoming), Towards a Green Investment Policy Framework: the Case of Low-carbon Climate-Resilient Infrastructure. | Within the space limits, this section has been strengthened and a figure included from the suggested author |
| 6790 | 13 | 48 | 26 | 48 | 27 | Suggest to add the following text: "At the same time, Public-Private-Partnerships have also been adapted to suit rural energy needs. For instance, United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) promotes the Pro-Poor PPP (5P) approach to power rural areas using locally available renewable energy resources" | A few words were included to this effect. |
| 16397 | 13 | 48 | | | | The title of this subsection is a bit misleading, perhaps " private sector-led initiatives" instead. Also, whilst CDP is an excellent initiative, it is not an example of institutional investors requiring reporting | The title has been amended as recommended. The text on the CDP has |
| 11694 | 13 | 49 | 10 | 52 | 11 | I feel in this section, the structure of the sub-secion is not very clear, why pick CDM, Cancun Agreements, Kyoto Protocol and policies outside of UNFCCC, it is not clear to me what are the criteria to choose these sub-tier contexts, for instance, why not EU ETS included, why CDM, and CDM is also part of the Kyoto Protocol flexible mechanisms? | Noted - all issues are covered and broken into subsections for clarity and based on the size of the available literature. The ETS is covered in |
| 8204 | 13 | 49 | 20 | 49 | 20 | "induced by": How does one determine which reductions were induced by the KP and which would have occurred anyhow? | Taken into acocunt - text revised |
| 9310 | 13 | 49 | 27 | 50 | 11 | I fully recognize that CDM is one of the international offset mechanisms to facilitate clean technology transfer from developed country to developing country. However, in spite of high potential projects to reduce the CO2 emissions, CER acquired by the cement industry is only less than one per cent of all CER from CDM projects due to severe definition of "Additionality". Therefore, it is absolutely unattractive for the cement industry. (https://cdm.unfccc.int/UserManagement/FileStorage/HT5JLR43VZ12BUFQ0XKMCW7OP9IDS6) | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 11475 | 13 | 49 | | 49 | | While firms are legally accountable to States only in the jurisdictions in which they are registered and legally recognized as juridical persons, the statement that “direct regulation of firms at the international level is unavailable” is not necessarily accurate. Firms can be regulated at the international level if, for example, a sufficient number of States agree to common regulatory frameworks in relation to corporate activities that they would then implement at the national level using common modalities or policies. By outright dismissal of such possibilities for international regulation, the statement implicitly downgrades the possibility of using the UNFCCC, for example as the framework through which multilateral regulation of corporate activity in relation to climate change can take place. | Noted - this comment is too detailed for the length of the chapter. |
| 9523 | 13 | 49 | 5 | | | Please, mention motivation of public sector likewise private sector, such as reduction of fiscal burden and means to stimulate economy. | Taken into account - new text prepared |
| 8203 | 13 | 49 | 10 | | | It is odd that there is a subsection devoted to Cancun but not one to Copenhagen. | Noted - The section on the Cancun Agreements is basically on the reduction proposals under the Copenhagen Accord |
| 16398 | 13 | 49 | | | | Would be good if future version of this section separated issues to do with the KP itself, from wider gobal emissions effects such as developing country emissions growing faster than expected. Could also include some text currently earlier in the chapter, eg in section 13.5. | Accepted |
| 6592 | 13 | 49 | 16 | 49 | 24 | This section is well written as an objective finding. Should not be deleted. | Noted |
| 16399 | 13 | 49 | | | | First para as it stands is not very clear, would be good to restructure to focus on where are the key areas that CDM has "worked' (renewables as well as HFC/N2O) and where it hasn't worked. Could also regroup some of the CDM anlaysis earlier in the chapter which would be relevant here instead. | Taken into account - Text adjusted. However, all empirical evidence on CDM should remain in this section, whereas |
| 2342 | 13 | 49 | | | | According to the Peter Newell et. al argument (2009), the governance in practice in CDM is rather different from the expected framework realization with good governance which provide strong state, functioning market and active, free civil society. Contrary, there are not well established good governance principles in many part of world. Under these circumstances, they identified "recipients" and "Providers" in the many countries (Newell et al. 2009:6). The “Providers” include private sectors that constitute private finance. Gold Standard of CDM, the Voluntary Carbon Standard and the Carbon Disclosure Project are significant private governance mechanism of private finance. These private governance schemes govern the CDM by adapting regulation and standards (Newell et al. 2009:10).<br>Reference:- Newell,P., Jenner, N. Baker,L.(2009) Governing Clean Development: A Framework for Analysis. Working Paper 001, The Governance of Clean Development Working Paper Series. School of International Development, University of East Anglia UK. | Taken into account: a paragraph on CDM governance exists in section 13.4.1.3 |
| 13929 | 13 | 49 | 27 | 50 | 28 | This section should mention the consensus that project-based approach such as CDM do not work for key urban sectors (such as transporta and building). See Zegras, C., 2007. As if Kyoto mattered: The clean development mechanism and transportation. Energy Policy, 35; Dalkmann, H., Stek, W., Bongardt, D., Wittneben, B., Baatz, C., 2007, The sectoral Clean Development Mechanism – A contribution from a Sustainable Transport Perspective, JIKO Policy Paper, Wuppertal Institute for Climate, Environment and Energy, Wuppertal, Germany | Taken into account - used more recent reference for CDM problems in the transport sector (Millard-Ball and Ortolano 2010) |
| 3962 | 13 | 5 | | 52 | | Overall, references to international law material and literature in the Draft Chapter 13 are very poor in spite of the fact that it is dealing with international law problems. I must say, regrettably, that this section is poorly drafted from the viewpoint of international law. | Noted |
| 8162 | 13 | 5 | 11 | 5 | 11 | Benefits of emissions reductions are distributed globally regardless whether or not there is cooperation. | Taken into account - text revised to add |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10802 | 13 | 5 | 14 | 5 | 18 | The global commons framing does indeed suggest that there is little incentive to reduce emissions in the absence of cooperation. However, in the last 5 years there has been growing efforts to construct a different framing around the complementarities between emissions reductions and other social and environmental goods. Under this narrative, countries, firms and individuals would act in the absence of an agreement. While the dominant framing remains the global commons, this alternative framing, appropriately contextualized as one on which there is NOT HIgh agreement (and indeed controversy), should perhaps also be mentioned. I am thinking here of the work of Victor, the Hartwell House document, and others. See specific cites in comments on Sec 13.2.1.1. | Taken into account - text revised to include the notion of co-benefits |
| 10798 | 13 | 5 | 18 | | | It is not always that commons face the tragedy of disapearance. According to late Nobel Laureate Dr. Elinor Ostrom in her worldwide survey, commons are not in peril when they are run by a three-parts cooperation among communites, market forces and government. She called it polycentric governance of complex economic systems. Left to markets and government ony, commons run the risk of damages and impacts. Commons linked to climate change, such as rivers, forests, fisheries, water could be run by a polycentric governance. | Noted - however this is too detailed for the ES<br><br>In Section 13.2, taken into account. The point is right. Because of space limitations we decided not to add it to the ES. However, following the comment, we have changed the litle of section 13.2.1.1 from "The tragedy of |
| 4793 | 13 | 5 | 19 | 5 | 23 | Please take care of mentionning difference between economic performance and financial performance. There is a gap between those 2 performances, which need to be overcome. It is necessary to recognise all benefits and to associate an economic value to all fo them) | Noted |
| 2262 | 13 | 5 | 2 | 52 | 42 | There is no evidence that emissions of greenhouse gases hav any harmful effect on the climate. .This information is thus not a cause for concern so the whole Chapter is unnecessary. It is also surprising that while the supposed, unproven theory relies on changes in the atmospheric concentioin of greenhouse gases. you seem here to be exclusively concerned with emissions. which are not necessarily related to concentrations | Rejected - beyond the mandate of WG III - comment refers to the science of climate change |
| 3731 | 13 | 5 | 2 | | | :synthesizes" chapter doesn't yet synthesize. At best it selectively summarizes. To "syntehsize" it will require more attention to the mechanisms associated with each of the governance approaches, and the extent to which they complement or interfere with one another. This will require a new section 13.4.4 (should be 13.4.3 with the existing 13.4.3 becoming 13.4.4) that discusses the social mechansims associated with approaches to climate change govenrnace - namely coercion, inducements, political economy market factors, norms, and learning. | Taken into account - covered in Section 13.3 and 13.4 |
| 6325 | 13 | 5 | 20 | 5 | 23 | It would be important to add that these criteria consider the principles on which the UNFCCC is based such as, "equity", " common but differentiated responsibilities and different capabilities", "precaution", "cost-effectiveness so as to ensure global benefits at the lowest possible cost" and "sustainable development". | Taken into account in Section 13.2. |
| 13651 | 13 | 5 | 26 | 5 | 27 | Modify the sentence as -- the landscape of proposed mechanisms of international cooperation on climate | Rejected - the suggested text is too |
| 13652 | 13 | 5 | 27 | | 28 | A significant literature is now devoted to studying an increasingly broad range of policies, and institutions, which span all scales of governance | Noted |
| 6326 | 13 | 5 | 30 | 5 | 40 | This comparison in the summary between three approaches without the arguments presented in the section 13.4 could be misleading in the sense that the reader can interpret that the three approaches could be equally effective. It would be necessary to mention that the strong multilateralism is perceived as the more effective way to address climate change due to characteristics of climate change. | Taken into account - with text under a new subheading at the end of the ES synthesizing Section 13.13 |
| 3733 | 13 | 5 | 30 | 5 | 32 | approaches rather than models. Some bullets indicating what they are would help, as well as a discussion of which are complementary and which operate at cross purposes | Taken into account - by switching the word to "approaches." Further |
| 6984 | 13 | 5 | 32 | 5 | 34 | At least to my ears, “coordination” isn’t something I would associate with “strong multilateralism” (though I’ve never heard of that term before). To a game theorist, coordination doesn’t require enforcement, and I would think that “strong multilateralism” must involve some measure of enforcement. Harmonization of standards, mentioned later in the paragraph, normally does involve coordination. | Accepted - text revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13628 | 13 | 5 | 36 | | | the end of the extreme shouldn't be characterized as cooperation at all. But it is action. | Taken into account - text revised to be |
| 2404 | 13 | 5 | 36 | 5 | 36 | Comment on specific text: 'Harmonized' is a strong word implying a high level of centralization and little if any room for differentiation. Might 'coordination' of national policies capture the idea better here? This also comes up as an issue on p. 24 (line 35) where you imply that harmonization connotes similar or equivalent policies. Harmonization implies more than equivalence, the latter being instead is a form of mutual recognition. | [respond to this comment after making changes in 13.4 and reflecting these changes in the ES] |
| 18240 | 13 | 5 | 37 | | | “harmonized carbon taxes” This example should not be used within the document because for national legal and political structure of some countries, as Venezuela, this tax harmonization is not accepted, nor in the context of international negotiations, neither in local policy. There should be a consideration of implication of its use as a prescriptive policy of the IPCC report. | Rejected - harmonized carbon taxes are offered only as an example not as a policy prescription. |
| 8091 | 13 | 5 | 42 | 5 | 42 | Recommend changing "the only climate policy institution with virtually" to "the only climate policy institution with both virtually" | Accepted |
| 8163 | 13 | 5 | 42 | 5 | 44 | It is not clear that the UNFCCC is the only institution with "the authority" to serve as a negotiating forum. (It is not clear who would give or deny other institutions such authority.) Perhaps is is the only institution whose charter explicitly acknowledges that function? Suggest a weaker statement. | Taken into account - combined with comment 8091 |
| 6830 | 13 | 5 | 42 | | | Need to define institution - why characterize the UNFCCC as an 'institution' rather than a regime, for instance. Need more generally to define the terms "institution", "agreements," "instruments" and "regime" - UNFCCC is for instance arguably an agreement, an instrument, an institution and a regime. How then are different modes of cooperation being characterized and delineated. | Taken into account - definitions for these terms are cross-cutting issues to be covered by the Glossary |
| 11790 | 13 | 5 | 44 | 5 | 47 | International coorperation has brought about not policital agreement but recognize. It shoud be amended to correct expression. | Accepted - text revised |
| 9516 | 13 | 5 | 44 | | | Please, replace political agreement with international goal.(Copenhargen Accord) | Taken into account - combined with |
| 10668 | 13 | 5 | 44 | 5 | 47 | Refer my comment No. 3. | Noted |
| 6566 | 13 | 5 | 44 | | 45 | Explain when and where such a "political agreement" was brought about or modify the description, as e.g. in Cancun Agreements COP only "recognizes that deep cuts [...] are required [...], with a view to reducing global greenhouse gas emissions so as to hold the increase in global average temperature below 2 degrees C" but not agreed on limiting temperature increase to no more than 2 degrees C. | Taken into account - combined with comment 11790 |
| 2942 | 13 | 5 | 45 | 5 | 47 | "level of mitigation ..appears inadequate [to limit temperature increase to no more than 2 degrees]". This just about the weakest form of words that could be used to describe this fact. It would be more accurate (in my view) to say something like "Comparing the growth in GHG emissions from 2000 to 2010 to Figure 5.1 of the AR4 Synthesis Report strongly suggests that current mitigation measures are clearly inadequate to achieve this goal, and therefore that stronger actions are needed". | Rejected - no scientific evidence/publication provided to support changes suggested by the reviewer. The text is sufficiently nuanced |
| 3734 | 13 | 5 | 47 | | | effects rather than consequences? | Taken into account - text revised |
| 4510 | 13 | 5 | 8 | 5 | 18 | This paragraph needs to be qualified to include the point that the very large emitting countries and blocs (e.g., the U.S., China, the EU) could unilaterally bring about dangerous climate change if they were to undertake a course of unabated emissions. Thus it is not strictly true that individual countries have no incentive to abate because the benefits to themselves would be negligible. The global benefits are greater than the benefit to an individual country, but the individual country benefits are not insignificant. | Rejected - text is already sufficiently nuanced |
| 2263 | 13 | 5 | 8 | 5 | 9 | This is not true. None of the greenhouse gases, including the most important, waterr vapour. mix uniformly with the atmosphere and this fact is concealed by restricting the sites where they are measured to places where the wind blows from the sea. . | Taken into account with comment 6944 |
| 3732 | 13 | 5 | 8 | | | "global commons problem" this claim is repeated in a subsquent section. It is actually a k-group problem, as collective acdtion by 10 countries would solve the problem. Discussion needs to recognize this fact - and justify why discussions of technology transfers and equity with developing countries is necessary. | Taken into account. But, this discussion belongs to Section 13.2.1 and not to ES. Literature on minilateralism is now cited. |
| 13624 | 13 | 5 | 8 | 5 | 18 | This section conflates action with cooperation. I would say that there's little incentive to reduce emissions in the absence of emissions reductions by other major emitters. That abatement doesn't necessarily have to derive from international cooperation. | Taken into account - text revised to add additional nuance |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15123 | 13 | 5 | 8 | 5 | 9 | Climate change is a global commons problem, because greenhouse gas (GHG) emissions from any source mix uniformly in the atmosphere and have global impacts mainly in most vulnerable regions. | Noted |
| 4567 | 13 | 5 | 10 | 5 | 16 | After "mitigating climate change" , add the following sentence "The inherent characteristics nature of climate protection as a public good with taxonomical features of non-rivalrous competition, non-excludability, and non-appropriability, presents an economic difficulty". What follows up to "As a result" is an explanatory to this added sentence. | Rejected. Text does not seem to improve readibility of the Executive Summary. |
| 4636 | 13 | 5 | 10 | 5 | 16 | After "mitigating climate change" , add the following sentence "The inherent characteristics nature of climate protection as a public good with taxonomical features of non-rivalrous competition, non-excludability, and non-appropriability, presents an economic difficulty". What follows up to "As a result" is an explanatory to this added sentence. | Rejected. Text does not seem to improve readibility of the Executive Summary. |
| 6804 | 13 | 5 | 10 | 5 | 16 | After "mitigating climate change" , add the following sentence "The inherent characteristics nature of climate protection as a public good with taxonomical features of non-rivalrous competition, non-excludability, and non-appropriability, presents an economic difficulty". What follows up to "As a result" is an explanatory to this added sentence. | Rejected. Text does not seem to improve readibility of the Executive Summary. |
| 10801 | 13 | 5 | | 7 | | The ES does not, to my mind, sufficiently capture the full range of issues that characterize understandings and interpretations of internaitonal cooperation on climate change over the last five years. There is insufficient representation of and distinction between the legal status of various instruments, insufficient discussion of the Kyotyo Protocol, insufficient treatment of the challenges to the global commons frame, an over-emphasis on market instruments as a form of cooperation as compared to other, notably information based regulatory instruments, a failure to represent political analyses of the challenges to cooperation, exemplified by thin treatment of the principle of common but differentiated responsibility, and weak attention to non-mitigation aspects of cooperation, notably adaptation. | Noted |
| 13907 | 13 | 5 | 10 | 5 | 16 | This sentence could also make the point that, in comparison with other environmental externalities, responsibility is highly defuse and therefore unilateral emissions reduction by any one individual, firm or country is unlikely to have any significant climate benefits. Yes climate stabilization is a non-excludable public good, but the real challenge is that it can only be provided by coordinated global action, with the potential exception of geo-engineering. | [draft single response will be made in line for comment #112] |
| 6943 | 13 | 5 | 2 | 5 | 2 | "scholarly literature"? Is this meant to be an acronym for peer-reviewed? Please be specific and use the IPCC terminology used in the cross-WG "General Guidance on the Use of Literature in IPCC reports". | Taken into account - text revised by deleting the word "scholarly" |
| 13908 | 13 | 5 | 35 | 5 | 40 | It is not sure that the single classification criteria "central organization and management" is sufficient. International approaches to cooperation can contain different permutations along multiple axes: multilateral vs. plurilateral/unilateral geometries of participation; targets and timetables or policies and measures, or both; deep or shallow coordination and management. The single criteria of central organization and management makes it difficult to reflect the actual variety of international regimes (e.g. Kyoto, EU climate and energy package), and the evolution of the international regime from Kyoto to Copenhagen and Cancun. | Taken into account - text revised with text to make clear that there are other dimensions |
| 14638 | 13 | 5 | 45 | 5 | 45 | Technically, the Copenhagen Accord is ambiguous about the baseline for the 2 degrees C goal. Paragraph 2 of the Accord simply states "We agree that deep cuts in global emissions are required according to science, and as documented by the IPCC Fourth Assessment Report with a view to reduce global emissions so as to hold the increase in global temperature below 2 degrees Celsius, and take action to meet this objective consistent with science and on the basis of equity." | Taken into account - text revised to reflect the Copenhagen Accord more accurately |
| 16230 | 13 | 5 | 9 | | | should specify that "widespread" international cooperation is necessary | Accepted - text revised to include the |
| 18434 | 13 | 5 | | | | I liked the frame of global commons and the acknowledgment of other scales of governance in terms of climate policy.<br>However, there is again a moderate vision regarding UNFCCC (page 5 last paragraph: “appears inadequate”) | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18435 | 13 | 5 | | 7 | | And when it talks about linkages between climate and other policies, the emphasis is too much on institutions and agreements, and does not acknowledges the reality, for example unilateral trade barriers based on carbon intensity (pages 6 and 7). | Rejected - this topic is too detailed for the ES |
| 12473 | 13 | 5 | 1 | | | The the Executive Summary should focus on the policy-relevant key findings of the text in the chapter. Some of the text is more of an discriptive nature. | Noted |
| 16177 | 13 | 5 | 41 | | | The ozone agreements (Vienna, Montreal) should be included in the discussions of existing international agreements. The approach of using a framework agreement implemented by a protocol is historically relevant to the UNFCCC and Kyoto Protocol and may continue to be a useful approach to designing narrower operational agreements. The Montreal Protocol has provided both significant GHG reduction benefits, albeit the intent was to protect the ozone layer not the climate. The Montreal Protocol's influence on the use of certain chemicals (e.g., HFC-134a) may also provide an example of the unintended consequences of pursuing one goal (reducing ozone-damaging chemicals) without taking into consideration the impacts on another (reducing climate-damaging chemicals). | Accepted - text revised to include the Montreal Protocol as an example of other fora. |
| 17104 | 13 | 50 | 29 | | 46 | Assessments of Cancun have been in terms of seeing the "mitigation gap" in terms of the carbon budget - see literature from UNEP, for example. The term used in the text "emissions gap" does not reflect this work or the negotiations, or even Cancun, and should be replaced with the term " carbon budget gap". Even in terms of science there is no such thing as the 'emissions gap"!!K44 | Rejected - the emissions gap is clearly defined in the UNEP gap reports and in other literature. As we are assessing the literature, we keep the same terminology. |
| 6361 | 13 | 50 | 3 | 50 | 28 | These 2 paragraphs describe in detail the shortcomings of CDM. The section is finalized with two comparisons in which the authors found that some projects certified by Gold Standards outperform CDM projects. This might lead to the perception that projects from the voluntary market certified by Gold Standard are better than CDM projects and this might not be real in many cases. The samples are limited: for the initial comparison 39 projects, and for the second 18, respectively, were used. By the way, in this later comparison it is not clear the meaning of "projects otherwise certified". Were they CDM projects or other projects from the voluntary market? | Taken into account - Text clarifies that Gold Standard projects are registered as CDM as well. |
| 18245 | 13 | 50 | 31 | | | “Copenhagen Accord”, in 2009 during COP XV there was no agreement among the Parties on the document entitled “Copenhagen Accord”, it is therefore suggested to delete references to reduction of emissions of this document and include only those of the Cancun Accords. | Rejected - Ananlysis of the reduction proposals under the Copehagen Accord are clearly described in the UNEP gap |
| 18246 | 13 | 50 | 39 | | 46 | This paragraph, besides prescriptive, must kept the principle of common but differentiated responsibilities and the historical debt that developed countries have in the accomplishment of an ambitious quantified goal of carbon, whose solution is not the commercial exploitation of nature through forest markets, but through domestic reductions. This is a paragraph which directly depends on the international negotiations and should, therefore, be deleted. | Rejected - The text reflects the available peer-reviewed literature and does not make policy recommendations |
| 6362 | 13 | 50 | 47 | 51 | 2 | The idea of this important paragraph seems incomplete. It would be important to expand it. | Taken into account - new text prepared |
| 12028 | 13 | 50 | 6 | 50 | 10 | Supplemental explanation of why there is a negative correlation should help understand the problem. | Taken into account - shortened the text |
| 18440 | 13 | 50 | | | | Even when the segment is under construction, the actual information is quite pessimistic regarding global climate policy; this should be the central message of the chapter, especially in relation to the little effectiveness of UNFCCC.<br>There is some kind of optimism regarding then national pledges included in cop 15 and 16: it is also like the chapter assumes that those targets will be implemented, and does not even acknowledge that some of them are very uncertain. (Pag 50 par 5). It would be key to compare the pledges of the Copenhagen Accord and the trajectory of emissions between 2010 and 2012 in the major players. My guess is that the outcome is very poor. | Noted - the text reflects the available scholarly literature and key messages will be presented in the executive summary of the chapter |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 6360 | 13 | 50 | | 51 | | To facilitate the understanding of the reader on CDM it is needed to describe in numbers the magnitude achieved by this mechanism, in terms of emission reductions and financially. A table with this information would be ilustrative or, at least, refer to the related information provided in section 13.5.5.1. This would contribute to frame the teorethical analysis of this section. It also would be convenient to know how many projects have been certified with the Gold Standards, which 57 of them have been used in the comparisons referred to in this session. | Taken into account: Data on CDM are available in section 13.5.1.1. |
| 6363 | 13 | 51 | | | | The characteristics of conditional and unconditional pledges are necessary to be explained. . | Rejected - discussion at this level of detail would blow up the text beyond the allotted page volume. We refer to the |
| 12819 | 13 | 51 | | | | Range of gap should be explained in the text. | Taken into account - we extended the textt in the caption of the Figure of the |
| 12820 | 13 | 51 | 12 | | | CDP (abrev. firstly explained later) | Rejeted - CDP already explained in 13.12 |
| 6364 | 13 | 52 | 1 | 52 | 5 | What is the source of the first sentence of the paragraph? In accordance with the GHG Guidelines used to prepare national GHG inventories all GHG reductions that takes place in a territory will be reflected in the national GHG inventory. | Taken into account - text revised |
| 17105 | 13 | 52 | 13 | | 15 | My peer reviewed work in 'Climate and Development' is relevant for this section. | Rejected - not able to find assessment in this body of work and no specific |
| 11695 | 13 | 52 | 26 | 52 | 42 | It seems there will be a very detail literature review on the burden-sharing, section 13.4.1.2 also discussed on burden-sharing methods, so these two parts need to coherently integrated, otherwise might have some repetition | Taken into account - however the coverage of burden sharing arrangements has moved to Chapters 4 |
| 6055 | 13 | 52 | 5 | | | Various publications by Harriet Bulkeley and Kristine Kerr would seem of relevance here. | Taken into account - these authors are cited in this chapter already |
| 18247 | 13 | 52 | 9 | | | “developed in private sector agreements may then become incorporated into government regulations (Knox-Hayes and DL Levy, 2011)”, this will depend on the legal system of each State and on respect of national interests. | Rejected - text is already sufficiently nuanced |
| 7416 | 13 | 52 | 12 | 52 | 42 | Suggestions include: 1- assess targets achieved vs. costs, 2- Exante vs Expost 3- spillover and burden sharing/shifting among broad groups of countries classified by level of vulnerability | Taken into account - new text prepared |
| 15671 | 13 | 52 | 16 | | 42 | This is arguably one of the most important contributions that the IPCC can make to furthering the literature on burden-sharing arrangements (and an unenviable task). One aspect that would be useful to consider is whether net costs across different regions could also be presented not only once emissions trading is incorporated, but also once any further financial transfers (outside the scope of emissions allowances, eg grants and loans) stipulated by the particular burden-sharing proposal are accounted for. The IPCC SAR's chapter on equity (WG III, Ch 3) provides a useful precedent for the value of considering trading and financing as separate components. Some assessment of the technical feasibility of different burden-sharing proposals would be useful (in a similar vein to EMF 22 studies that have explored the implications of different participation regimes: see eg Russ, P., and T. van Ierland. 2009. Insights on Different Participation Schemes to Meet Climate Goals. Energy Economics 31, Supplement 2:S163-S73 and other articles in the same journal issue). Finally, it would also be useful to compare the implications of different proposals in 2020 with the implications of _current_ burden-sharing arrangements under the Cancun Agreements (on both mitigation and finance). | Taken into account - the text will reflect these issues per the available peer-reviewed literature; however the coverage of burden sharing arrangements has moved to Chapters 4 and 6 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17106 | 13 | 52 | 16 | | | the assessment of burden sharing arrangements MUST consider both cost sharing and resource sharing. That is, sharing the carbon budget. The approach suggested of comparing the GHG emissions reduction targes is not appropriate because it is a response to a particular decision in the negotiations and does not reflect the "potential burden sharing arrangements". Equitable access to sustainable development, or sharing the carbon budget, should be included as an example. Since two different principles are involved - emissions and concentrations - it is not possible to put them together. They need to be looked at separtely and the implications for countries compared in a single table, but the concentration based approach cannot be reduced to an emissions based approach. THe question is not only about emissions reduction targets but also about sharing the carbon budget equitably to determine the emission allowances, even if they are negative. This section must capyure the recent peer reviewed literature, including my papers in 'Climate Policy' and Climate and Development' . | Taken into account - the text will reflect these issues per the available peer-reviewed literature; however the coverage of burden sharing arrangements has moved to Chapters 4 and 6. The concepts for structuring an agreement, including carbon budgets is covered by 13.4 and 13.5 |
| 6124 | 13 | 52 | 16 | | | Just for team's information, I would draw your attention on burden sharing issue to the following literature that proposed defferent sharing for Annex I and non-Annex I countries. "Akimoto, K., (2012). Mitigation Targets and Effort-Sharing Among Regions and Countries. In: Climate Change Mitigation, A Balanced Approach to Climate Change. M. Yamaguchi, (ed.), Springer, London pp. 43-62. | Taken into account - however the coverage of burden sharing arrangements has moved to Chapters 4 and 6 |
| 3471 | 13 | 58 | 17 | | | Bossetti V should be Bosetti | Editorial - copyedit to be completed prior |
| 9517 | 13 | 6 | 1 | | | Please, clarify the meaning of agreeing to reduction targets for 2012 and 2020 and actions for 2020. | Taken into account - covered in Section |
| 6567 | 13 | 6 | 1 | | 2 | Explain when and where such "consequences [...] agreeing to reduction targets for 2012 and 2020 and actions for 2020" took place, as such targets seems to be agreed on only in the Kyoto Protocol for period between 2008 and 2012. | Taken into account - text revised and also covered in detail in Section 13.5 |
| 7368 | 13 | 6 | 1 | 6 | 2 | Is it correct to say that reduction targets have been "agreed" to for 2020 in the same way they were for 2012? Given the continued work of the AWG-LCA and the lack of a finalised second commitment period for the Kyoto Protocol (to 2017 or 2020), it may be more correc to say: "agreed to targets for 2012, and negotiated possible targets through to 2020" or something similar. | Accepted - text revised with additional nuance |
| 6831 | 13 | 6 | 1 | | | No reference to the Kyoto Protocol here - the 2012 targets are not under the UNFCCC but the Kyoto Protocol. Need to introduce the KP here | Accepted - text revised with additional nuance |
| 13639 | 13 | 6 | 12 | | | Empirically, leakage estimates aren't all that big. Check out the new work by the Energy Modeling Forum on border adjustments, for example. | Taken into account - text revised to take into account additional nuance |
| 3736 | 13 | 6 | 14 | | | linkages- need to disaqggregate between vertical linkages between levels of scale, including the application of global norms; and horizontal linkages that take the form of regime complexes, and synergies. These linkages can either be positive or negative, so more empricial attention is necessary. | Taken into account - covered in Sections 13.6 and 13.7 |
| 6327 | 13 | 6 | 15 | 6 | 27 | Consider to briefly explain to the reader to what credits are referred to in this section. | Taken into account - text revised |
| 18241 | 13 | 6 | 15 | | 34 | regarding paragraph “Linkages between Climate Policies” is considered a prescriptive paragraph because it present carbon markets as the solution implemented to promote mitigation. However, this is a mechanism for commercial exploitation of natural resources that should be seen in the perspective of national environmental policies of States. | Rejected - text is already sufficiently nuanced |
| 10804 | 13 | 6 | 15 | 6 | 27 | The Linkages section seems to focus very heavily on market linkages. But there are other literatures, that suggest information mechanisms, framing devices and procedural mechanisms all provide means for international law to affect domestic policy. See specific comments below on secs 13.3,4,5 | Taken into account - combined with comment 13910 |
| 11439 | 13 | 6 | 15 | 6 | 15 | The reference to “absence of … a binding international agreement on climate change” is factually incorrect as the UNFCCC and its Kyoto Protocol are, in fact, such binding international agreements. | Taken into account - text revised to correct the original text |
| 15721 | 13 | 6 | 17 | 6 | 17 | and "can" function as a de facto international policy. Better: "may" function as de facto international policy. We don't know whether in the absence of a binding international agreement bottom-up approaches will lead to substantial emissions cuts... | Taken into account - combined with comment 13909 |
| 8165 | 13 | 6 | 18 | 6 | 18 | "the scale effects": This sort of jargon won't mean anything to many ES readers | Taken into account - text revised to |
| 5240 | 13 | 6 | 21 | | | What is the unit for 1 billion? Tonnes of CO2 or dollars? | Taken into account - text revised with |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 4795 | 13 | 6 | 22 | 6 | 27 | It could be interesting to mention that the Australian government and the European Commission announced that Australia and Europe will be linking their emissions trading systems (ETS), and the full-way link is to commence no later than 1 July 2018. | Taken into account - combined with comment 11145 |
| 8752 | 13 | 6 | 22 | 6 | 25 | The sentence is not clear. In addition to the EU ETS there are operating ETS in Switzerland, Japan and New Zealand. The EU, Japanese and NZ ETS have used Kyoto units for compliance. Switzerland allows Kyoto units for compliance, but none have been used. RGGI would allow international units for compliance if the RGGI price exceeds $10/ton CO2. Alberta has no links with any other ETS. In addition to the California - Canadian provinces link, other near term developments include negotiation of a link of the Swiss ETS with the EU ETS, announcement of a 2015-2018 link between the Australian ETS and the EU ETS, and possible links for ETS in China, Korea, Mexico, Khazakstan, Ukraine, etc. | Taken into account with further nuance here and more detail in Sections 13.6 and 13.7 |
| 12918 | 13 | 6 | 22 | 6 | 22 | Note the agreement between EU and Australia on linking their emissions trading systems. | Taken into account - combined with |
| 12919 | 13 | 6 | 22 | 6 | 22 | California is not 'national level' | Taken into account - text revised with |
| 15073 | 13 | 6 | 24 | | | The new Australian carbon policy will link to the ETS by 2018 | Taken into account - combined with |
| 16359 | 13 | 6 | 25 | 6 | 27 | California and WCI is itself example of sub-national policy linkage, so last sentence not needed | Accepted - text revised |
| 15722 | 13 | 6 | 26 | 6 | 26 | "Another recent development has been experimentation in policy linkages at the sub-national level": there are plans, but not so much experimentation so far… | Taken into account - sentence deleted, combined with comment 16359 |
| 8753 | 13 | 6 | 28 | 6 | 29 | In addition the larger market created by linked ETS can lead to introduction of additional financial instruments (options, forwards) and lower transaction costs (exchange trading). Linked ETS also reduce leakage, output losses in countries with the ETS, and lower welfare losses. See ALTERNATIVE APPROACHES FOR LEVELLING CARBON PRICES IN A WORLD WITH FRAGMENTED CARBON MARKETS, Elisa Lanzi, Jean Chateau and Rob Dellink, OECD Environment Directorate, 2012. | Taken into account - covered in Section 13.6 |
| 13625 | 13 | 6 | 28 | 6 | 34 | This paragraph importantly fails to mention an important drawback of linkages: the transmission of shocks. If two countries have linked cap-and-trade programs and one experiences a macro shock, that can be transmitted to the other via permit prices. See "Expecting the Unexpected: Macroeconomic Volatility and Climate Policy", by Warwick McKibbin, Adele Morris, and Peter Wilcoxen, in J Aldy and R. Stavins (eds), Implementing Architectures for Agreement: Addressing Global Climate Change in the Post-Kyoto World, Cambridge University Press. | Taken into account - covered in Section 13.6 |
| 12920 | 13 | 6 | 28 | 6 | 28 | Linking also signals international collaboration and a commitment to long-term climate policy and multilateralism. This may in turn provide larger predictability for investors in carbon intensive industries. Linking carbon markets from different regions may equalize carbon prices and hereby reduce competitive distortions between the regions. I can provided references if needed. | Taken into account - covered in Section 13.6 |
| 3735 | 13 | 6 | 3 | 7 | | private governance is a huge topic that has to be addressed. Look at the work by Biermann, Abbott&Snidal, and Gereffi/Meyer. | Taken into account - covered in Section 13.12 |
| 8164 | 13 | 6 | 3 | 6 | 7 | The first sentence seems to be at best tenuously related to the rest of this paragraph. Yes, climate change is addressed in other forums, but the text here incorrectly implies that those other forums are primarily ones that have nothing to do with sovereign states. | Taken into account - text revised with clarifying language |
| 16360 | 13 | 6 | 30 | 6 | 34 | Para refers only to market-based linkages; need to specify this or broaden the sense of the para | Taken into account - combined with |
| 9518 | 13 | 6 | 31 | 6 | 34 | Good comment | Noted |
| 12975 | 13 | 6 | 31 | 6 | 34 | I suggest rewording lines 31-34. It is not correct to say that "linked systems are only as stringent as the weakest among them". In case of two cap-and-trade systems linkage increases efficiency but does not change the aggregate level of abatement. Abatement increases in the system with lower marginal abatement cost and decreases elsewhere. Maybe the authors mean to say that the system with lax certification rules of emission credits would introduce "hot air" in the larger market. | Taken into account - text revised with additional nuance |
| 12921 | 13 | 6 | 31 | 6 | 31 | A problem of linking two regions with different political objectives may be the loss of control and compromising of the original policy priorities in each system. With linking, the scope for regulatory interventions of the single system is reduced. I can provided references if needed. | Taken into account - covered in Section 13.6 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4233 | 13 | 6 | 32 | | | The sentence in parentheses makes no sense. Linking two systems of differing stringency will cause the price in the less stringent system to rise and the price in the more stringent system to fall. The only circumstance in which the price of the linked systems would fall to the level of the less stringent system is when the latter is very large and the more stringent system is very small. As a general statement, what is asserted here is wrong. | Taken into account - combined with comment 12975 |
| 8166 | 13 | 6 | 35 | 7 | 6 | This section seems to be missing interactions with international security policy, which can be large. | Accepted - text revised |
| 6029 | 13 | 6 | 36 | 6 | 37 | Delete "sustainable development…public health" since these issues aren't mentioned in the subsequent text. | Rejected - okay to mention these here even if not subsequently fleshed out |
| 16361 | 13 | 6 | 36 | 6 | 38 | Important to mention fossil fuel subisidies and fuel taxes (excise duty etc) here as important other interactions | Accepted - text revised |
| 11331 | 13 | 6 | 36 | 6 | 38 | Interactions also exist between climate change mitigation policy and environmental protection, human security, human rights etc. For example, literature has examined synergies and conflicts in the context of the law of the sea and ocean fertiltisation proposals. Other policy linkages relatign to geoengineerign may also be relevant. These issues are not addressed in the corresponding sections of the report. | Accepted - text revised |
| 18242 | 13 | 6 | 39 | | 42 | Climate change issue and actions in the multilateral level should stay in its natural forum, that is the framework of UNFCCC. In this forum, is under discussion financing for climate change and a new legal international instrument, thus, discussion should not be diverted to WTO and ICAO. This paragraph can be read as prescriptive. | Rejected - text is already sufficiently nuanced |
| 11330 | 13 | 6 | 4 | | | The reference to 'international agreements not centred on soverign states' is difficult given that termionologically 'international agreements' is geenrallt taken to refer precisley to agreemetns between states. Better terminology would be to refer to the broad range of other arrangements and initiatives as 'international arrangements not centred on ...' | Taken into account - text revised with clarifying language |
| 2405 | 13 | 6 | 4 | 6 | 4 | Comment on specific text: The term 'international agreements' does not seem quite right here to capture the practices you describe below. Transnational initiatives would be better. | Taken into account - combined with comment 11330 |
| 4794 | 13 | 6 | 8 | 6 | 13 | I fully support this statement. However there is potential competition distorsion | Noted |
| 10803 | 13 | 6 | 8 | | | The term "regime complex" is not sufficiently widely used to merit inclusion in the executive summary, and without definition. Indeed, later in the text, too, the term appears well before it is defined. Moreover, Keohane and VIctor's work on this term has been robustly critiqued by Abbot (cited later in the chapter). While the concept certaintly deserves mention in this chapter as an important new idea, it should not be introduced in the ES, and it should be well defined when introduced, and the criticisms of the concept aired. | Taken into account - text revised |
| 6832 | 13 | 6 | 8 | | | Term 'regime complex' introduced here with no definition, explanation or justification | Taken into account - combined with |
| 17097 | 13 | 6 | 8 | | | the new regime complex includes discussion around sharing the carbon budget. Recent analyses are now arguing that what really matters is the total greenhouse gas budget we allow ourselves, because of the scientific uncertainty associated with emission rates and concentration targets*, which cannot be accurately inferred from quantities we can observe . The United Kingdom already has legislation establishing a national carbon budget , and the National Academy of Sciences of the United States concludes that the “policy goal must be stated as a quantitative limit on domestic GHG emissions over a specified time period – in other words a GHG emissions budget …… national shares of global emissions need to be agreed at the multilateral level as the basis for developing and assessing domestic strategies” . The scientific analysis notes that its efforts are “based on ‘global least cost’ economic efficiency criteria for allocating global emissions among countries, and using other criteria, different budget numbers could be suggested; for instance, based on global ‘fairness’ concerns, a more aggressive U.S. emission reduction effort is warranted – and this is what equity is all about. | Taken into account in Section 13.4 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14699 | 13 | 6 | 8 | | | The term "regime complex" that is first mentioned here (but never defined) and then predominantly used in chapter 13 to depict the institutional complexity of global climate governance. However, 'regime complex' is but one concept used in the literature to depict this growing complexity. Other terms - that have been established earlier and have also been used by communities other than internatinoal relations (e.g. international law) - include: "institutional fragmentation" and "institutional complexity". The simple but crucial advantage of these other terms is that they speak of institutions, not just regimes. This does justice to a well-established, classical typology in international relations - for example reflected in the works by Robert Keohane who uses "institution" as the generic term and then distinguishes different types of institutions, including organizations and regimes (see: R.O. Keohane (1989). International Institutions and State Power. Essays in International Relations Theory. Westview Press, Boulder, CO, p. 3). 'Regime' is hence just one type of institution, describing sets of connected agreements, or, in Keohane's words: sets of "explicit rules, agreed upon by governments" (see: R.O. Keohane (1993). The Analysis of International Regimes. Towards a European-American Research Programme. In: Regime Theory and International Relations. V. Rittberger, (ed.), Clarendon Press, Oxford, UK, pp. 23-45, p. 28). Thus, the term 'regime complex' may suggest to many readers that the intricate governance architecture on climate change consists only of (intergovernmental) regimes. However, as chapter 13 clearly stresses, the institutional complexity of climate governance is much more diverse - and also includes other types of international institutions, namely international organizations (e.g the UN and several of its bodies) and transnational or hybrid institutions (such as public-private partnerships). Given this diversity of institutions involved, it would be much more accurate to speak of an "institutional complex" here, not just of a "regime complex". One reference for the term "institutional complexity" is: S. Oberthür and O.S. Stokke, (eds.) (2011). Managing Institutional Complexity: Regime Interplay and Global Environmental Change. The MIT Press, Cambridge MA. | Taken into account - combined with comment 10803 |
| 11145 | 13 | 6 | 15 | 6 | 27 | Please add EU- Australia linkage | Accepted - text revised |
| 13909 | 13 | 6 | 15 | 6 | 17 | There seems to be an inappropriate normative judgement implied in the sentence "…can function as a de facto international policy" : it seems that it would be just as effective as an international binding agreement. | Taken into account - text revised by deleting this phrase |
| 13910 | 13 | 6 | 28 | 6 | 34 | Further benefits of linkage could be mentioned: reduced risk of carbon leakage; economies of scale and positive spill-overs from innovation and changing markets. Further disadvantages of linkage could also be mentioned: increased transaction costs and policy complexity in the linked systems. A general comment: this discussion of linkage seems to focus exclusively on linkage of carbon markets. Policy linkage may however take other forms, some of which are discussed in the text such as joint product standards, free trade agreements for low carbon products, harmonized taxes etc. These may have other benefits/advantages which are not discussed here. | Taken into account - text revised to include additional nuance |
| 14639 | 13 | 6 | 3 | 6 | 7 | It seems odd to note other fora (line 3), and then immediately pivot to public-private partnerships, private sector governance initiatives, etc., and fail to mention other important plurilateral and multilateral fora, including the Major Economies Forum, the G20, the G8, APEC, the Montreal Protocol, the Arctic Ministerial, etc. The ES should include some reference to these other fora. | Accepted - text revised with clarifying language |
| 16231 | 13 | 6 | 3 | 6 | 7 | After discussing UNFCCC-based agreements, this paragraph covers "other fora" but only mentions private and transnational initiatives. You might first mention the variety of regional intergovernmental intiatives, such as the Regional Greenhouse Gas Initiative in the North America and, of course, the EU. At a minimum, perhaps the second sentence of the paragarph could begin like this: "In addition to a number of intergovernmental efforts at the regional level, a prominent development since AR4..." | Rejected - regional initiatives are discussed in Ch. 14 |
| 18243 | 13 | 7 | 5 | | | Should insert the subject of research and investment for adaptation to climate change, and not consider exclusively the subject in the mitigation level. | Accepted - text revised |
| 16362 | 13 | 7 | 5 | 7 | 6 | Not clear what this refers to, please clarify | Taken into account - this paragraph has |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14416 | 13 | 7 | 6 | | | Should emphasize the breakthrough at Copenhagen through enlisting China and other major emerging market economies in undertaking mitigation goals, in contrast to the earlier exclusion of all developing countries from mitigation efforts in Kyoto | Taken into account - covered in Sections 13.3 and 13.5 |
| 8968 | 13 | 71 | 1 | | 3 | IPCC (201b) is a flawed report that does not consider the history of the field, its link to military technologies, or its social implications. Here are my detailed comments on that report. "The concept of geoengineering can be traced back to the 1960s." (p. 2) -- It is in fact an ancient concept, rooted in classical myth and hubris, and discussed throughout history, including the 1830s when building an "artificial volcano" was being discussed. Geoengineering was widely discussed after 1945 and practiced in fact (not a concept) in 1958 and 1962 in projects Argus and Starfish Prime using nuclear weapons to intervene in Earth's magnetosphere. The USSR made similar efforts. Note that this was high atmospheric and near space geoengineering.<br>References.<br>J.R. Fleming, Fixing the Sky: The checkered history of weather and climate control. Columbia University Press, 2010. J.R. Fleming, “Iowa Enters the Space Age: James Van Allen, Earth’s Radiation Belts, and Experiments to Disrupt Them.” Annals of Iowa 70 (Fall 2011), 301-24; available in America: History & Life with Full Text.<br><br>"There are basically three ways to change the climate." (p. 19) -- Yet according to climatologist C. E. P. Brooks writing in 1950, "There are at least nine and sixty ways of constructing a theory of climatic change, and there is probably some truth in quite a number of them."<br>Reference:<br>J.R. Fleming, Historical Perspectives on Climate Change. Oxford University Press, 1998.<br><br>"Are there some aspects of SRM that require expertise that is missing from the author teams of Working Group I, II and III? Are there other things the author teams can do to improve their ability to develop a high quality assessment? The BOG felt that there is no obvious missing expertise amongst the lead authors. For specific questions that may need further consideration, it is advisable to involve others as contributing authors." (p. 93) -- Obviously, there was no sense of history in the report, and seemingly a rather perfunctory discussion of ethics. | Noted - discussion of SRM has been updated with support from Working Group I |
| 3973 | 13 | 71 | 22 | 71 | 23 | Please insert the following: ILA Committee on Legal Principles relating to Climate Change, First Report, 2010, Second Report, 2012, http://www.ila-hq.org/en/committees/index.cfm/cid/1029 | Rejected - not peer reviewed |
| 3974 | 13 | 72 | 23 | 72 | 24 | Please insert the following: Japan Branch of ILA, Report of the National Committee, “Legal Principles relating to Climate Change: Preliminary Issues on the Methodology and Scope of the Work”, Japanese Yearbook of International Law, vol. 52, 2009, pp. 500-537. | Rejected - commentor did not suggest where this reference would fit into the chapter |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3975 | 13 | 78 | 2 | 78 | 3 | Please insert the following: Murase, Shinya, “International Lawmaking for the Future Framework on Climate Change: A WTO/GATT Model”, in S. Murase, International Law: An Integrative Perspective on Transboundary Issues, Sophia University Press, 2011, pp. 167- 180.<br>Murase, Shinya, “Conflict of International Regimes: Trade and the Environment”, in S. Murase, International Law: An Integrative Perspective on Transboundary Issues, Sophia University Press, 2011, pp. 130- 166.<br>Murase, Shinya, “Protection of the Atmosphere”, Annex B, Report of the International Law Commission, Sixty-third session, 2011, General Assembly, Official Records, Sixty-sixth session, Supplement No. 10(A/66/10), pp.315-329, http://www.un.org/law/ilc/;<br>Shinya Murase, “Protection of the Atmosphere and International Law: Rationale for Codification and Progressive Development”, Sophia Law Review, vol. 55, nos. 3-4, 2012, pp. 1-58, http://www.sophialaw.jp/faculty/paper/index.html;<br>Murase, Shinya, “Protection of the Atmosphere and International Lawmaking”, in Miha Pogacnik, ed., Challenges of Contemporary International Law and International Relations: Liber Amicorum in Honour of Ernest Petric, The European Faculty of Law, Nova Gorica, Slovenia 2011, pp. 279-297. | Taken into account - references by this author are included already, but the commentor did not suggest where additional references would fit into the chapter |
| 18695 | 13 | 8 | 18 | 8 | 21 | The summary of section 13.3 does not mention that 13.3 discusses conclusions from formal modeling of possible agreements. | Rejected - the introduction will not include this level of detail |
| 2264 | 13 | 8 | 2 | 8 | 3 | This is not true. None of the greenhouse gases, including the most important, waterr vapour. mix uniformly with the atmosphere and this fact is concealed by restricting the sites where they are measured to places where the wind blows from the sea. | Taken into account - combined with comment 6944 |
| 7137 | 13 | 8 | 2 | 8 | 4 | This is one reason, but the need for international cooperation has a broader basis. It is not only a matter that everyone has to mitigate, because a common good is affected, but it also necessary to consider the very different contribution – historical and current- to the GHG problems, and the very different capacity of each country in order to deal with those problems. There are also differences in the degree and gravity in which the climate change problems affect each country, depending of the vulnerability (environmental, but also socio and economic vulnerabilities), in this situation the international cooperation in critical, to create global conditions to deal with this problem- That’s why international cooperation is not only about mitigate, but also related with finance, technology, capacity building, and, of course, adaptation. " | Taken into account - covered in Section 13.2 |
| 11332 | 13 | 8 | 28 | 8 | 30 | What is the difference between multi/bi-lateral agreements and transnational agreements? | Taken into account - text revised with |
| 6031 | 13 | 8 | 35 | 8 | 36 | I assume someone will check for consistencies between this chapter and chapter 15 on national and sub-national policies. | Noted |
| 6944 | 13 | 8 | 2 | 8 | 3 | This opening sentence to the introduction seems to oversimplify the point it's trying to make and I would argue it's even partly incorrect from a WGI physical science perspective. Even if GHG were not mixed uniformly in the atmosphere, GHG-induced changes in the regional radiation balance of the Earth could certainly induce global scale changes due to atmospheric and oceanic dynamics which connects remote locations on the globe (c.f. teleconnections). Suggest to delete the first sentence and to start with "International cooperation is necessary for mitigating (global) climate change". | Taken into account - text revised by replacing the word "uniform" with the word "global" |
| 12474 | 13 | 8 | 1 | | | This is an elaborate description of what all the sections in the Chapter will discuss. Much of it can be read from the list of Content, hence most of it can be considered redundant. Please consider to delete parts. | Rejected - the introduction is meant to describe what will be discussed in the |
| 3472 | 13 | 9 | | | | Section 13.2 is in general very clear | Noted. No action required. |
| 11140 | 13 | 9 | 22 | 9 | 22 | Use of the word "tragedy" is over-emotive and must be removed. | Accepted. The title in section 13.2.1.1. was changed and "tragedy" was |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3737 | 13 | 9 | 22 | 26 | | see comment 7, climate engineering belongs in a separate section on responses. See comment 1. | Taken into account. The reference to the regional nature of SRM impacts have being clarified. Since the literature on SRM is so new, the local (and not global) impacts of such policies was stated as hypothetical and a reference to |
| 12040 | 13 | 9 | 22 | 10 | 46 | The tragedy of the global commons and the current state of international political deadlock is well explained. | Noted. No action required. |
| 18690 | 13 | 9 | 22 | 9 | 25 | This point is very specific, surely some references can be given. | Taken into account. Sentence was rephrased following other comments too. |
| 13626 | 13 | 9 | 22 | 10 | 7 | It is not technically free riding if a country would not experience costs from climate change and accordingly chooses not to mitigate emissions. | Taken into account. The text on free riding was revised following also |
| 2265 | 13 | 9 | 23 | 9 | 24 | This is not true. None of the greenhouse gases, including the most important, waterr vapour. mix uniformly with the atmosphere and this fact is concealed by restricting the sites where they are measured to places where the wind blows from the sea.. | Accepted. "uniform" was removed. Same for FAQ 13.1. |
| 2266 | 13 | 9 | 23 | 9 | 24 | There is again the curious emphasis on emissions when the supposed effect is changes in atmospheric concentrations, which are not neceasarily related to emissions | Rejected. The relationship is explained elsewhere in IPCC reports. |
| 6985 | 13 | 9 | 28 | | 29 | You should explain how solar radiation management could create excludable benefits. That's an entirely new idea that I can't comprehend. | Taken into account. This issue of regional impacts of SRM is discussed extensively in 6.9.2. Section 13.4.2. already discusses the international governance aspects of SRM. A link to those two sections was added here. Text |
| 5912 | 13 | 9 | 28 | 9 | 29 | It is not be possible to geographically limit the effects of solar radiation management (Robock, A, Oman, L and Stenchikov, GL. 2008. Regional climate responses to geoengineering with tropical SO2 injections. Journal of Geophysical Research–Atmospheres, 113(D16) D16101), a claim supported by literature on climate system feedbacks. Uncertainty around the effects of SRM and associated rapid rates of change to ecosystems is a key argument for employing the Precautionary Principle with regards to geoengineering (Brewer, PG. 2007. Evaluating a technological fix for climate. Proceedings of the National Academy of Sciences, 104(24): 9915–9916; Trenberth, KE and Dai, A. 2007. Effects of Mount Pinatubo volcanic eruption on the hydrological cycle as an analog of geoengineering. Geophysical Research Letters, 34(15) L15702; Nancy Tuana, Ryan L. Sriver, Toby Svoboda, Roman Olson, Peter J. Irvine, Jacob Haqq-Misra, Klaus Keller (2012) Towards Integrated Ethical and Scientific Analysis of Geoengineering: A Research Agenda, Ethics, Policy & Environment, 15, 2). | Taken into account. More on this to be covered in section 13.4.2. There is literature on risk and SRM and ethics and SRM. More detail on the benefits excludability is added here (section 13.2). |
| 2161 | 13 | 9 | 28 | | | the benefits are not global public goods, but mitigation is a global public good providing benefits globally | Accepted. Phrase was clarified because benefits are not public goods but mitigation and sinks actions towards |
| 12795 | 13 | 9 | 29 | | | Solar radiation management is firstly explained on p.13 ll. 13f. ; you may like to make a cross reference | Taken into account. A general definition of SRM was added here. |
| 2162 | 13 | 9 | 29 | | | I do not understand to which word "These" refers. | Accepted. Text was reorganized to make |
| 16179 | 13 | 9 | 39 | 10 | 22 | A discussion of sectoral policies (discussed later in the chapter) inserted here, with some analysis of how Ostrom's criteria for collective action apply more effectively within a sector than between states, will integrate the sectoral approach more logically into the discussion. | Taken into account. Sectoral approach was cited and referenced to 13.4.1, where it is discussed in more depth. |
| 2406 | 13 | 9 | 42 | 9 | 42 | Comment on specific text: I think you need to clarify what you mean by legal remedies here and how these relate to the broader point about internalising externalities. Is law an instrument to bring about such an internalisation here or something else? | Accepted. Text has already changed slightly in response to another similar comment. |

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| 8085 | 13 | 9 | | 13 | | In this text, a cascade of concepts is proposed to approach (and supposedly understand) the complex phenomenon of international cooperation. The exposition goes<br>– from six "principles" (economic efficiency, precaution, sustainable development, common but differentiated responsibilities, fairness)<br>– to four "criteria" (environmental effectiveness, aggregate economic performance, distributional impacts, institutional feasibility)<br>– the last one of which (institutional feasibility) further contains four "sub-criteria" (participation, compliance, legitimacy, and flexibility).<br>The reason for the above listing is to express the surprise that among the so many aspects of the phenomenon, the word "stability" (group-wise, as well as time-wise) is never mentioned. Of course, specialists understand that this is part of the "participation" sub-criterion. But for the non specialist, this is not so evident. Shouldn't that notion (a principle, a criterion or a sub-criterion, I am not sure) appear somewhere? A main reason for that is that, the factual lessons that will be reported on further down the text (in particular p. 26, lines 32-47 and 1-2 of p.27 on the fate of the Kyoto Protocol) bring in the forefront the issue of the stability (group-wise, as well as time-wise) of the agreement.<br>It is suggested here that some room be made in this section for the stability notion, integrating it in the otherwise interesting "cascade" just reviewed. | Accepted Stability was explicitly mentioned in the text together with participation. Specific references on stability of coalitions were added. |
| 17665 | 13 | 9 | 16 | 9 | 20 | Another important feature of climate change is that emission reduction strategies create high costs for certain industries/countries; it requires the change of whole economic systems and lifestyles, which makes international cooperation extremely difficult | Taken into account. For dicussion on climate change impacts within countries, refer to chapter 15. A reference to differential costs among |
| 11587 | 13 | 9 | 28 | 9 | 31 | This statement should be removed.Free riding is all over by developed countries on the attempts to deal with climate change. This section is also skewed as it does not also take into consideration of the suffering of countries that have not contributed to the climate change problem. | Accepted. A statement about consequences of free riding (i.e. "…and thus imposing harm to others") has been |
| 10805 | 13 | 9 | 22 | 10 | 46 | As noted above, the discussion of the global commons frame should also include some discussion of a counter frame that seeks rationales for action in the complementary gains from climate mitigation and various other economic growth or development focused actions. This idea creeps in at the very end of the section in lines 20-22 of p. 10, but perhaps deserves a short para in the section, to note that this perspective has grown in significance, perhaps as a reaction to the challenges of winning political agreement around the global commons frame. David Victor's work (http://www.cfr.org/climate-change/madisonian-approach-climate-policy/p8885), the Harwell House document (http://eprints.lse.ac.uk/27939/1/HartwellPaper_English_version.pdf), Stephen Rayner "How to eat an elephant: a bottom-up approach to climate policy" (2010) in Climate Policy Vol 10 are all good references. This counter frame is controversial for sure, but represents a new current since AR4 and as such is worth mentioning as a subsidiary theme. In my own work, I have argued the usefulness of such a co-benefits frame to induce developing country actions, although contra the papers above, I am at pains to point out I don't think this frame is suitable for industrializing country actions (Dubash, "Climate CHange and Development" in Stewart, Kingsbury and Rudyk eds., Climate FInance, NYU Press, 2009. | Accepted. Mention was more explicit with respect of other policies that generate co-impacts for climate (suggested literature on bottom-up approaches was included). A sentence was added with respect of co-impacts that climate has on other policies (those are analyzed in depth in section 5.10). |
| 3963 | 13 | 9 | 22 | 9 | 22 | The word "tragedy," being an expression sounding rather emotional to non-economists who are not familiar with externality problems, is not appropriate for an IPCC report. | Accepted. The title in section 13.2.1.1. was changed and "tragedy" was |
| 6945 | 13 | 9 | 23 | 9 | 24 | See comment to introductory section 13.1 above. The uniform mixing contributes, but is not the only reason for local emissions having global impacts, c.f. teleconnections through atmospheric and oceanic dynamics. Need to revise this non-precise statement. | Accepted. "uniform" was removed. Same for FAQ 13.1. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6946 | 13 | 9 | 23 | 9 | 31 | The sentence "overuse of the atmosphere as a depository of GHGs is likely" is awkward (i) as it seems to imply we are purposely "using" the atmosphere as a DEPOSITORY of GHGs rather than unintentionally polluting it, and (ii) the uncertainty assessment "likely" is unsupported by evidence or reference to, e.g., the WGI contribution to AR5. Please note that depository commonly refers to a place where something is stored for safekeeping (e.g., a bank).... Furthermore, the subsequent focus on geoengineering and the link to mitigation further confuses the purpose of this opening paragraph. Considering all our comment on this particular first paragraph, we suggest a careful revision. As it currently stands, it provides in our view a very bad start into this chapter/section. | Accepted. Change the word “depository” such as with the word “receptor”. Same for FAQ 13.1. |
| 3964 | 13 | 9 | 24 | 9 | 24 | The term “atmosphere” used here and elsewhere in the Draft is not defined. It is crucial to define the term appropriately in order to address the linkages of climate change with other atmospheric problems such as ozone depletion and transboundary air pollution. See (1) Shinya Murase, “Protection of the Atmosphere”, Annex B, Report of the International Law Commission, Sixty-third session, 2011, General Assembly, Official Records, Sixty-sixth session, Supplement No. 10(A/66/10), pp.315-329, http://www.un.org/law/ilc/; (2) Shinya Murase, “Protection of the Atmosphere and International Law: Rationale for Codification and Progressive Development”, Sophia Law Review, vol. 55, nos. 3-4, 2012, pp. 1-58, http://www.sophialaw.jp/faculty/paper/index.html; (3) Shinya Murase, “Protection of the Atmosphere and International Lawmaking”, in Miha Pogacnik, ed., Challenges of Contemporary International Law and International Relations: Liber Amicorum in Honour of Ernest Petric, The European Faculty of Law, Nova Gorica, Slovenia 2011, pp. 279-297.<br>I would suggest the following definition of the Atmosphere: “Atmosphere” means the layer of gases surrounding the earth in the troposphere and the stratosphere, within which the transport and dispersion of airborne substances occurs."<br>Commentary<br>(1) While the relevant conventions and legal documents have refrained from defining the term “atmosphere” or “air,” (although the definition of “air pollution” is given in a number of conventions and documents (e.g., Article 1 (a) of the 1979 ECE Convention on Long-Range Transboundary Air Pollution; 1987 Institute of International Law Resolution on Air Pollution across National Frontiers).<br>(2) The definition is not intended to be an “objective” definition but simply to be a practical “use of term(s)”. It is nonetheless considered appropriate to formulate a legal definition in such a way as to reasonably correspond to the scientific definition. The major international issues to be dealt with by the present Draft are transboundary air pollution, ozone layer depletion and climate change as they relate to the troposphere (up to 18 km from the surface of the earth) and the stratosphere (up to 50 km), which scientists call “lower atmosphere”. Eighty per cent of air exists in the troposphere and twenty per cent in the stratosphere. The present Draft is concerned only with these two layers. Since virtually no air exists in the upper atmosphere (mesosphere and thermosphere) and outer space, they are of little concern for the present Draft.<br>(3) It is necessary to address not only the substantive aspect of the atmosphere as the layer of gases but also the functional aspect of the atmosphere as a medium for transporting and dispersing airborne substances (pollutants). This latter aspect of the atmosphere as a medium for transporting pollutants is extremely important: even if some of the pollutants are relatively innocuous while in the atmosphere, they can accumulate in Polar Regions and have serious concentrated effects on fauna and flora, and, through food chains, on humans, as in the cases of persistent organic pollutants (POPs) and mercury (Hg). It is not appropriate to identify specific “pollutants” in the Draft. That is an exercise that should be left to the provisions of specific conventions and domestic laws. Therefore, the more neutral term “substances” is employed here.<br>(4) Currently, gaps in the existing treaty regime are significant; the lack of a treaty regime addressing the link between transboundary air pollution and climate change despite growing scientific evidence in recent years that so-called “tropospheric ozone” and “black carbon” in the atmosphere directly threaten both air quality and climate change. It has been said that the so-called greenhouse gases identified in the UNFCCC are responsible for only 60 to 65 percent of climate change, while these other substances are responsible for some 35 to 40 percent. This | Rejected. There is a clear definition of atmosphere in the glossary. |
| 6947 | 13 | 9 | 36 | 9 | 36 | Re "global nature of climate change": Could refer to WGI and WGII reports here, providing the link to the underlying assessments of the physical science basis and impacts and adaptation of climate change. | Taken into account. The TSU will handle this. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5683 | 13 | 9 | 42 | 9 | 43 | It is not clear to me how legal remedies can solve the public goods problem. Can the authors explain this further? | Taken into account. Text was rephrased to make it clearer. |
| 3483 | 13 | all | | | | SRM is defined five times in the chapter (p. 2, line 24; p. 13, line 13; p. 23, line 26; p. 23, line 31; and p. 23, line 33). This is only necessary once. | Taken into account - text revised to reduce repitition |
| 10284 | 14 | | | | | Good figure. It is useful to understand consumption pattern with embodied CO2. | Noted. |
| 15050 | 14 | | | | | Latin America is missed. | Accepted. Energy and Climate Partnership of the Americas (ECPA) under Latin America now listed (see |
| 15040 | 14 | | | | | It is not possible to read legends in Figure 14.10. | Accepted. A larger font will be used. |
| 15041 | 14 | | | | | It is not possible to read legends in Figure 14.11. | Accepted. A larger font will be used. |
| 15038 | 14 | | | | | It is not possible to read legends in Figure 14.8. | Accepted. A larger font will be used. |
| 15039 | 14 | | | | | It is not possible to read legends in Figure 14.9. | Accepted. A larger font will be used. |
| 15395 | 14 | | | | | This systematically ignores economic valuation in discussion of development patterns, energy use and adaptation – what are WTP measures of "healthy" vs actual diets – similarly for urban density and household lifestyle preferences. The discussion presents what is largely an energy and carbon theory of value, that ranks every action solely in terms of effects on carbon emissions. The discussion of diets is just silly – has no one read Danzig account of optimal solutions to the diet problem as a warning about oversimplified modeling (see George B. Dantzig, ''The Diet Problem.'' Interfaces 20, 4 (1990) pp. 43–47)? Diet is a matter of taste, even in the poorest countries, and there would be large welfare losses from imposing such diets that are completely missed by the failure to mention consumer valuation in any way. The level of detail about development patterns is highly excessive – it is elevator economics reciting numbers from tables without developing/obscuring any insight. The chapter discusses projections of climate impacts to 2100 as if they should guide current adaptation decisions. I believe this is at variance with the recommendations found in papers by Mendelsohn and others that decisionmakers should manage for current climate – then update. Dealing with large scale and long lived investments such as dams and afforestation required looking further forward, but predictions of local climate are not possible with the current state of GCM's. Without reliable predictions of long term climate at the required level of geographic detail, there is not enough information to change decisions from what it would be with current climate.Suggested papers by Mendelsohn: Robert Mendelsohn and Ariel Dinar Climate Change and Agriculture: An Economic Analysis of Global Impacts, Adaptation, and Distributional Effects, Edward Elgar Publishing, England, 2009. Mendelsohn, R., A. Dinar and A. Sanghi. 2001. "The Effect of Development on the Climate Sensitivity of Agriculture", Environment and Development Economics 6: 85-101. Mendelsohn, R. 2000. "Efficient Adaptation to Climate Change", Climatic Change 45: 583-600. Mendelsohn, R., W. Nordhaus and D. Shaw. 1994. "Measuring the Impact of Global Warming on Agriculture", American Economic Review 84: 753-771. Mendelsohn, R., A. Dinar, and L. Williams. 2006. "The Distributional Impact of Climate Change On Rich and Poor Countries" Environment and Development Economics 11: 1-20. Robert Mendelsohn The Impact of Climate Change on Land. Ch. 4. Climate Change And Land Policies Edited by Gregory K. Ingram and Yu-Hung Hong, Lincoln Institute of Land Policy,2011 pp 62-83. | The point is well taken. In the descriptive sections, we are just examining trends and drivers without undertaking an economic valuation of those. This is now clarified. Moreover, the section on diet is no longer in the chapter as indeed the claims are controversial. We also drastically shortened the detail of development patterns. |
| 10448 | 14 | | | | | Maybe the explanations can be removed | Accepted. The text will be shortend. |
| 10449 | 14 | | | | | Maybe the explanations can be removed | Accepted. The text would be shortend. |
| 10450 | 14 | | | | | Maybe the explanations can be removed | Accepted. The text will be shortend. |
| 10799 | 14 | | | | | Graphs and tables should replace the long paragraphs describing regional issues, thus reducing the number of pages while keeping the information. | Implemented. Text has been shortened drastically. |
| 10936 | 14 | | | | | Does the Asia-Pacific Partnership still exist? | Taken into account. Status of APP at time of final report should be checked |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4007 | 14 | | | | | Under the "improved forest management" row I believe information beyond rotation length could be highlighted such as the effect of species selection, management of other C pools (e.g., dead wood) and impats of fertilization should be mentioned. Also, the references for this row are all over 7 years old, there has been tremendous new work in this area since that time | Accounted for. References updated and related-data were included. This issue is also accounted for in section 14.3.2.3 Regional examples of synergies and |
| 6125 | 14 | | | | | The clasification of region is very difficult. It seems that in this chapter, regions are grouped by geographycally as well as development stage. I have a sympathy with this process. However what this way of regional groupings misses is difference in culture. For example regional culture is quite different between people (region) whether they believe in polytheism or monotheism. Even among the latter people, Islam and Christianity is quite different. Those are not reflected in this classification. Another example is that Japan, China, Korea share the same culture to the certain extent in that price mechanism may not function well. On the other hand, Australia and NZ are the countries where price mechanism may well function. However, actual grouping is that China and Korea are classified as East Asia and Japan and Australia/NZ is classified as JPAUNZ. When we discuss the effectiveness of certain mitigation policies, this grouping may not necessarily be appropriate. That said, I know it is quite difficult to have another grouping because we do not have such literatures. What I wish Chapter 14 team to do is to draw readers' attention on this limitation in the footnote. | It is hard to come up with a grouping that suits all needs. We used one that was principally related to the level of economic development (plus geography) to make it consistent with the modelling exercises and useful for the purposes of our chapter. When discussing the literature, we have to follow the regional groupings of the literature, which is now stated in the chapter. |
| 15396 | 14 | | | | | Adapting to Category 4 and 5 hurricanes is not easy – maybe not worthwhile. | Noted. This is a comment no directly related to the text and very specific to |
| 15397 | 14 | | | | | Don't confuse mitigation and adaptation – not a win-win, they are not the same – don't let mitigation test interfere with increased air conditioning as a response to heat stress. | Noted. This is an specific comment on a case in which there is not possible a win-win solution between adaptation and mitigation. Many authors have identified multiple activities in which synergies between adaptation and mitigation are not only possible, but convenient in some sectors. Part of the text that has been moved to section 14.3. This text refers to actions that could be taken at regional level to potentiate these |
| 18376 | 14 | | | | | This section could be significantly shortened by removing redundancies and focusing the discussion. | We have implemented this. |
| 10447 | 14 | | | | | This section is not necessary here, since it is dealt with in a separate chapter | Accepted, although there is not any other independent chapter dealing with this. Part of the content of regional character was moved to section 14.3, |
| 18374 | 14 | | | | | Improve linkage and coordination with Chapter 12 regarding the coverage of urbanisation trends. | Taken into account: The text has been shortened. Part of the description of urbanization trend has been moved to |
| 18669 | 14 | | | | | 14.2 – the regionalisation is changed to ? | I don't understand this comment. |
| 3665 | 14 | | | | | Delete or massively reduce to save space as overlapping with chapter 12.2. | Taken into account: The text has been shortened. Part of the description of urbanization trend has been moved to |
| 10285 | 14 | | | | | T. Homma et al., "Quantitative evaluation of time-series GHG emissions by sector and region using consumption-based accounting", Energy Policy (forthcoming) will also provide consumption emissions by region including non-CO2 GHG, and additional information on the consumption CO2 emission pattern. | Accepted, will read through the paper and reference accordingly. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11677 | 14 | | | | | As for the analysis on consumption-based emissions, regional analysis by sector done in many studies should be also comprehensively reviewed. Although a sectoral analysis of consumption-based emissions is reviewed on page 29-31, it seems that only one study is reviewed. It has been widely acknowledged in many studies that while manufacturing industries in many developed countries are net CO2/GHG emissions importers, those industries in developing countries with high CO2 intensity are net emissions exporters (e.g. Figure 14.20, Peters et al. (2011), Nakano et al. (2009), Barett et al. (2011), Homma et al. (forthcoming). For example, Sinden et al. (2011) which focus on an analysis of aluminium sector in EU, show that the net import of CO2 emission embodied in aluminium imported into Europe results in one-third of aluminium consumed in Europe in 2004, therefore, it can conclude that the impacts of EU-ETS on the aluminium consumed in EU is marginal. On the other hand, Homma et al. (forthcoming) in which consumption-based emissions including CH4 and N2O are analyzed, reveal that regional tendency of consumption -based GHG emissions in agricultural sector is different from that in manufacturing sector due to the different trade structure. That is, the major agricultural commodities importers like Japan and the EU15 are consistently net GHG emissions importers for the agricultural sector from 1990 to 2005 while major exporters like the U.S., Australia and New Zealand are consistently net GHG emissions exporters. Reference: G. E. Sinden, G. P. Peters, J. Minxd and C. L. Webere (2011) “International flows of embodied CO2 with an application to aluminium and the EU ETS,” Climate Policy, 11 (5), pp. 1226-1245. Barrett J., Owen A., Sakai M. (2011) UK Consumption Emissions by Sector and Origin, Report to the UK Department for Environment, Food and Rural Affairs by University of Leeds,http://randd.defra.gov.uk/Document.aspx?Document=FINALEV0466report(2).pdf | Agreed. The last section of 14.2. 5.2 selectively addresses the consumption based emission at sectoral level. The text will be revised. |
| 3666 | 14 | | | | | Delete or massively reduce to save space as overlapping with chapter 11.2. | Accepted. The text was reduced here. |
| 18377 | 14 | | | | | Much of the material presented in this section should be merged with the discussion in section 14.2 in order to cover past trends and possible future (projected) developments in one place. Based on this, section 14.3 could instead focus on identifying and discussing the resulting barriers and opportunities. Also, some of the material presented in section 14.3.2.4 refers to impact studies which are better covered by WGII; instead cross-referencing to the relevant sections in the WGII report should be included here. | We now merged sections 14.2 and (previous) 14.3 in the new 14.2 to address this issue. |
| 10451 | 14 | | | | | The sectoral issues has to be rewritten with more references | Accounted for. References were |
| 3667 | 14 | | | | | Delete or massively reduce to save space as overlapping with chapter 12.2. | Taken into account: The text has been shortened. Part of the description of urbanization trend has been moved to |
| 5897 | 14 | | | | | Please shorten the text - you do not need to give information in the text and in the figures. In addition, you deviate from the main topic too much. Please concentrate on things relevant for development and mitigation, avoid delving into studies and you should come up with about one third the length of the text. | Accounted for. The text was reduced to 2 pages and refocused on development and mitigation. |
| 3668 | 14 | | | | | Delete or massively reduce to save space as overlapping with chapter 12.2. | Accounted for. The text was reduced to 2 pages and refocused on development and mitigation in order to avoid |
| 18379 | 14 | | | | | In addition to the CDM and JI discussion, could you expand your analysis to address in how far regional policies are able to encourage investment and/or generate funds as agreed in Wellington (section 3.4 page 9)? Also, for some material in section 14.3.4.2 the specific regional focus and related distinction to Chapter 16 is not clear. | There really is not much regional policy on these matters and thus hard to discuss. |
| 3670 | 14 | | | | | Delete or massively reduce to save space as overlapping with chapter 16. | Yes, implemented. |
| 3671 | 14 | | | | | Cut chapter by 60%, reduce amount of graphs. Overlaps with chapter 15.2.3. | Accepted. Check with Ch. 15 regarding |
| 18378 | 14 | | | | | Please note redundancies regarding the discussion of the APP (page 65, lines 1-24 and page 82, lines 19-31) | Accepted – text revised. |

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| 10930 | 14 | | | | | An underlying theme in this section is that regional cooperation may have advantages and trade is mentioned a lot. A barrier is leakage. However, as discussed a little in this paper, it is perhaps beneficial to base climate policy around regional groupings as it will reduce leakage. This may be a relevant reference in several places? Peters, G.P., Hertwich, E.G., 2008. CO2 Embodied in International Trade with Implications for Global Climate Policy. Environmental Science and Technology 42, 1401-1407. | Accepted. |
| 3672 | 14 | | | | | Cut chapter by 60% to save space. | Accepted. |
| 3673 | 14 | | | | | Cut chapter by 60% to save space. | Accepted. Section on cooperation in the energy sector has been reduced |
| 18373 | 14 | | | | | The section on trade is in parts very well developed but would benefit from a better linkage to the sectoral issues discussed in sections 14.2 and 14.3. | Rejected due to lack of space. This would be desirable, but requires |
| 10454 | 14 | | | | | This section is very dense to read and it would be preferable to put in some bullet points | Rejected. We don't use bullet points, but we streamlined the whole section such that readability is improved. The section |
| 10937 | 14 | | | | | A relevant refence on the effect of trade on climate policy is Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908. | Accepted. |
| 18375 | 14 | | | | | Please coordinate coverage and discussion of REDD(+) with Chapters 11 and 15 in order to develop specific regional focus of the assessment. | Taken into account. Parts of the text (e.g the box on Latinamerican forestry activities) were deleted. In line with the new structure of the chapter the current text focuses on regional cooperative efforts where synergies between mitigation and adaptation are necessary. What is written in this text does not |
| 10455 | 14 | | | | | A problem with this section is that synonyms are numerous and it would be preferable if one gets an index for easy reference | Taken into account -there will be an index (glossary) included |
| 16229 | 14 | | | | | This para. states good example for S-S co-operation, but I guess it's good to talk and encourage developing countries for more co-operation by make a spot and give more examples of developing countries that have a good resources and give advice how they could share and exchange to gain more benefits for them as a developing countries. Co-operation between Asia and Africa is good example; e.g. China, India and Malaysia at Asia side; South Africa, Algeria and Egypt on the other hand. It's good also to encourage the Regional Banks to support that co-operation. | Taken into account - this is convered in s 14.4.3.4 as supported by the literature. |
| 7417 | 14 | 0 | | | | Spillover effects , burden sharing, and burden shifting are important dimensions at the regional level when assessing climate change policies but unfortunately are not well covered in this chapter and executive summary lacks any statements related to these dimensions. | These issues are discussed in detail in chapter 13 and to some degree in chapter 15. The division of labor |
| 16955 | 14 | 0 | | | | This seems to be a really interesting chapter and I regret not having had time to review it in depth. It does need closer coordination with some other chapters, I think most notably Chapters 4, 5, and 12. I confine my remarks to just one, very specific issue, though my remarks on interpreting the data may have broader implications across the chapter (and maybe more widely). | We now interlink our chapter much more closely with chapters 4, 5, and 12. |
| 14897 | 14 | 0 | | | | It would be useful to revise the chapter with an eye toward greater clarity as to the answers to some key framing questions, namely: What is the potential value of this chapter? Who is the audience? What sort of information would you like them to take from it? What is the key story that this chapter tells? | We streamlined the chapter now so that answers to these questions are now more apparent. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14898 | 14 | 0 | | | | 1) More clarity and consistency about the definitions of the regions would be helpful. Section 14.1.3 states that the chapter considers 10 specific regions (p. 7/27-31), but elsewhere the chapter refers to different sets of regions (e.g. p. 43/Table 14.4 and p. 45/Table 14.5 – 6 regions; 40/Figure 14.25 – OECD, BRIC, Other; 41-42/Figure 14.26 – other regions; 52/Table 14.6; 57/fig 14.41; 58/f14.43). Are the key points in the chapter about the 10 identified regions or about supranational regions in general? Or are they about country groups at differing levels of economic development? | We stick to our 10 region definition whereever the data is available; this definition is particularly suitable to assess the development and mitigation challenges of different regions. Otherwise we have to use the regional |
| 14899 | 14 | 0 | | | | a. The chapter also deals with subnational regions in pp.49-50. | We dropped this. |
| 14900 | 14 | 0 | | | | b. Some of the figures in 14.1 suggest that belonging to a region could explain development level; others suggest that certain development indicators are independent of region. How to make sense of this in the narrative? | The charts are meant to simply illustrate regional differences without implying causality. This is now clarified. |
| 14901 | 14 | 0 | | | | c. How important are regions for all of these issues? In some cases (e.g., journal articles, high tech exports (Fig 14.6)) individual countries may be more important than regions. In other words, does belonging to a region explain variance? Is there less variance across countries than across regions? | Point well taken. We have now streamlined this discussion and focused more on issues where regions matter. |
| 14902 | 14 | 0 | | | | To streamline the text and reduce its length, it may be helpful to | Have done this. |
| 14903 | 14 | 0 | | | | (continued from comment above) Cut back on text that is duplicative with sectoral chapters (e.g., in 14.3.2). For example, examine the following issues in comparison with specific chapters: (i) Agriculture with chapter 11; (ii)Regional scale trading initiatives: EU/ETS, WCI vis a vis 13.6; (iii) Urbanization with chapter 12; (iv) Finance with chapters 13, 14, 16; (v) the public/private finance discussion overlaps with chapter 13. Also it would be valuable to integrate the discussion of trade flows with trade discussion in chapter 13. | We have implmented the suggested cuts |
| 14904 | 14 | 0 | | | | Leapfrogging – This seems like an important issue, and one regarding which it seems the chapter could go into greater depth. More detailed and precise discussion of the capacity barriers to leapfrogging and how they play out across various countries and regions would be useful, for example. Also, are there historical analogs in which leapfrogging occurred successfully that could provide examples for how to break through financial, capacity constraints? | We have added some more discussion on this. Unfortunately, the literature is rather thin on this important issue and are conclusions reflect this uncertainty. |
| 14905 | 14 | 0 | | | | a. Adaptation -- The integration of mitigation and adaptation strategies is likely to be important in some contexts. The AR5 should find some way to highlight and address this issue in the overall report and presumably in WGIII. Chapter 14 would seem to be a good place to do it, given the regional nature of these strategies and how they intersect. | Accepted. There is some discussion on the relation adaptation-mitigation in the chapter. Particularly referred to regional cooperation schemes in subsection |
| 14906 | 14 | 0 | | | | Regional cooperation – With respect to regional cooperation, are there lessons to be learned about what differentiates successful and less successful regional cooperation initiatives? | This is now drawn out more clearly. The problem is, however, that the level of regional cooperation (outside of the EU) is rather low so that it is hard to make |
| 14907 | 14 | 0 | | | | The text is dense in places. Presentation of text is therefore highly important – bolding text, using bullets, etc. to provide visual distinction and relief is very important for this chapter and for the whole report. A number of sections of this chapter could be improved in this way, for example, the executive summary and the discussion of regional cooperation mechanisms. | We will address this in the next round of the report. |
| 14908 | 14 | 0 | | | | It is important to standardize units throughout the chapter and indeed, the AR5. For example, Figure 14.21 is expressed in GTC, whereas most discussion refers to CO2. | Yes, will stribe to standardize where possible. |
| 18362 | 14 | 0 | | | | The treatment of trade and embedded emissions is a very sensitive issue and a clear vision of its coverage should be developed in cooperation with Chapters 4, 5 and 13. | As it is an important part of our story, we decided to retain it here. But we are cooperating closely with the other chapters on the treatment of the issue; we also discuss the sensitivity and |
| 18368 | 14 | 0 | | | | General comment: Chapter 14 could be improved through a sharpening of key findings and better integration across the different chapter sections. The TSU is thus submitting a range of questions that can guide the author team in focusing their discussions in the relevant sections. | Have focused message and streamlined chapter. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18369 | 14 | 0 | | | | Guiding question: What can be learnt from linking the analysis of differences in regional mitigation capacities to the assessment of regional cooperation options for mitigation?<br>Given that mitigation capacity is low in all developing countries, what are the implications of this insight for different world regions:<br>• Should Africa focus on leapfrogging and technology transfer alone?<br>• How could development and mitigation in resource rich countries be linked to induce investments in important infrastructure (see relevant literature of Venables and van der Ploeg)?<br>• What are implications for industrialized countries in terms of selecting suitable partners (Africa or BRICS countries) when thinking about different investment strategies?<br>• What does this mean in the context of the green growth and sustainable development debate?<br>• Which role do envisaged urbanization trends in Africa in the context of mitigative capacity and cooperation options play, with megacities yet to be built and the development of rural areas largely shifting out of focus of decision makers?<br>In order to answer some of these questions, a number of issues need more focus and attention: at present, sections 14.2, 14.3 and 14.4 remain largely disconnected. Although there is interesting material presented in each of these sections, the assessment carried out does not connect the insights gained in order to build up a coherent storyline. While 14.2 provides an interesting description of the status quo, section 14.3 does not identify opportunities and barriers that may be relevant in altering the trends identified in 14.2 or forging regional cooperation initiatives in the sectors discussed (energy, agriculture, urbanisation), and in section 14.4, the sectoral focus is almost completely lost. | We are now addressing some of these questions in the chapter. To answer all of them is difficult as there are complex country and regional specificities to consider. Some brief reply to the bullets: Africa has the potential to leapfrog but will only succeed if the substantial barriers to doing so are removed (with international help). The urbanization challenge is now discussed in the chapter. The other bullets really go beyond the scope of our chapter. |
| 18370 | 14 | 0 | | | | Improve linkage to Chapter 3 regarding the usage of relevant assessment criteria in the assessment of policies. | We closely liaise with chapter 3 on this (although the X-Cuts in Vigo were poorly planned and did not advance the linkages to chapter 3 much as there was |
| 18371 | 14 | 0 | | | | The following sections could be improved through a better internal linkage: introductory section (14.1.5.1 and Figure 14.6), section on leapfrogging & technology transfer (14.3.3), section on investment and finance (14.3.4) and section on technology-focused agreements (14.4.3). Also, as the treatment of sub-national issues is beyond the focus of this chapter, the treatment of sub-national regions in section 14.3.3.1 may be removed. | Now done. Thanks for pointing this out. |
| 18372 | 14 | 0 | | | | Guiding question: What do we learn from consumption based accounting? Although the relevant sections on consumption are well developed their purpose for the chapter remains unclear. What needs to be more clearly developed in the assessment is a clear insight to what we learn from consumption based accounting and international emission flows (see related comment on embedded emissions and trade). Its role as a useful tool to assess the distribution of mitigation efforts needs to be evaluated in strong coordination with Chapters 4 and 5. | We now discuss more clearly the relevance of consumption-base accounting. They matter as they pose special challanges for mitigation for carbon exporters and carbon importers (also, e.g. in terms of border tax |
| 18380 | 14 | 0 | | | | Please remember to convert all monetary units to 2010 US$ (methodology, common exchange rates and deflators are provided by Metrics & Methodology CLAs). | Yes will do (when the literature allows it). |
| 19005 | 14 | 0 | | | | In your analysis of development trends and implications on emissions at the regional level in section 14.2, please include relevant regional scenario analyses such as from the Asian Modeling Exercise, EMF 22/27, or Low Carbon Societies. You may wish to liaise with your colleagues from Chapter 6 for more information on this. You may also wish to discuss with chapter 6 authors using regionally specific results from the scenario database, which is compiled for the purpose of the AR5. | We are in close touch with chapter 6 on these matters. |
| 18665 | 14 | 0 | | | | 86 pages, 46 over target!<br><br>A disaster in comparison to chapter 13, more of a rough outline than a draft | Now heavily stramlined. |

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|---|---|---|---|---|---|---|---|
| 18666 | 14 | 0 | | | | Is the aim to describe the situation in different regions and compare them or to discuss how regional coop. can drive mitigation? The first part is to a big extent covered by earlier chapters (though the division into regions tend to differ in an uncontrolled way). | The chapter does both and now says it more clearly; the overlapy have been reduced and we are the only chapter to present data and issues at a highly regionally disaggregated level (10 |
| 18667 | 14 | 0 | | | | A problem is that the division used seems to be mainly geographical or economic/geographical – not according to existing cooperations. | This is true and, in our view, necessary for the regional heterogeneity portion of our chapter (14.2); we explicitly discuss |
| 18668 | 14 | 0 | | | | The chapter contains a lot of descriptive material – will have to be sorted out since the expectation is to have 40 pages. | Yes, now mostly sorted out. |
| 18670 | 14 | 0 | | | | Handles themes that are already handled (or should be handled) in other chapters such urbanisation. Interesting as such but shows a lack of coordination. | Urbanization was a specific bullet to be tackled in our chapter. We now coordinate more closely with the other |
| 18671 | 14 | 0 | | | | The chapter is all over the place – a clear need to sort out what is or should be handled in other chapters and what is the overall theme for this chapter. My understanding is that the idea is to go through regional cooperation form a policy/mitigation perspective but not implemented in that way. | Regional cooperation is a central theme, now in 14.3, but regional heterogeneity is also a central theme, now in section |
| 18673 | 14 | 0 | | | | EU ETS (in reality wider, a climate and energy package)<br><br>WCI<br><br>EU ETS is also described in chapter 13 (more structured but also more limited in scope) | We have a clear division of labor with chapter 13 on what to include in our chapter (the main assessment of the EU ETS) while they focus on the linkage to global deals. |
| 3182 | 14 | 0 | | | | The purpose of this chapter is elusive. It seems to cover the same territory as the sectoral chapter. There's a lot of discussion of CDM and REDD (both topics discussed to death in earlier chapters) and also on decentralized agreements (discussed in chapters 2 and 13 among other places). What is the center of gravity of this chapter and its main goal? | In streamlining the chapter, we have now focused on the importantce of regional heterogeneity for mitigation oppounities and capacities and the |
| 3690 | 14 | 1 | | | | Here I would like to suggest some very important references | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3693 | 14 | 1 | | | | Bhandari, Medani P. (2012) Environmental Performance and Vulnerability to Climate Change: A Case Study of India, Nepal, Bangladesh, and Pakistan, (in press) “Climate Change and Disaster Risk Management" Series: Climate Change Management, Springer, New York / Heidelberg, ISBN 978-3-642-31109-3 | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3694 | 14 | 1 | | | | Brechin, Steven R. and Bhandari, Medani P. (2011) Perceptions of climate change worldwide, WIREs Climate Change 2011, Volume 2:871–885. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3695 | 14 | 1 | | | | Brechin SR. Chapter 10: Public opinion: a cross-national view. In: Lever-Tracy C, ed. Routledge Handbook of Climate Change and Society. London & New York: Routledge Press; 2010. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3696 | 14 | 1 | | | | Bord RJ, Fisher A, O’Connor RE. Public perceptions of global warming: United States and international perspectives. Clim Res 1998, 11:75–84. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3697 | 14 | 1 | | | | Dunlap R. Lay perceptions of global risk: public views of global warming in cross-national context. Int Sociol 1998, 13:473–498. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3698 | 14 | 1 | | | | Brechin SR. Comparative public opinion and knowledge on global climatic change and the Kyoto Protocol: the U.S. versus the world? Int J Sociol Soc Policy 2003, 23:106–134. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3699 | 14 | 1 | | | | Bell A. Climate of opinion: public and media discourse on the global environment. Discourse Soc 1994, 5:33 – 64. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3700 | 14 | 1 | | | | Bostrom A, Morgan MG, Fischhoff B, Read D. Does concern about global warming equal a willingness to sacrifice? Risk Anal 1994, 14:959 – 970. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3701 | 14 | 1 | | | | Kempton W. Lay perspectives on climate change. Glob Environ Change 1991, 1:321 – 324. | Thanks for the reference. We will look them up and cite them if they fit well. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3702 | 14 | 1 | | | | Kempton K, Boster JS, Hartley JA. Environmental Values and in American Culture, Cambridge, MA: MIT Press; 1995. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3703 | 14 | 1 | | | | Loftstedt RE. Climate change perceptions and energy- use decisions in Northern Sweden. Glob Environ Change 1991, 1:321 – 324. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3704 | 14 | 1 | | | | Loftstedt RE. Lay perspectives concerning global climate change in Sweden. Energy Environ 1992, 3:171 – 175. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3705 | 14 | 1 | | | | Loftstedt RE. Lay perspectives concerning global climate change in Vienna, Austria. Energy Environ 1993, 4:140 – 154. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3706 | 14 | 1 | | | | Read D, Bostrom A, Morgan MG, Fischoff B, Smuts T. What do people know about global climate change: survey studies of educated laypeople? Risk Anal 1994, 15:971 – 982. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3707 | 14 | 1 | | | | Dunlap R, Gallup GH Jr, Gallup AM. The Health of the Planet Survey: A George H. Gallup Memorial Survey. Princeton, NJ: Gallup International Institute; 1993. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3708 | 14 | 1 | | | | Kempton W, Craig PP. European perspectives on cli- mate change. Environment 1993, 35:16 –20, 45. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3709 | 14 | 1 | | | | Brechin SR, Freeman D. Public support for both the environment and an anti-environmental President: pos- sible explanations for the George W. Bush anomaly, The Forum, (1) online. 2004. Available at: http://www. bepress.com/forum. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3710 | 14 | 1 | | | | McCright AM, Dunlap RE. Defeating Kyoto: the conservative movement's impact on U.S. climate-change policy. Soc Probl 2003, 50:348 – 373. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3711 | 14 | 1 | | | | Dunlap R, McCright A. Climate change denial: sources, actors and strategies. In: Lever-Tracy C, ed. Handbook on Climate Change and Society. Routledge Press; 2010. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3712 | 14 | 1 | | | | Oreskes N. The scientific consensus on climate change. Science 2004, 306:1686. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3713 | 14 | 1 | | | | Lever-Tracy C. Routledge Handbook on Climate Change and Society. London & New York: Routledge Press; 2010. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3714 | 14 | 1 | | | | Brody SD, Zahran S, Bedlitz A, Grover H. Examining the relationship between physical vulnerability and public perception of global climate change in the United States. Environ Behav 2008, 40:75–95. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3715 | 14 | 1 | | | | Guber DL. The Grassroots of a Green Revolution: Polling America on the Environment. Cambridge, MA: MIT Press; 2003. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3716 | 14 | 1 | | | | Hoggan J, Littlemore R. Climate Cover-up: The Crusade to Deny Global Warming. Vancouver, BC, Canada: Greystone; 2009. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3717 | 14 | 1 | | | | Jacques PJ, Dunlap RE, Freeman M. The organization of denial: conservative think tanks and environmental skepticism. Env Polit 2008, 17:349–385. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3718 | 14 | 1 | | | | McCright AM, Dunlap RE. Challenging global warming as a social problem: an analysis of the conservative movement's counter-claims. Soc Probl 2000, 47:499–522. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3719 | 14 | 1 | | | | Oreskes N, Conway EM. Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming. New York: Bloomsbury Press; 2010. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3720 | 14 | 1 | | | | Leiserowitz A. Knowledge of Climate Change Across Global Warming's Six Americas, Yale Project on Climate Change Communication, Yale University, New Haven, CT; 2010. Available at: http://environment.yale.edu/uploads/SixAmericasJan2010.pdf . (Accessed | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3721 | 14 | 1 | | | | June 25, 2010). | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3722 | 14 | 1 | | | | Gupta J. A history of international climate change policy. WIRES: Clim Change 2010, 1:636–653. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3723 | 14 | 1 | | | | Leiserowitz A. International public opinion, perception, and understanding of global climate change. Human Development Report 2007/2008. Human Development Office Occasional Paper, UNDP; 2007. | Thanks for the reference. We will look them up and cite them if they fit well. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3724 | 14 | 1 | | | | Lorenzoni I, Pidgeon NF. Public views on climate change: European and USA perspectives. Clim Change 2006, 77:73–95. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3725 | 14 | 1 | | | | Moser SC. Communicating climate change: History, challenges, process and future directions. WIRES: Clim Change 2010, 1:31–53. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 3726 | 14 | 1 | | | | Wolf J, Moser SC. Individual understandings, perceptions, and engagement with climate change: Insights from in-depth studies across the world. WIRES: Clim Change 2011, 2:547–569. | Thanks for the reference. We will look them up and cite them if they fit well. |
| 5877 | 14 | 1 | 1 | 116 | 28 | The text could be shortened considerably if you made sure information was given EITHER in the text OR in a figure OR in a table, not - as it is quite often the case - in at least two of the three ways possible. | Accounted for. Figures were deleted, leaving those with more relevant information in the text. Discussion was included to substitute for most of the |
| 13623 | 14 | 1+ | | | | At the risk of providing some shameless self promotion I just wanted to flag research I did for my PhD dissertation which may be of interest -- I examined the uptake of trade policy on renewables (where it was found that 1) a less open trade regime afforded Brazil more opportunities to build up their indigenous expertise and hence had knock on effects for use 2) previous experiences had an impact on adoption (in a positive way in Brazil due to the experience of the apagao and negatively in Mexico where previous bad experiences with Solar Water Heaters painted all SWHs with the same negative brush) and 3) that local technology cooperation dynamics (in this case cities and relationships between and among actors) were also important in helping to explain adoption (as in Sao Paulo actors were more mobilized, coherent and institutionalized - this was also traced to trade policies where more infighting occurred between firms depending on their origins (foreign / domestic / joint)) Mallett (2009) Technology adoption, cooperation and trade and competitiveness policies: Re-examining the uptake of Renewable Energy Technologies (RETs) in urban Latin America using systemic approaches | Thanks for the reference. We will look it up and cite it if it fits well. |
| 14924 | 14 | 10 | 1 | 10 | 2 | Does the reference to “disparities” in this sentence refer to country-to-country disparities within a region or to disparities among groups within the region (e.g. men vs. women), as suggested in the next sentence? | Accepted. Clarification made in text. |
| 14925 | 14 | 10 | 7 | | | Figure 14.3 depicts a situation with greater intra-regional disparity than disparity among regions. How does this fit with the overall narrative about regions? | Rejected. There is also a great intraregional disparity as seen from the |
| 10218 | 14 | 11 | | | | "income share" and "adjusted net savings" graphs lack unit on the x-axis | Accepted and corrected. |
| 5882 | 14 | 11 | | | | Please explain what is meant by "poverty gap" (not explained in the text and not included in the glossary). The same holds true for "dependency ratio". | Accepted. Dependency ratio is no longer in the text. Poverty gap is explained in the glossary. It was decided to relegate |
| 14927 | 14 | 11 | 12 | | | The adjusted net savings graph does not show much variation (at least in the median of the distribution) among the four categories depicted. What point does it make? | Taken into account The median does show variation across regions and what we want is to explicit regions showing |
| 14926 | 14 | 11 | 2 | | | Subdivide figure with letters (14.4a); not all figures here are referenced in text. Some of these beg further explanation (e.g., dependency ratio). Here too, variation within regions is sometimes greater than across regions (e.g., adjusted net savings). | Accepted. Changes made in text. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15070 | 14 | 111 | 1 | 111 | 3 | Alternative source for Rowlands (2011) is: Reference Type: Journal Article<br>Author: Rowlands, Ian<br>Primary Title: Ancillary impacts of energy-related climate change mitigation options in Africa's least developed countries<br>Journal Name: Mitigation and Adaptation Strategies for Global Change<br>Cover Date: 2011-10-01<br>Publisher: Springer Netherlands<br>Issn: 1381-2386<br>Subject: Earth and Environmental Science<br>Start Page: 749<br>End Page: 773<br>Volume: 16<br>Issue: 7<br>Url: http://dx.doi.org/10.1007/s11027-011-9292-z<br>Doi: 10.1007/s11027-011-9292-z | Taken into account. Thank you for pointing this out. Rowlands (2011) has been removed from the list of references |
| 15284 | 14 | 12 | 18 | 12 | 18 | "0,8%" to be "0.8%" | Accepted. OK |
| 13601 | 14 | 12 | 6 | | 8 | east Asia is lumped together - I would suggest noting the rapidly changing landscape and differences within these groups of countries e.g. Georgia institute of technology has done work suggesting that China is quickly moving from being the world's factor to the world's R&D lab; Economic intelligence Unit's report on China and high value goods (heavy duty) (world market share) page 4 graphic is particularly arresting http://www.eiu.com/Handlers/WhitepaperHandler.ashx?fi=Heavy_duty_Chinas_next_wave_of_exports.pdf&mode=wp&campaignid=heavyduty_Aug11 | We note the eterogeneity within regions and the changing patterns of development there. |
| 14928 | 14 | 12 | 9 | 12 | 20 | This paragraph seems to be expressing an important point, but is difficult to understand. Suggest rewriting it for clarity. | Accepted. Considered by the author. |
| 3301 | 14 | 12 | 1 | 12 | 25 | This section is ok, including useful Fig. 14.6. Don't shorten here. | Noted. |
| 14929 | 14 | 13 | 15 | 13 | 24 | Consider putting this paragraph under a separate "summary" subhead. | Accepted. Considered by the author. |
| 12494 | 14 | 14 | 35 | | | The many abbreviations need explanation | Accepted. The abbrevistions will be |
| 5883 | 14 | 15 | | | | Please user larger font in the figure. Especially the labels at the x-axis are too small. | Accepted. A larger font will be used. |
| 12495 | 14 | 15 | 2 | | | The figure need more explanation in the caption. It would also be beneficial if the two time ranges were the same. Now it is 10 and eight years. | Accepted. The abbrevistions will be replaced by full names. The two time ranges will be merged into one single |
| 14930 | 14 | 15 | 2 | | | Figure 14.8 is not clear. A legend should explain the yellow dots (which are presumably the net emissions. Do these data reflect changes against a baseline? This should be explained. Why does 2000 appear in both intervals? It would also be useful to distinguish 1990-2000 from 2000-2008 in a visual way (perhaps with a different color scheme or cross-hatching). Also is there data more recent than 2008? This will be somewhat outdated by the time the report is published. | Accepted. The date will be updated as EDGAR DB is updated and more explanation will be made on legends. |
| 5884 | 14 | 15 | 22 | 15 | 25 | Please make sure you don't attribute all AFOLU-emissions to forestry. De-forestation, what is responsible for a large part of emissions, is land-use change, not forestry. | Accepted. EDGAR DB, which is used here, includes AFOLU emissions in forestry fire partly. The exact relationship between AFOLU, LULUCF and foresty fire in EDGAR will be defined later in the |

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| 13602 | 14 | 15 | | | | while increase in per capita income along with population growth are important in terms of GHG emissions, also think one needs to flag the changing landscape and how supply chains are global now and what the implications are of this. E.g. Watson and Wang (2007) did a study entitled Who Owns China's Emissions, which suggest that a fair chunk of its emissions can be traced to goods for those outside of its borders. www.tyndall.ac.uk/content/who-owns-chinas-carbon-emissions Glen Peters has also done work http://www.sciencedirect.com/science/article/pii/S0301421508002905 | Taken into account. The consumption-based emissions are dealt with in Section 14.2.3. |
| 5885 | 14 | 16 | | | | Please user larger font in the figure. Labels at the x-axis are too small. | Accepted. A larger font will be used. |
| 14931 | 14 | 16 | 3 | | | Does the CO2 data include AFOLU other than forest fires? | Accepted. A clear indication on the exclusion of AFOLU will be made. |
| 14932 | 14 | 16 | 3 | | | Does the CO2 data include AFOLU other than forest fires? It would seem important to include this. | Accepted. EDGAR DB, which is used here, includes AFOLU emissions in forestry fire partly. The exact relationship between AFOLU, LULUCF and foresty fire in EDGAR will be defined later in the |
| 5886 | 14 | 16 | 8 | 16 | 18 | Text can be shortened considerably, is redundant to figure 14.10. | Accepted. The text will be shortend. |
| 14933 | 14 | 17 | 10 | | | This is an important figure. Some version of it should be made salient in the chapter and considered for inclusion in the technical summary. | Noted. |
| 8938 | 14 | 17 | 12 | 18 | 2 | This is a far too short representation of the lively and elaborate scientific debate on the EKC. The existence of the EKC for air pollutants is already debated, but for CO2 there is a huge body of literature, that mostly does not find an EKC. | Rejected. More discussion on EKC does not seem to be appropriate here considering that there is little empirical evidence available and that it is hard to |
| 5887 | 14 | 17 | 16 | 18 | 2 | Text can be shortened, if you have no indication of EKCs you do not need to mention them. | Accepted. The text will be shortend. |
| 14934 | 14 | 17 | 18 | 18 | 2 | The meaning of this sentence is unclear. Does it mean to say that Figure 14.12 provides evidence of an Environmental Kuznets Curve with respect to CO2? Or does it mean to say that 14.12 suggests a hockey-stick trend. Figure 14.12 doesn't seem to clearly support either hypothesis, though it is seems more consistent with an EKC. | Taken into account. It is not possible to derive any general conclusions on EKC. This section shows regional heterogeniety w.r.t greenhouse gases |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16956 | 14 | 18 | | | | I find this format of data fantastically rich and important. Unfortunately, quite a lot of this richness is lost in the level of aggregation, and also the text which seems to be hunting for one specific thing (evidence of a Kuznets curve peak) and fails to find it. This blinds the authors to far more interesting observations. However, a number of these would only be possible at a more disaggregated level, not least to avoid the big gap between US$10 and US$20,000/capita income which seems to be where the really interesting questions arise.<br>Grubb, Hourcade and Neuhoff present a version of the chart which is more disaggregated, in terms particularly of Annex I but also containing a number of other specific countries. It seems easiest to offer the thoughts that the Chapter offers from this:<br>There is a clear pattern of emissions rising in the early to mid stages of economic development – up to around $10,000 per capita – though even here there is huge divergence between Brazil and some other mid-income countries, which emit more than twice as much for the same levels of wealth (never mind Russia, which is much higher still). Economic recovery in eastern Europe and Russia was not accompanied by corresponding emission increases.<br>Economic growth has not uniformly increased emissions, once countries have reached a basic stage of industrialisation. Above incomes of about $10,000-$20,000 per capita, there is little sign of consistent relationship and indeed emissions per person seem to have roughly stabilised in many industrialised countries for the past 20 years, and more recently for some of the most advanced "developing" countries of Asia and Latin America. However there is clear divergence between North American and Australia on the one hand, and the major industrialised economies of Europe and Asia on the other: … [the section goes on to explore in more detail and concludes .. ]<br>"This makes future trends and possibilities all the more interesting. Most of the world's populations reside in the emerging and developing economies. The apparent stabilisation and "open jaw" of different per-capita emission levels at incomes above $10-20,000 per capita is then hugely significant . Given the weight of billions of poor people, the global average income level is around $10,000. Across Asia overall and much of Latin America, it averages at around $6,000 but is rising rapidly. It makes a massive difference whether their future trajectories emulate those typical in the US and Australia in moving towards 20tCO2 per capita; the 10 tCO2 typical in Europe and Japan; or closer to the 5-6 tCO2/cap of France…. [Or ] emulating the current energy sector emission levels of Brazil … "<br>The tone of the current IPCC text appears to be that Annex I countries have failed to cut emissions– a focus of message which seems a combination of blame and hopelessness; if this were uniformly true through the peak of climate change concerns and efforts (broadly the mid 1990s to mid 2000s), it would be an extremely depressing conclusion and would inexorably lead us to conclude that the world has no real hope of tackling climate change. The actual message from the data, across Annex I and elsewhere, seems far more subtle and intriguing.<br>The more detailed analysis of policies in the book (notably Chapters 5 - 7) suggest that this is due to a combination of Pillar 1 (regulation and engagement) and Pillar 2 (prices and markets) policies.<br>Reference: Grubb, Hourcade and Neuhoff, Planetary Economics: the Three Domains of Sustainable Energy Development, Taylor & Francis forthcoming (Chapters 1 – 5 submitted, others in draft available on request). | Taken into account. Due to the lack of evidence about environmental Kuznets curve, the explanations on the graph will be shortend and will describe just regional differences. |
| 10914 | 14 | 18 | | | | A relevant figure may be Steinberger, J.K., Timmons Roberts, J., Peters, G.P., Baiocchi, G., 2012. Pathways of human development and carbon emissions embodied in trade. Nature Clim. Change 2, 81-85. | Rejected. The figure here aims to show regional differences, not national ones. Country-by-country discussions are better fit in other chapters, such as 15 |
| 12496 | 14 | 18 | 4 | | | This figure is the same as figure 5.4.2 in chapter 5. In order to cut text, coordinate which information that needs to be included in this chapter, and what is already included in chapter 5. | Accepted. I will try to coordinate with Chapter 5 authors. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13604 | 14 | 19 | | | | suggest highlighting discrepancies within regions - not only urban rural but also in examining Asia - see Urmee (2009) and Singapore, China and Thailand have electricity rates close to 100% while 5% in Myanmar / Burma and around 50% in India, Nepal, Bangladesh Urmee, T., Harries, D. and Schläpfer, A. (2009) Issues related to rural electrification using renewable energy in developing countries of Asia and Pacific. Renewable Energy, 34 (2). pp. 354-357. | Accepted. Reference is relevant, a detailed assessment of energy aceess by region and across region will be presented.<br>Variation of energy access by country, is |
| 5888 | 14 | 19 | | | | Table can be deleted, content is already given in the text. | Accpeted. The content from the table |
| 5889 | 14 | 19 | | | | Table can be deleted, content is already given in the text. | Accpeted. One table is presented |
| 14935 | 14 | 19 | 1 | | | It would be useful to show this information also in percentage terms if data is available. | Accepted. A new table has been created and the information will be presented in |
| 14936 | 14 | 19 | 1 | | | Note that this table and Table 14.2 below also depart from the 10-Regions framework described earlier in the chapter. | Accepted. The regional difference as per Wellington Accord did not fit when compiling data on energy access. Hence, regional grouping as available in |
| 14937 | 14 | 19 | 3 | | | This table is redundant with Table 1; suggest using one of these tables only. | Accepted. One table is kept. |
| 15131 | 14 | 19 | 6 | 19 | 6 | It seems to me that is neccessary to explain as weel that in a lot of developing countries, in rural areas, the highest percentage of expenditure on energy respect to the level of income, is observed in the population that has the lowest income and expenditure on energy | Accepted. A detailed assessment of available literature on energy expenditure and level of income is being presented. |
| 5890 | 14 | 20 | | | | Figure shows "n.a." approximately in the region of Kashmir. Is this a printing error or are data for this region really not available? | (a question to Section on Energy and Development) |
| 5891 | 14 | 20 | 13 | 20 | 32 | This text can be shortened considerably if you change the point of view. Instead of describung what was found in the regions, write what was found / has happened and list the respective regions, e. g. "some regions had high levels of urbanization (Europe, EIT, NAM, the Caribbean and Korea), others ...". | Taken into account. The text has been shortened. Part of the description of urbanization trend has been moved to |
| 10915 | 14 | 20 | | | | I thought this was an interesting and well written section. What is the relationship with this section and the urbanisation chapter, and chapters 4 which discuss urbanisation | Noted. The section of urbanization in this chapter focuses on regional variations in the patterns and forms of urbanization and their impacts on mitigation. All other aspects of urbanization (esp. Also the discussion on the linkages between |
| 14941 | 14 | 20 | 6 | | | Urbanization and development -- This is an important discussion and should be tightened up a bit and revised for clarity. What is implication? Is urbanization bad for CO2? It is worth thinking about what this means and what to say about it. | Take into account: the text has been rewritten, and indicates the challenges and opportunities for climate change mitigation in regions with<br>different patterns and forms of |
| 13605 | 14 | 21 | | | | Dodman, D. (2009). "Blaming cities for climate change? An analysis of urban greenhouse gas emissions inventories." Environment and Urbanization 21: 185-201. | Noted. |
| 13606 | 14 | 21 | | | | not sure why Dodman reference is like this but just to point out that while initially it is stated that per capita emissions are more in cities, later on (page 22) the differences emerge -- e.g. SSA and Latin America they tend to be less Dodman 2009 (above0 also notes this - so I don't know that it's fair to say that cities tend to have higher GHG emissions per capita as a whole | Noted. |
| 10219 | 14 | 21 | | 22 | | not all lines in the graph are explained in the figure legend | Taken into account: fixed (figure |
| 10220 | 14 | 21 | | 22 | | not all lines in the graph are explained in the figure legend | Taken into account: fixed (figure |
| 12497 | 14 | 21 | 2 | | | Part of the ledgend is missing | Take into account. fixed (figure removed) |
| 14939 | 14 | 21 | 2 | | | legend is incomplete, missing several regions | Taken into account. fixed (figure |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5892 | 14 | 21 | 28 | 21 | 30 | What does this mean? Poor people emit more if relocated in an urban area, middle income groups less than when dwelling in small towns and high income groups emit the same wherever they live? If this is the case, what do you want to point out here? Please either elaborate a little further why you give the information here or delete text. | Taken into account: The text has been rewritten. |
| 14938 | 14 | 21 | 8 | 21 | 10 | syntax is unclear; delete “than”? | Editorial. corrected |
| 12498 | 14 | 22 | 2 | | | Part of the ledgend is missing | Taken into account: fixed (figure |
| 14940 | 14 | 22 | 2 | | | legend is incomplete, missing several regions | Taken into account: fixed (figure |
| 14942 | 14 | 22 | 20 | 22 | 24 | Is this phenomenon evidence of a “leapfrogging” of sorts? | Editorial: text removed |
| 14944 | 14 | 24 | 13 | 24 | 14 | Perhaps surprisingly, the per-capita energy consumption of developing country cities does not appear much lower than that of developed country cities in Figure 14.16, in contrast to the statement here. | Noted and included |
| 14943 | 14 | 24 | 7 | 24 | 10 | The reference to “Asian” would appear to encompass East Asian, yet East Asian cities have higher than average per capita energy use according to Figure 14.16. | Noted |
| 11665 | 14 | 24 | | | | The content of the text in 14.2.4 nearly overlaps with those of 5.5.3 (Consumption trends) and 5.5.4 (Embedded carbon in trade). While the related research results shown in 5.5.3 and 5.5.4 are reviewed in a balanced manner, the text in 14.2.4 tends to be biased toward presenting particular research results. | Overlaps are acknowledged and will be removed. Cross-references will be used to guide the reader to the relevant sections. Efforts will be made to mitigate |
| 11666 | 14 | 24 | | | | The uncertainties of the consumption-based CO2/GHG emissions are not stated in the text. This is an important issue, and many studies pointed out these uncertainties. It has been acknowledged in the related literature that the consumption-based emissions highly depend on the data used, data coverage (geographical/sector/gas (energy-related CO2 only, or energy-related CO2+non-energy-related CO2 from industrial process etc, or GHG emissions including non-CO2) and aggregation and the methodologies. (e.g. Lenzen (2001), (Lenzen et al. (2004), Lenzen et al. (2010)). Reference: Lenzen, M. (2001) Errors in Conventional and Input-Output–Based Life-Cycle Inventories, Journal of Industrial Ecology, 4(4), pp. 127-148., Lenzen, M., Pade, L. and Munksgaard, J. (2004) CO2 Multipliers in Multi-region Input-Output Models, Economic Systems Research, 16(4), pp. 391-412., Lenzen, M., Wood, R. and Wiedmann, T. (2010) Uncertainty Analysis for Multi-Region Input-Output Models: A Case Study of the UK's Carbon Footprint, Economic Systems Research, 22(1), pp. 43-63. | Agreed - uncertainty of the consumption approach is a very important issue. This will be briefly acknowledged, however, detailed discussion (with references to the literature) may be better located in ch 5. where consumption approaches are first introduced. |
| 10916 | 14 | 24 | | | | I thought this was an interesting and well written section. It has a nice graphical presentation of the results, showing many relevant aspects. What is the relationship with this section, and the similar sections in Chapters 4 and 5? | The close relationship with this section and 5.5 and 4.4 is acknowledged. Cross-referencing will be used to avoid duplication. The relationship between |
| 10921 | 14 | 24 | | | | One regional aspect that was not captured in this section, but is worth including, is the trade in fossil fuels: Davis, S.J., Peters, G.P., Caldeira, K., 2011. The supply chain of CO2 emissions. Proceedings of the National Academy of Sciences 108, 18554-18559. | Accepted. This aspect will be included in the SOD. |
| 11667 | 14 | 24 | 32 | 24 | 34 | As for the purpose of the UNFCCC national inventory, the quotation of Glen P. Peters (2008) is not appropriate. The UNFCCC states the purpose of the inventory in its own website at http://unfccc.int/national_reports/items/1408.php. | Accepted. |
| 11668 | 14 | 24 | 34 | 24 | 35 | The text states that there are three emission accounting methods. However, the terriorial approach is almost the same as the production approach. Therefore, there are two emission accounting methods. | Although territorial and production approaches are similar, there are important differences highlighted in the literature. However, changes to the text |
| 12499 | 14 | 24 | 31 | | | Take out what is already in chapter 5 with cross references to this chapter. | Accepted. The close relationship with this section and 5.5 and 4.4 is acknowledged. Cross-referencing will be used to avoid duplication. The |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7329 | 14 | 25 | 11 | 25 | 11 | Many reference lacked even though you cited in texts, e.g. Manfred Lenzen et al. 2007 | Efforts will be made to comprehensively cite relevant studies in the SOD. |
| 7328 | 14 | 25 | 13 | 25 | 15 | Peters et al. (2011) on Nature Climate Change updated these numbers up to 2010. doi:10.1038/nclimate1332 | Accepted |
| 11670 | 14 | 25 | 13 | 25 | 15 | The quotation of Glen P. Peters, Jan C. Minx, et al. (2011) is not necessary as the sentence "Global CO2 emissions (CDIAC data, which includes fossil-fuel, cement and gas-flaring sources) grew…" only explains the statistic data of CDIAC. | Accepted. Associated paragraph will be removed in SOD. |
| 11669 | 14 | 25 | 13 | 25 | 30 | It should be mentioned clearly whether the emissions stated in this paragraph are production-based or consumption-based. | Accepted. Emissions stated are production-based. Associated paragraph |
| 11671 | 14 | 25 | 22 | 25 | 23 | The quotation of Dabo Guan et al. 2008; Dabo Guan et al. 2009; Gregg et al. 2008 is not necessary as the sentence "East Asia has seen its production emission increase…the United States." only explains the statistic data of CDIAC. | Accepted. Associated paragraph will be removed in SOD. |
| 10917 | 14 | 26 | 11 | | | "largely drives this growth". Disentangling what drives the growth may be difficult. While trade has grown, the question is really what drives the growth in trade. It is perhaps worth mentioning that studies generally do not analyse what is driving the growth in trade (otherwise it might look like you are indirectly saying trade is the problem). | Accepted. |
| 10918 | 14 | 26 | 23 | | | A good reference here is Chakravarty, S., Chikkatur, A., Coninck, H.d., Pacala, S., Socolow, R., Tavoni, M., 2009. Sharing global CO2 emission reductions among one billion high emitters. Proceedings of the National Academy of Sciences 106, 11884-11888. | Accepted. |
| 11672 | 14 | 26 | 20 | 26 | 29 | The definition of "carbon footprint" is not clealy described. Also, it is not clear the relationship between the carbon footprint and the consumption-based emissions. | Definition of 'carbon footprint' will be provided with cross-reference to 4.4 or |
| 11678 | 14 | 26 | 30 | 26 | 37 | Evaluation periods should be mentioned. | Accepted |
| 11673 | 14 | 26 | 38 | 28 | 29 | It seems that the text presents only the results using GTAP and CDIAC statistics. In terms of global estimations, other studies such as Nakano et al. (2009) using OECD and IEA statistics should be referred as well in a balanced way, because according to Sato (2012) and Homma et al. (forthcoming), large uncertainties on estimations of net emissions transfers are observed in many studies. Even if the same MRIO estimation method is used, it is widely recognized that there are large difference in results, as shown in Sato (2012). Furthermore, the uncertainties in GTAP data used in Peters et al. (2011) should be mentioned. Reference: Peters G.P., J.C. Minx, C.L. Weber, and O. Edenhofer (2011). Growth in emission transfers via international trade from 1990 to 2008. PNAS.<br>M.Sato (2012), Embodied carbon in trade: a survey of the empirical literature, Centre for Climate Change Economics and Policy Working Paper No. 89. Homma et al. (forthcoming). Quantitative evaluation of time-series GHG emissions by sector and region using consumption-based accounting, Energy Policy | This is an important issue and will be addressed accordingly. We are still discussing the best description and format to present the uncertainty of consumption based accounting with Chapter 5. This will be covered in SOD (either in our chapter or chapter 5). |
| 11674 | 14 | 26 | 38 | 28 | 29 | Data source should be mentioned. | Mentioned in Figure caption, but will also be given in main-body text. |
| 9128 | 14 | 27 | | | | As for abbreviation for Japan, the word "JAP" is used in the figure 14.18 and in the sentences in page 19 to 30. I would like to recommend using the abbreviation JPN or JAPAN instead. | Accepted. |
| 9159 | 14 | 27 | | | | good figure | Noted. |
| 9160 | 14 | 27 | | | | good figure | Noted. |
| 14946 | 14 | 27 | 12 | 27 | 12 | -“is” should be “was”, given that this is discussing 2004. | Accepted. |
| 14945 | 14 | 27 | 5 | 29 | 27 | may be able to save space here by cutting back on examples. | Accepted. |
| 11676 | 14 | 27 | | 29 | | It should be mentioned whether the evaluated CO2 emissions are energy-related CO2 emissions only or sum of energy-related CO2 and non-energy-related CO2 (from industrial process etc.). | Accepted. |
| 11675 | 14 | 27 | 12 | 27 | 15 | In the text, it says that North America is the largest net emission importer in 2004. As far as I see from Figure 14.18, Western Europe is the largest net emission importer (1072 Mt). | Accepted. Figure was revised without necessary changes being made in the |
| 14948 | 14 | 28 | 21 | 28 | 23 | This is a sentence fragment. | Accepted. Sentence will be revised. |
| 14947 | 14 | 28 | 4 | 28 | 4 | This sentence attributes 1366 MT CO2 to East Asia, whereas Figure 14.19 attributes 1266 MT CO2. | Accepted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9127 | 14 | 28 | 4 | | | The growth of traded CO2 emissions of East Asia is 1266 MtCO2, while in the sentence which appears in page 28, the number is 1366 MtCO2. | Accepted. |
| 9129 | 14 | 29 | | | | The changes from 1990 to 2008 include the effects of the collapse of the Soviet Union. The world trade increase accelerated in the 2000s. Therefore referring the growth from 2000 to 2008(?) is better than the period starts from 1990. The following paper mentions at this point. Hoshino, Y., Sugiyama, T., Ueno, T. 2010. International Comparison of trade embodied CO2 emissions, Journal of Japan Society of Energy and Resources 31 (4), 8-14 (in Japanese), http://www.jser.gr.jp/journal/journal_pdf/2010/journal201007_2.pdf , English Abstract can be downloaded from the following URL.. http://www.gispri.or.jp/english/symposiums/images110706/Dr_Sugiyama-2.pdf | This is an important issue. 1990 has been used as it is the base-year for the Kyoto Protocol. Reference will be given to the acceleration in world trade from 2000 |
| 8309 | 14 | 29 | 11 | | | Correction: delete reference to intra-region traded CO2 emissions, "e.g. between US and Canada" between 1990 to 2008 as trade between those countries will only begin after 2013 | Throughout this section, 'trade in CO2' refers to virtual transfers of CO2 associated with physical trade in products rather than monetary trades |
| 12500 | 14 | 29 | 2 | | | Figure 1.7.b in Chapter 1 summarises this point. Consider to refer to this figure in order to save space. | Overlap between two figures acknowledged. Cross-reference will be given. Value-added by fig 14.19 will be |
| 12501 | 14 | 29 | 2 | | | Figure 1.7.b in Chapter 1 summarises this point. Consider to refer to this figure in order to save space. | Fig. 14.20 and associated text to be |
| 14949 | 14 | 29 | 28 | 31 | 8 | This is the beginning of an interesting discussion. But is it relevant to include here, given that only two regions are represented in Figure 14.20? It would be better to treat topic this more comprehensively, including emissions intensity in addition to absolute emissions. This section could then be linked up with a discussion on trade. | Fig. 14.20 and associated text to be revised in SOD |
| 10919 | 14 | 30 | | | | This is a nice figure. Is it possible to split the sectors into Primary, Secondary Energy Intensive, Secondary non-Energy Intensive, Tertiary and plot them as different colours? It would be interesting to see how the different types of sectors vary by region. | Fig. 14.20 and associated text to be revised in SOD. Consideration will be given to the visual categorisation of |
| 14950 | 14 | 31 | 19 | | | This figure needs further explication. For example, which time period does it cover? The caption and the figure should provide more information about the RCP pathways, etc. It would also be valuable to include information on AFOLU emissions in one of these figures. | Accounted for. The explanation is provided in a paragraph that was inserted previously to the figure, as follow: "Global estimates of changes during the period 1850-2005 in ecosystem carbon associated with land use and land cover change show that 65 GT have been released into the atmosphere (Lawrence et al., 2012; Pongratz, et al., 2009). These ecosystem carbon losses have been larger in South East Asia, East Asia, Sub Saharan Africa, and Latin America (Lawrence et al., 2012; Houghton, 2003; Hurtt et al., 2011; Pan et al., 2011; |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5893 | 14 | 31 | 21 | 32 | 6 | Please correct text and figure subscript. Wood harvest does not constitute a Land-use change. Wood removed during land clearing for other land uses than forestry is usually not considered "harvested". And cumulating harvests in a naturally re-growing system and terming the result "land use flux" without considering the regrowth is just false. Please check the sources and, if in doubt, consult a forester. | Rejected. The fraction of the carbon accounted as wood harvest from land clearing is variable and dependent on the coincident activities of land transformation and forestry. In many cases, especially in the historical period, the wood carbon harvested is zero. Following the pathway of carbon in CMIP5 Earth System Models only the fraction of carbon harvested for wood products is then transferred to product pools that have various decay times to release to the atmosphere. The remaining above ground carbon is either lost to the atmosphere through fire or remains in the ecosystem as litter and coarse woody debris. From a common sense point of view counting the harvest of regrowth carbon to landuse seems inconsistent, however the convention within earth system models is to keep the fluxes of land use separate from those of regrowth so that there is no double accounting for the regrowth flux. Hence a landuse flux from regrowth will appear as both a flux for the terrestrial ecosystem sink and a landuse flux giving |
| 10920 | 14 | 31 | | | | To include the trade in biomass carbon (C in wood products, C in crops, etc), then see Peters, G.P., Davis, S.J., Andrew, R., 2012. A synthesis of carbon in international trade. Biogeosciences 9, 3247-3276. | Rejected for the Agriculture section. This would be more suitable for the regional carbon trade section and is covered |
| 5894 | 14 | 31 | | | | Why do you give the RCPs' land-use emissions here? This should be placed in chapters 5 or 11, delete here. | Rejected. Neither chapters 5 or 11 refer to regional patterns, which is the focus of this Chapter. Projections seek to portrait how RCP´s relate to regional |
| 14951 | 14 | 31 | 9 | | | This discussion requires further context about the RCPs. Presumably this will be elsewhere in the volume. The text on p. 32 is written in some places as though it refers to a historical event rather than modeled pathways. The discussion seems very much in the details: is it possible to pull back a bit and distill some larger lessons and observations from the results of the modeling? | Accounted for. The figure on RCP´s was remade to make it clearer. A part of the section deals with historical data. Projections are contrasted against them. An explanation was included as to how |

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| 7500 | 14 | 32 | 21 | 33 | 6 | "Historical cumulative global wood harvest is estimated to be around 65Gt C (excluding slash) between 1850 and 2005 (Hurtt et al., 2006, 2011; Lawrence et al., 2012). Regionally the largest historical wood harvest amounts were in South East Asia, Sub Saharan Africa and North America (Figure 14.21). As a result of the historical increases in agricultural land and wood harvest, the cumulative global land use flux to the atmosphere between 1850 and 2005 is estimated to have been between 115Gt C (Pongratz et al., 2009; Lawrence et al., 2012) to over 150Gt C (Houghton, 2003; Canadell et al., 2007). Regionally, the largest historical land use fluxes were in South East Asia, Latin America, Sub Saharan Africa, and North America (Figure 14.21)". I don't know if the figure of 65 Gt C includes woodfuel and poles. The yearly average of 0.42 Gt C seems low. The estimated harvest in 2009 is 3.5 Gt C. It is difficult to believe some of the cumulative land use fluxes in figure 14.21. | Rejected. This is what the peer-reviewed literature shows. |
| 15042 | 14 | 33 | 1 | 33 | 1 | Although there is an item on sectoral issues for "low carbon development at the regional level", transport sector was not considered. Knowing that transport sector consumes most of fossil fuel in the world, it is recommended to be considered. | This is true but not something we can change easily at this stage (also given the tight page budget), also since there was no bullet for transport (but other sectoral issues). It is also not as clear as with the other 'sectoral' issues that the issues arising in the transport sector can usefully be discussed at the regional |
| 15043 | 14 | 33 | 8 | 33 | 9 | "… there are, in principle. Different pathways available…" | Thanks |
| 13607 | 14 | 33 | | 47 | | I was rather surprised at how quantitatively heavy this section is. While on the one hand, the focus here is on 'regions', there is an appetite for the richness and details and insights afforded by case studies (to do with regions, countries or subnational geographic settings pertaining to certain regions). All this to say I would suggest more of a balance between these quantitative / econometric studies and some insights from case studies (which tend to come from 'real world' examples of attempts at implementing, encouraging, etc. GHG emissions reductions -- there are some rich, insightful qualitative studies which I think are important -- see references throughout (U of Sussex work; various chapters in Ockwell and Mallett (eds) 2012; Haselip et al. 2011; etc.). (some are noted on page 50-51 but suggest more 'real estate' be allotted to these other types of studies / approaches and especially their insights) | The chapter has cut down on the quantitative section and includes, where relevant, regional case studies (but there are not that many that can be drawn on in the peer-reviewed literature). Peer-reviewed work by Ockwell refers to national-level low carbon technology transfer, which is useful but does not relate particularly to Agriculture. |
| 14952 | 14 | 33 | 3 | | | – It would be useful to expand this opening subsection by one or two paragraphs to provide some further framing for the discussion that follows. | Now restructured and includes a discussion. |
| 6791 | 14 | 33 | 1 | 85 | 7 | It may be helpful to shorten and merge contents under sections 14.3 and 14.4. This move may be helpful to reduce the number of pages and yet retain the flow. The revised section 14.3 may be further renamed to appropriately reflect the revised contents. | We have merged the contents of 14.3 and 14.4 as suggested. |
| 12502 | 14 | 33 | 19 | | | Make sure that this secion in line with the findings in the IPCC SRREN report, or point out why there are differences. New information, disagreements, etc. | Will consider in the SOD |
| 15950 | 14 | 34 | | | | This is now rather old data, and much has changed in the cost of both wind and pv, and no doubt gas as well; and rather misleading; as it doesn't take into account project timelines, water footprint, subsidies, etc. | Will look for more updated information. |

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| 17387 | 14 | 34 | 19 | 34 | | "Table 14.3: Costs of electricity generation" does not seem to be very clear or complete, though cited from the source of the IEA report. As already indicated in the previous page (33 of 166), " Local costs are country-specific and may vary widely. They depend on two main features of a country or region." , however this table does not give any information related to such mentions, that is, one is unable to understand if the numbers are world averages for a certain period or specific to a particular region for a given time ? In addition, if the data represent an average across the world, then they are not so much meaningful enough. Anyway this table is a bit confusing and dissociated from the texts or arguments there in the narrative. Still more, the numbers in the first row look a little strange or unusual, one would wonder if they refer to the unit capacity of that kind of technology, if so, then they are not typical or understandable enough. For the 7th row, the unit "year" should not have been omitted in that case. | Table will be dropped. |
| 14954 | 14 | 34 | 27 | 35 | 34 | – This discussion could be streamlined with references to chapter 7, focusing only on the regional elements. | Yes, will do so. |
| 14953 | 14 | 34 | 8 | 34 | 26 | This discussion is useful context, but seems likely to be duplicative with chapter 7 and could be eliminated to save space. | Thanks, will consider cutting it. |
| 6764 | 14 | 34 | 9 | | 18 | Renewable energy, such as solar PV and wind power generation, has an unstable output and their energy density is low. Therefore, according to the regional peculiarity, the power grid expense accompanying extensive introduction is required.<br>DeCarolis and Keith (2006) [1] published a peer-reviewed detailed article on the economics of large-scale wind power which included the costs of long-distance electricity transmission, storage, and gas turbines to supplement the variable wind power output in order to meet a realistic time-varying load.<br><br>[1] J.F. DeCarolis and D.W. Keith (2006) The economics of large-scale wind power in a carbon constrained world, Energy Policy 34, p. 395, column 2, lines 9-20. | Thanks for the reference. |
| 6765 | 14 | 34 | 9 | | 18 | The evidence of "carbon cost at $30 per tonne CO2" is not clear. The reference must be described . | Now provided. |
| 5895 | 14 | 34 | 9 | 34 | 18 | Neglecting the costs of building a power grid puts energy generating options that work in small, "de-centralized" units at a disadvantage. By omitting grid construction costs coal, nuclear and gas are favored, wind and solar hindered. The same holds true for all other infrastructure - how do you get gas and coal to the e.g. CHPP? | A point that we will mention. |
| 15951 | 14 | 34 | 9 | | 18 | This statement a) uses very old data; and b) makes its analysis on very incomplete information about the real issues facing investors in the power sector - among others, fuel price volatility, water consumption, total quantity of the capital required, existing subsidies which will be triggered at cost to the utility, etc. Suggest it be caveated or deleted. | Will clarify point in revision. |
| 6766 | 14 | 35 | 10 | | 14 | Renewable energy, such as solar PV and wind power generation, has an unstable output and their energy density is low. Therefore, according to the regional peculiarity, the power grid expense accompanying extensive introduction is required.<br>DeCarolis and Keith (2006) [1] published a peer-reviewed detailed article on the economics of large-scale wind power which included the costs of long-distance electricity transmission, storage, and gas turbines to supplement the variable wind power output in order to meet a realistic time-varying load.<br><br>[1] J.F. DeCarolis and D.W. Keith (2006) The economics of large-scale wind power in a carbon constrained world, Energy Policy 34, p. 395, column 2, lines 9-20. | Thanks for this. |
| 14955 | 14 | 35 | 35 | 38 | 32 | – The urbanization discussion is important but presumably belongs in Chapter 12 and could be deleted here to save space. Discussion of the regional elements of urbanization may be appropriate here. | Taken into account: The text has been shortened. Part of the description of urbanization trend has been moved to |
| 15044 | 14 | 35 | 42 | 35 | 45 | The connection is missed between "… dioxide emission." and "Because traditional…". | Noted |

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| 10922 | 14 | 38 | 34 | 38 | 50 | This paper gives similar numbers, but for GHG which may be quite relevant Hertwich, E.G., Peters, G.P., 2009. Carbon Footprint of Nations: A Global, Trade-Linked Analysis. Environmental Science and Technology 43, 6414-6420. | Noted |
| 14956 | 14 | 38 | 33 | | | Consumption. This section should be elevated in the subchapter hierarchy; consumption is not a sector per se. Also, some of this discussion seems generic, rather than regionally-focused. Should it perhaps be relocated to another chapter of the report (e.g., chapter 11)? | Take into account: Text shortened. You are not answering the first part of the comment |
| 10923 | 14 | 39 | 9 | 39 | 35 | This focus on food means you miss about 80% of household impacts, Hertwich, E.G., Peters, G.P., 2009. Carbon Footprint of Nations: A Global, Trade-Linked Analysis. Environmental Science and Technology 43, 6414-6420. | Taken into account: text removed |
| 10924 | 14 | 39 | 9 | 39 | 35 | The allocation between meat and non-meat depends on the metric used. You have used GWP100, but others are equally defendable. See Ch8 WGI | Taken into account: text removed |
| 12487 | 14 | 4 | 1 | 4 | 5 | Please rewirte this paragraph in a clearer language to bring through the essens. Suggestion: It is important to define regions based on socioeconomic issues for two distinct reasons: | Thanks, will implement. |
| 2269 | 14 | 4 | 1 | 87 | 31 | Once more, this Chapter is useless because there is no evidence that increases in greenhouse gases have a harmful effect on the climate. Again it is strange that the emphasis is on emissions, when the supposed effects are due to atmospheric concentrations | The link between emissions and concentrations is taken up in other chapters (and other working groups). For us, the focus of policy influence in |
| 12488 | 14 | 4 | 22 | 4 | 37 | This part can be shortened considerably. Please focus the excecutive summary on results rather than text book text. | Now shortened. |
| 14913 | 14 | 4 | 23 | 4 | 37 | this is one of the richer paragraphs in the Executive Summary (and the chapter), but the point made here is not easily found in the underlying text within the chapter. | Now the link between ES and chapter is made more clearly. |
| 14914 | 14 | 4 | 24 | 4 | 24 | Should this say “low income countries in Sub-Saharan Africa” or is MNA also included? As written, it seems to deviate from the regional framework that is set out in the chapter. | Yes, it should say low-income country in Sub-Saharan Africa. |
| 8077 | 14 | 4 | 35 | 4 | 37 | it is unclear whether the statement related to domestic finance only relates to developing countries or to all countries | We now have very little discussion of finance where we mostly refer to chapter 16 (esp. When it comes to concrete |
| 14915 | 14 | 4 | 37 | 4 | 37 | The identification of the degree of agreement and evidence in the conclusions presented in the Executive Summary seems useful. | Thanks |
| 12489 | 14 | 4 | 38 | 4 | 46 | This part can be shortened considerably. We suggest that you spend most of the excecutive summary on results rather than text book text. | Now done. Thanks for pointing this out. |
| 14916 | 14 | 4 | 43 | 4 | 46 | This sentence is important and should be more salient in the Exec Summary. | Will address this in the SOD. |
| 14909 | 14 | 4 | 1 | | | The Executive Summary should be revised to bring forth more strongly a narrative thread for this chapter. The existing text provides some good material for that, although it could be rewritten in a somewhat tighter and more direct style. For example, the opening sentence is particularly dense and somewhat unwieldy, and should be revised. | We have tightened the ES. |
| 14910 | 14 | 4 | 1 | | | What is the overarching goal of the chapter?Why do regions matter? Is this just a clever way of discussing countries without naming them? | Now clarified. Regions matter as they are different (in this sense it is an easier way to talk about them than about individual countries) and regional |
| 14911 | 14 | 4 | 1 | | | The overall frame of regional heterogeneity vs regional cooperation seems useful. | Thanks. |
| 14912 | 14 | 4 | 1 | | | Need to distinguish what belongs here from what belongs in Chapter 4. To what extent are these issues of development vs. purely regional issues? Another way to think about this is to consider the question: is there something about an OECD country in East Asia that is characteristic of East Asia rather than characteristic of OECD countries? Or is there something characteristic of a European country with a relatively low income per capita that stems from its location in Europe rather than its place on the per capita income distribution? | This is an interesting point. We will cover it in the sense that in some (geographic) regions the scope for regional cooperation appears to be much larger than in others. Being close to an area of deep regional integration (such |
| 14958 | 14 | 40 | 15 | 40 | 27 | The opening paragraph should be replaced with a reference to chapter 11. | Accounted for. It begins with a reference |

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| 5896 | 14 | 40 | 15 | 40 | 17 | Again: please don't confuse agriculture and forestry with land-use change. | Noted. Precision is made within the text |
| 10925 | 14 | 40 | | | | The allocation between CO2, CH4, and N2O depends on the metric used. You have used GWP100, but others are equally defendable. See Ch8 WGI | Accounted for. This paragraph was deleted. |
| 10926 | 14 | 40 | | | | This whole section seems to depend on one reference, Smith? | Accounted for. The section was much reduced and relience is made on Ch. 11. Therefore the reference to Smith is no |
| 2344 | 14 | 40 | | 47 | | In the "Agriculture" section, authors have perfectly elaborated their arguments to prove how regional disparities causes GHG emission under food demands of growing world population. However, concerning the issue of over pages, they can choose some selected figure for supporting main argument. | Accounted for. The page was reduced to 2 pages |
| 14957 | 14 | 40 | 14 | | | This section should be consolidated with chapter 11. Much of the material in here could be replaced with references to chapter 11. The regional issues should be drawn out more strongly in what is retained here. | Accounted for. The section was rewritten |
| 10221 | 14 | 41 | | 42 | | it would be more comprehensive if the same regions used inthe rest of the chapter (including the same abbreviations/acronyms) were also used in this figure | Accounted for. Abbreviation/Acronyms have been harmonised along the Chapter, while in its introduction the |
| 7419 | 14 | 41 | 1 | 41 | 11 | The cited (Smith et al, 2007) results on GHG emissions growth in the Middle East needs cross confirmation. The argument that the increase in emissions for this region is a result of growth in demand for livestock products is not plusible given that a lot of the livestock products consumption is met from imports and not domestic production. | Accounted for. The statement was deleted, as the text was much reduced and relies on Ch. 11 |
| 10452 | 14 | 41 | 12 | 41 | 27 | This section of Agriculture does not contribute much to the chapter and can be removed | The subsection aims at presenting regional mitigation opportunities and barriers in a sector that importantly contributes to carbon emission and has an important place in adaptation/mitigation development |
| 14773 | 14 | 42 | | 45 | | The discussion on these four pages relies entirely on IIASA's study that is more than 10 years old. It is necessary to provide a balanced view of alternative assessments of this kind. | Accounted for. This paragraph and reference were deleted. |
| 15045 | 14 | 42 | 19 | 42 | 21 | To use corn to produce ethanol is really a bad practice and it leads to a land misuse. | Accepted. This sentence was deleted |
| 14959 | 14 | 42 | 19 | 42 | 33 | This paragraph could be replaced with a reference to chapter 11. | Accepted. The paragraph as shortened and reference made to Ch. 11 |
| 15046 | 14 | 42 | 23 | 42 | 26 | It is not the case if the correct feedstock is used. It is not the case of corn. | Accepted. This sentence was deleted |
| 15047 | 14 | 42 | 30 | 42 | 33 | Why not sugar cane? | The paragrafh was deleted |
| 14960 | 14 | 42 | 34 | 42 | 43 | The regional implications could be drawn more strongly in this paragraph, or the paragraph eliminated. | This paragraph was deleted |
| 10453 | 14 | 42 | 7 | 42 | 33 | All lines from 7 - 33 can be removed and only regional comaprisions need to be included | Accounted for. The page was reduced to 2 pages to focus on |
| 5899 | 14 | 43 | | 45 | | Please consider combining both tables. | Accounted for. Tables were deleted |
| 10222 | 14 | 44 | | | | category NS=not suitable, is not shown in the graph | Accounted for. Figure was deleted to avoid overlap with Ch. 11 |
| 10223 | 14 | 44 | | | | category NS=not suitable, is not shown in the graph | Accounted for. Figure was deleted to avoid overlap with Ch. 11 |
| 5898 | 14 | 44 | | | | Please amend figure subscript: what does "with IR" stand for? | Accounted for. Figure was deleted to avoid overlap with Ch. 11 |
| 10224 | 14 | 46 | | | | the symbol for South America should be dark grey since change in productivity negative (-5) | This is the original figure. Can we modify it? Editorial - edit to be completed prior |
| 3302 | 14 | 47 | 29 | 48 | 11 | This short section could be eliminated, but keep the longer section 14.3.3.1, which is more directly relevant to chapter's regional focus. | Accepted - text in this section has been revised |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13608 | 14 | 48 | 24 | 48 | | suggest a definition for technological capabilities (e.g. a region, firm, organization's, etc. ability to contend with technological change) or an adaptation is innovation capabilities See Ockwell (2012) policy brief By “innovation capacities” we mean the technological capacities to adopt, operate, adapt and innovate around new technologies within specific local contexts. p. 2 http://steps-centre.org/wpsite/wp-content/uploads/Low-Carbon-Development-briefing.pdf | Taken into account -definitional issues such as this one are being coordinated across multiple chapters. |
| 13609 | 14 | 48 | 25 | | 26 | how are number of researchers being defined? 'hard / natural scientists and engineers'? Suggest noting the distinction between BERD and GERD as that would suggest that relevant policy levers will change depending on whether or not business or govt agencies are key avenues for R&D | Taken into account - will clarify definition according to original source. |
| 14961 | 14 | 49 | 2 | | | This is an interesting figure, and a key figure for the leapfrogging discussion, but its implications are not discussed in any detail in the chapter (though they are in the Executive Summary). It would be very useful if it could be discussed further. Also, there are a few issues with the figure including as it relates to the regional discussion in the chapter: (1) Australia and New Zealand appear in the figure but are not represented in the legend. (2) Japan is treated in the figure as part of East Asia rather than as part of JPAUNZ. (3) Latin America (LAM) and Sub-Saharan Africa (SSA) are each represented by only one country, raising questions about whether the figure can claim to represent those regions (4) Middle East and North Africa (MNA), South Asia (SAS), and Southeast Asia and Pacific (PAS) are not represented. Is there a way to broaden the representation of the figure, perhaps by using measures for which data would be more widely available? | Taken into account - figure has been revised to make sure legend is accurate and regional groupings are consistent with rest of chapter. Due to data limitations some regional data are not available. We now discuss this in more detail in the chapter. |
| 14962 | 14 | 49 | 6 | 50 | 12 | Should the subnational discussion be relocated to Chapter 15? | Accepted - the subnational discussion has been deleted and given to chapter |
| 3669 | 14 | 49 | 6 | 50 | 12 | Delete or massively reduce to save space as overlapping with chapter 15. | Accepted - the subnational discussion has been deleted and given to chapter |
| 4796 | 14 | 5 | 15 | 5 | 18 | Personnaly I am in favour of the ETS as an appropriate instrument to mitigate climate change. But for instance the EU ETS only incorporate some sectors (i.e. not all), and this scheme could be improved in order to reach the targets, even ambitious ones. | The problems of EU ETS are discussed in detail in the SOD |
| 12490 | 14 | 5 | 20 | 5 | 22 | Include one good example | Will look for one. |
| 5878 | 14 | 5 | 26 | 5 | 28 | Cooperation does not necessarily mean tranfer of sovereignity. Please re-phrase sentence or delete it. | Ok |
| 12480 | 14 | 5 | 28 | 5 | 31 | Please consider this finding again. Since the intended mitigation objective will be reached per definition in a cap-and trade system, as long as the cap is set, such as in ETS. The challenge might be related to other aspects of the policy measure, such as the carbon price. | Will reconsider this finding as suggested. |
| 12491 | 14 | 5 | 28 | 5 | 31 | Please consider this finding again. Since the intended mitigation objective will be reached per definition in a cap-and trade system, as long as the cap is set, such as in ETS. The challenge might be related to other aspects of the policy measure, such as the carbon price. | Will reconsider this finding as suggested. |
| 6603 | 14 | 5 | 28 | 5 | 31 | Important messege for policy makers. Should not be deleted. | Will retain in. |
| 14917 | 14 | 5 | 29 | 5 | 30 | It is not clear from the chapter text that “the EU ETS has so far not been as successful as anticipated in actually achieving the intended mitigation objective.” The chapter does not really discuss anticipation of what the EU ETS might achieve. The EU ETS was a pilot program in many respects, and therefore provided a natural -- and useful, under principles of adaptive management -- laboratory to learn about how to design a cap-and-trade program to address carbon dioxide emissions. | Yes, this is an advantage of the EU ETS, but it was not just meant to be an experiment but a tool to achieve actual mitigation. But we will emphasize these issues more in the revised version. |
| 4797 | 14 | 5 | 38 | 5 | 43 | It should be noted that European Union undertook a climate-energy package till 2020 with associated targets (20% energy efficiency, 20% renewables, aned at least 20% CO2 emission reduction) | This is discussed now. |
| 12492 | 14 | 5 | 38 | 5 | 40 | Please rewrite or delete , "are to date, " | Will consider. |
| 7418 | 14 | 5 | 5 | 5 | 13 | Emphasize the mismatch in terms of scale between mitigation and adaptation. Modeling results related to mitigation are usually at high level of geographical and sectoral aggregations (chapter 6) whereas adaptation is essentially at local and sectoral levels. There is a real challenge for the IAM models to downscale to the sectoral and local levels and clear difficulties for the adaptation folks to aggregate to the IAM regional groupings. | Good point. Will mention in next version. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13610 | 14 | 50 | 1 | | 9 | See comment 22 which I think may also be of interest (Abdel Latif 2012) | Rejected - not clear what this comment refers to (comment 22 where?) |
| 14963 | 14 | 51 | 3 | 51 | 16 | Should the sources in this paragraph be integrated into other chapters (e.g., Chapter 7) rather than being presented here? | Taken into account - coordinating with other chapters dealing with simliar topics |
| 14964 | 14 | 52 | 8 | 52 | 20 | The text should elaborate on the investment need differential in Table 14.6. This seems like an important issue for the chapter to cover, yet it is not really discussed in any detail here. | Taken into account -will be included as data and available literature permits. |
| 14965 | 14 | 52 | 21 | | | This general discussion of climate finance should be integrated into chapter 13. | We cut the discussion and largely refer to chapter 16 for financy issues. |
| 13611 | 14 | 55 | | | | the date says 2013 | Noted |
| 15048 | 14 | 57 | 7 | 57 | 8 | If NAMAS for transport sector are the most frequent actions for mitigating GHG emissions, why the transport sector is not considered elsewhere? | Accepted. Sectoral distribution of NAMAs referred to Ch. 15 |
| 14966 | 14 | 57 | 7 | 57 | 14 | This sectoral distribution of NAMAs probably belongs in a different chapter (15?) | Accepted. text shortened accordingly. |
| 14967 | 14 | 58 | 23 | 58 | 25 | The mention of CDM appears to be an editorial comment. What is meant by this? This should be explained further or deleted. | Accepted. Deleted as indeed not belonging into this section. |
| 14968 | 14 | 59 | 29 | 59 | 47 | Suggest breaking out the different categories mentioned here using bullets to improve readability. | Rejected. Section wille shortened substantially. Clarity is achieved without |
| 10928 | 14 | 59 | 33 | 59 | 34 | Sure, the transport will have a climate impact, but perhaps the trade reduces impact? The idea of trade is to allocate production more efficiently. While the current allocation may not be optimal for climate, with policies in place it may become optimal. Just because trade has transport, does not mean trade is bad for the environment. | Taken into account. This is a demand for better clarification. What is meant is not that trade is harmful since it involves transport, but that transportation is an |
| 10929 | 14 | 59 | 35 | 59 | 36 | This paper disucsses using regional trade blocks for policy will reduce leakage Peters, G.P., Hertwich, E.G., 2008. CO2 Embodied in International Trade with Implications for Global Climate Policy. Environmental Science and Technology 42, 1401-1407. | Taken into account. The reference seems to be more related to page 61. However, the discussion of leakage will be shifted to Chapter 5. A remark: It is true that leakage is smaller if there are less countries in the rest of the world. Figure 3 in the paper does not depict leakage but only emissions embodied in trade. Leakage would be those emissions i the rest of the world that are due to climate policies of the EU. Leakage can occur even if the emissions embodied in imports are nil. If an exporter of carbon intensive goods. |
| 15049 | 14 | 59 | 6 | 59 | 6 | It was not clear how transport systems are mentioned if no emphasis in these systems is considered along the text (item 14.3). | Taken into account. Transport systems will not be mentioned here. |
| 9095 | 14 | 59 | | | | it should review the barriers of Regional Cooperation and Mitigation and indentify key factors. | Taken into account. The review is the subjetc of the remainer of Section 14.2, |
| 4798 | 14 | 6 | 32 | 6 | 34 | I am not sure of this statement. Could you please provide evidence of this sentence (in particular effect of ETS vs. taxes) | Will discuss in more detail |
| 14918 | 14 | 6 | 8 | 6 | 9 | It is helpful that the introduction begins with comparison to AR4 | Thanks |
| 5879 | 14 | 6 | 38 | 7 | 17 | Section can be deleted - in my opinion, talking about what you want to show instead of presenting this is a waste of space. Instead, provide readers with a concise summary. | Yes, now streamlined. |
| 12481 | 14 | 60 | 14 | 60 | 15 | It is not necessarily a problem that the ETS do not cover all GHG emissions, if the other emissions are covered by other policy instruments. In many cases it is more important to regulate emissions by other instruments. Examples are Phase-out schemes of CFC as in the Montreal Protocol. Direct regulation of methane emissins from landfills are in place in many countries. The ETS also covers in some cases other GHGs than CO2, e.g. some European countries have opted in N2O in the ETS. | Taken into account. Wording is adjusted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12503 | 14 | 60 | 14 | 60 | 15 | It is not necessarily a problem that the ETS do not cover all GHG emissions, if the other emissions are covered by other policy instruments. In many cases it is more important to regulate emissions by other instruments. Examples are Phase-out schemes of CFC as in the Montreal Protocol. Direct regulation of methane emissins from landfills are in place in many countries. The ETS also covers in some cases other GHGs than CO2, e.g. some European countries have opted in N2O in the ETS. | Taken into account. Wording is adjusted. |
| 6767 | 14 | 60 | 14 | | 22 | I agree these probrems with existing trading systems. | Accepted. |
| 10036 | 14 | 60 | 14 | 60 | 22 | This part should be kept in SOD. Market-based mechanism such as emission trading has several problems. Volatility of emission permit prices affects volatility of product prices as evidenced by fluctuating price developments in the EU-ETS. Therefore, the market-based policy tools of cap-and-trade cannot provide credible incentives for the technological change, as described in (Montgomery, 2005, abstract) and (Baldursson, 2009, page29). These literatures are listed in the No62 line of this table.<br>In addition, CO2 leakage caused by the implementation of the ETS happened actually through transfer of industry from one country to others. Market mechanisms at least under Kyoto-like international scheme, where the condition of all countries' meaningful participation is not met, does not work well, as shown in (Rosendahl, 2011, abstract), (Aichele, 2012, page336), and (Peters, 2011, page1). These literatures are listed in the No50 line of this table. | Accepted. |
| 7420 | 14 | 60 | 23 | 60 | 33 | Please also reference the literature pointing to problems related to using border tax adjustment to fix the carbon leakage problem, particulary in relation to WTO and the UNFCCC principle of common but differentiated responsibilities. | Rejected. WTO issues are discussed in Chapter 13 and we refer to that in the chapter. |
| 10932 | 14 | 60 | 23 | 60 | 24 | Can you reference this? My reading of the literature would suggest that environmental legislation is a minor factor in location decisions. | Taken into acount. But it was not said that this effect is strong. |
| 12482 | 14 | 60 | 44 | | | This Box may be overstating the effect of carbon leakage, when stating in the first line that carbon leakage may fully offset regional climate policies. It is important to note that carbon leakage issues is not only related to the market prices . Some industries will prefer to stay in their original country due to other factors, such as competence, stable political situation etc. Please also consult other studies that have investigated this, an example might be : Vista Analyse Report, 2012-06. | Taken into account. Systematic treatment of leakage will be discussed in Chapter 5 in the SOD. |
| 12504 | 14 | 60 | 44 | | | This Box may be overstating the effect of carbon leakage, when stating in the first line that carbon leakage may fully offset regional climate policies. It is important to note that carbon leakage issues is not only related to the market prices . Some industries will prefer to stay in their original country due to other factors, such as competence, stable political situation etc. Please also consult other studies that have investigated this, an example might be : Vista Analyse Report, 2012-06. | Taken into account. Systematic treatment of leakage will be discussed in Chapter 5 in the SOD. |
| 10933 | 14 | 60 | 44 | 62 | 8 | There are different ways of defining leakage, and the choice taken here is a CGE approach (which is indirectly critiqued). For a more detailed discussion of ways of defining leakage, the following references are of use: Peters, G.P., 2010. Managing Carbon Leakage. Carbon Management 1, 35-37.; Peters, G.P., Hertwich, E.G., 2008. CO2 Embodied in International Trade with Implications for Global Climate Policy. Environmental Science and Technology 42, 1401-1407.; Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908. | Taken into account. Systematic treatment of leakage will be discussed in Chapter 5 in the SOD. We used the definition of leakage used by UNFCCC and by IPCC. Definition ssues are moved to Chapter 5. |
| 10931 | 14 | 60 | 6 | 60 | 22 | This paper is a good reference for parts of this paragraph Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908. | Taken into account where appropriate. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10934 | 14 | 61 | 33 | | | A better refernece for this is, Peters, G.P., Minx, J.C., Weber, C.L., Edenhofer, O., 2011. Growth in emission transfers via international trade from 1990 to 2008. Proceedings of the National Academy of Sciences 108, 8903-8908. | Rejected. Why is a simple input-output analysis better than a structural econometric model that uses instrumental variable techniques to correct of endogeneity bias? Since we are interested in the effects of climate |
| 14969 | 14 | 61 | 40 | 62 | 6 | This paragraph should also acknowledge that leakage would be mitigated if the major economies (and preferably, all or nearly all economies) were to place caps on emissions. Similarly, the implementation of NAMAs in a broad range of countries could help to reduce the risk of leakage, depending on the design of those NAMAs. | Taken into account. You suggest to rephrase line 7 and 8, which can be done. However, the discussion of leakage issues is moved to Chapter 5. |
| 10935 | 14 | 61 | 47 | | | A paper taking up the same issue from a quantitative viewpoint is Davis, S.J., Peters, G.P., Caldeira, K., 2011. The supply chain of CO2 emissions. Proceedings of the National Academy of Sciences 108, 18554-18559. | Taken into account. Systematic treatment of leakage will be moved to |
| 18672 | 14 | 62 | | | | Page 62: So far, regional policy initiatives have been rare. | Rejected. Comment unclear. |
| 12164 | 14 | 62 | | | | My suggestion is to remove the Table 14.8, after all, this information or compilation of analyses, for many, will look like contradictory and inconsistent. | Rejected. The commentator does not make clear why the table is inconsistent; |
| 14971 | 14 | 62 | 14 | 62 | 14 | It is unclear why the WCI is included as a regional initiative, but the Regional Greenhouse Gas Initiative in the Northeastern U.S., is not. Is it because the WCI is transnational (including, as it does, Canadian provinces)? Query whether the WCI belongs in Chapter 15, as arguably the RGGI program does. (See note above on line 9.) | Rejected. WCI is clearly regional, as spanning Canada and the US, and thus in the scope of Ch. 14 |
| 8310 | 14 | 62 | 15 | | | Re: WCI…included several states in the US and Canada, please add "provinces in" before Canada | Accepted. |
| 14972 | 14 | 62 | 21 | 62 | 24 | This discussion should refer to Table 14.9. | Editorial team to take into account |
| 14973 | 14 | 62 | 25 | 65 | 24 | Suggest using subheads for each regional initiative described. Also, does the APP really belong here? Why select the APP as distinct from one of the other regional initiatives described in Table 14.9? As noted on p. 65 (lines 25-30), the EU ETS is not truly comparable with the WCI and the APP. | Rejected. APP has been included because it is clearly a regional initiative. Its different (and much weaker) |
| 14974 | 14 | 62 | 27 | | | See note above about WCI. Also, it seems strange to include the APP here, as it is a much different sort of partnership than the other two regulatory programs (EU ETS and WCI). As Table 14.9 notes, there are many other such partnerships. | Rejected. APP has been included because it is clearly a regional initiative. Its different (and much weaker) |
| 6126 | 14 | 62 | 27 | | | Asia-Pacific Partnership on Clean Development and Climate (APP) has turned in July 2010 into Global Superior Energy Performance (GSEP). Paticipating countries now increased to 24 including Germany, France and the UK. Decision making is decentralized way (unchanged since APP (Okazaki et al. 2012)). For citation Okazaki, T., Yamaguchi, M., Watanabe, H. Ohata, A., Inoue, H. Amano, H. (2012), Technology Diffusion and Development. In: Climate Change Mitigation, A Balanced Approach to Climate Change. M. Yamaguchi, (ed.), Springer, London pp. 179-221. | Accepted. Text and reference added. |
| 14970 | 14 | 62 | 9 | 62 | 10 | – It seems worth reiterating the operating definition of “regional” here, as there are many levels of regional cooperation processes (from sub-national within a country to transnational sub-national efforts, to supra-national efforts). | Rejected. Given the previously clear definition and in order to save space, there is no need to reiterate the definition |
| 12505 | 14 | 62 | 9 | | | It is relevant to include cooperation such as the Convention on Long-range transboundary air pollution (LRTAP). Mitigating air pollution might in several cases lead also to mitigation of climate change. | Rejected. LRTAP has actually increased climate change, by reducing the aerosol load over Europe. Air pollution only contributes to reduction of climate change if it addresses blackcarbon and tropospheric ozone. As these are not yet |
| 6127 | 14 | 63 | 22 | 63 | 23 | Reduction estimate figures are ambiguous, i.e.from when to when? In page 51 of Chapter 10, estimate is for the period of 2005-2008. | Accepted. Text clarified to refer to pilot phase 2005-2007. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6128 | 14 | 63 | 23 | 63 | 23 | Add after "(Anderson and Di Maria, 2011)", though these figures are rather rough because of the impossibility of knowing counterfactual BAU emissions (Ellerman et al. 2010). For citation, Ellerman AD, Convery FJ, de Perthuis C (2010) Pricing carbon—The European Union emissions trading scheme. Cambridge University Press, Cambridge. | Accepted. Text adjusted accordingly |
| 14975 | 14 | 63 | 32 | 63 | 35 | This passage makes a key point. The discussion of the EU ETS should include the general point that price volatility and investor uncertainty tends to be increased by the EU ETS's practice of setting relatively short (5-year) commitment periods. The economics and policy literature supports the principle that creating longer commitment periods can help to create more policy certainty and therefore greater investor certainty. These tendencies facilitate a lower and less volatile price regime. See, for example:<br><br>-William Blyth, Richard Bradley, Derek Bunn, Charlie Clarke, Tom Wilson, Ming Yang, Investment risks under uncertain climate change policy, Energy Policy, Volume 35, Issue 11, November 2007, Pages 5766-5773, ISSN 0301-4215, 10.1016/j.enpol.2007.05.030.<br><br>-Ming Yang, William Blyth, Richard Bradley, Derek Bunn, Charlie Clarke, Tom Wilson, Evaluating the power investment options with uncertainty in climate policy, Energy Economics, Volume 30, Issue 4, July 2008, Pages 1933-1950, ISSN 0140-9883, 10.1016/j.eneco.2007.06.004. | Taken into account. Relevant comment, but should refer to the generic discussion of trading schemes in Ch. 15, as it is not unique to the EU ETS. |
| 6768 | 14 | 63 | 37 | | 42 | Although there is a description that higher shares of auctioning are not jeopardizing competitiveness, this concrete evidence is unknown and it should be deleted.<br>And more, there is a reveiw that analyzed the effects of all-auction-approach in Australian ETS by Paul Simahuser [1], executive of Infrasture division at Babcok & Brown Limited.<br><br>[1]Paul Simshauser<br>On Emission Permit Auction vs. Allocation and the Structural Adjustment of Incumbent Power Generators in Australia Original Research Article<br>The Electricity Journal, Volume 21, Issue 10, December 2008, Pages 30-41 | Rejected. This comment relates to the generic design of trading schemes, and should thus be covered by Ch. 15. As the Australian auction has not yet been implemented, empirical eveidence for the assertion made by the commentator does not exist. |
| 6129 | 14 | 64 | 17 | 64 | 19 | The text desribes as "Most of this literature concludes that the EU ETS is not generating price signals high enough to mobilize renewable energy and energy efficiency investments and thus specific support policies are justified". However, there are two points worth for attention. First, especially for energy efficiency, this may not be based on solid evidence. As well known among experts, there are large rooms for energy efficiency improvement even at a negative cost. Main barriers for those potentials not being materialized are the lack of information, people's irrational behavior etc. Second, whether a permit price is not high enough to mobilize renewable energy has nothing to do with whether the policy (low permit price of EU ETS) is relevant or not. By reading through this paragraph, readers may have impression that low carbon price may not be appropriate. Suggest rewriting this sentence. | Rejected. The text coveys clearly what is written in the quoted literature. The commentator should be invited to suggest literature supporting his statement. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6769 | 14 | 64 | 21 | | 37 | Competitive implications of mandatory cap and trade schemes can be teoretically softened by border tax ad j ustments or benchmarks. It is only theoretical view to the last, and you should emphasize that these would have small effects in fact as described.<br>As for border tax adjustments, Eichenberg[1] pointed out three of the primary complaints raised concerning BTAs for the costs of GHG regulations as follows; (1) that an efficient methodology would be almost impossible to achieve, resulting in reduced economic efficiency, unreasonable transaction costs, and the potential for widespread systemic fraud, (2) that BTAs for greenhouse gases would not be in conformity with various international trade regimes that favor free trade, primarily those of GATT and the WTO, and (3) that BTAs are politically destructive because of their association with protectionist trade policies and their potential to destroy delicate negotiations toward cooperation on GHG emissions reductions.<br><br>[1]http://digitalcommons.law.ggu.edu/gguelj/vol3/iss2/3/ | Taken into account. Discuss within writing team whether BTA discussion should be moved to Ch. 13 where trade issues are discussed in depth, or to Ch. 15, and take reference into account there. |
| 10037 | 14 | 64 | 21 | 64 | 28 | This part should explain whether BTA or benchmark method work well or not in the real economy. Even if they are theoretically effective, questions about the effectiveness are raised, as described in (Carolyn, 2012, page214) and (Wakabayashi, 2007, page36 and 40).<br><br><Reference><br>[1] Carolyn Fischer and Alan K. Fox (2012). Comparing Policies to Combat Emissions Leakage: Border Carbon Adjustments versus Rebates, Journal of Environmental Economics and Management Volume 64, Issue 2, Pages 199-216. Available at:<br>http://www.sciencedirect.com/science/article/pii/S0095069612000186<br>[2] Wakabayashi et al. (2007). A Review on Effectiveness of Emissions Trading Schemes: Empirical Evidences of Their Implementation, No.Y06010 | Taken into account. Discuss within writing team whether BTA discussion should be moved to Ch. 13 where trade issues are discussed in depth, or to Ch. 15, and take reference into account there. |
| 14976 | 14 | 64 | 39 | 64 | 41 | This sentence ("By 2008 [the WCI] looked like it was set to be the second largest trading system in the world, behind only the EU-ETS, due to a rise of the relevance of mitigation policy under the Obama administration.") is factually incorrect as written; the Obama Administration did not commence until January 2009 and was not the reason for the momentum generated in 2008 (before it was evident President Obama would be elected). Suggest deleting this sentence. | Accepted. Reference to 2008 indeed flawed, now reads 2009. |
| 14977 | 14 | 64 | 44 | 64 | 45 | The statement that "generally the WCI was to take the role as testing ground for a federal cap and trade system" is too strong. While proponents of the WCI may have had that intent, it was not clear in 2008 that the WCI would be implemented before a federal cap-and-trade system could be adopted. Suggested text: "It seemed possible that the WCI could play a role as a testing ground for a federal cap and trade system." | Accepted. Wording suggested by commentator is appropriate and has been accepted. |
| 14978 | 14 | 64 | 46 | 64 | 46 | "Federal cap and trade had been defeated in . . . the US . . ." This statement is technically incorrect. Federal cap and trade legislation passed the U.S. House of Representatives and was not brought to a vote in the full Senate. Suggested replacement text: "Efforts to enact federal cap-and-trade legislation in the U.S. had failed." | Accepted. Wording suggested by commentator is appropriate and has been accepted. |
| 9096 | 14 | 65 | | | | it will be better to examine the participation of major developing econony in Regional Climate Initiatives | Rejected. Comment unclear. |
| 12034 | 14 | 65 | 1 | 65 | 24 | It looks the statement puts too much emphasis on political ties between Asian countries and the US. APP can contribute to foster good international relations, however, economic merits come first as the initiative heavily relies on private partnership. | Rejected. The text as it stands reflects the peer-reviewed literature quoted and thus should not be changed. |
| 6130 | 14 | 65 | 1 | 65 | 24 | APP has turned successfully into GSEP (Global Superior Energy Performance with number of paticipating countries increased to 24 including Germany, France and the UK (Okazaki et al. 2012). For citation Okazaki, T., Yamaguchi, M., Watanabe, H. Ohata, A., Inoue, H. Amano, H. (2012), Technology Diffusion and Development. In: Climate Change Mitigation, A Balanced Approach to Climate Change. M. Yamaguchi, (ed.), Springer, London pp. 179-221. Therefore this information should be added. | Accepted. Text adjusted and reference added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7790 | 14 | 65 | 10 | | 24 | The role of Asia-Pacific Partnership on Clean Development and Climate (APP) should be highly evaluated, especially in terms of information sharing, networking and improved access to existing technologies and know-how. Importance of APP's approaches in each task force including i) public-private partnership in a bottom-up manner, ii) project-based approach, iii) long-term commitments, and iv) horizontal nature of an international partnership should be duly considered.<br>Above-mentioned points are comprehensively explained in "Sector-specific Activities as the Driving Force towards a Low-Carbon Economy From the Asia-Pacific Partnership to a Global Partnership" (Noriko Fujiwara, CEPS Policy Brief N0. 262 January 2012). | Rejected. The text as it stands reflects the peer-reviewed literature quoted and thus should not be changed. The reference quoted by the commentator is not peer-reviewed and thus should not be included. |
| 6131 | 14 | 65 | 10 | 65 | 11 | The text "explain the willingness of Asian countries to participate by the wish to maintain good diplomatic relations with the US, and to generate revenues through transfers" is not correct and suggest removing this citation. If you wish to keep this citation, please add the essense of the follwoing with the citation. Major incentive for Japanese industrial sectors, one of major players of APP, for participation is to promote technology diffusion, never just to maintain good diplomatic relations with the US nor to generate revenues through transfers. If Ch. 14 LAs learn more precisely of actual activities in Iron and Steel sector in APP, you will understand the argument above very clearly. For the actual activities in Iron and Steel sector in APP, refer to Okazaki T, Yamaguchi M (2011) Accelerating the transfer and diffusion of energy-saving technologies steel sector experience – lesson learned. Energy Policy 39:1296–1304 | Taken into account. Reference is relevant and has been added. Other text reflects peer-reviewed literature and will not be changed. |
| 6770 | 14 | 65 | 15 | | 18 | The description that APP activity has not led to direct emission reduction is unsuitable, because a technological improvement such as APP activity leads to great emission reduction as a result. | Rejected. Commentator statement not supported by peer-reviewed literature. |
| 9161 | 14 | 65 | 25 | | 30 | delete ths paragraph - what matters is the impact on emissions, not the style of policy. EU ETS had limited impacts on emissions. | Rejected. Commentator statement not supported by peer-reviewed literature. |
| 9162 | 14 | 65 | 25 | | 30 | EU is special since it is politically highly integrated from the outset, the characteristics is absent elsewhere in the world. | Noted. This is reflected in lines 25-28 |
| 14979 | 14 | 65 | 35 | | | Should include the Energy and Climate Partnership of the Americas (ECPA) under Latin America (see http://www.ecpamericas.org/). | Accepted. Added |
| 7520 | 14 | 65 | 1 | 65 | 24 | More impartial and balanced description is required for APP. 1. The Charter of the APP clearly stated that the purposes of APP were consistent with the principle of the UNFCCC and were intended to complement but not replace the KP. 2. "The willingness of Asian countries to participate by the wish to maintain good deplomatic relations with the US and to generate revenues ." is vague and miss leading description. It requires an official report from these countries to agree with the authors view to wite the current description. Asian countries in the APP were China, India, Japan and Korea. As far as steel group concern, no goverment and private participants agreed with the description. | Rejected. The text as it stands reflects the peer-reviewed literature quoted. The commentator is invited to provide peer-reviewed literature to support his statements. |
| 12645 | 14 | 65 | | | | There is an alliance called "East Asia Low Carbon Growth Partnership" under "East Asia Summit"<br>http://www.mofa.go.jp/policy/environment/warm/cop/ealcgpd_1204/index.html<br>http://www.kettha.gov.my/en/content/east-asia-low-carbon-growth-partnership-dialogue | Accepted. Added |
| 12646 | 14 | 65 | 1 | 65 | 24 | Following peer-reviewed thesis describes APP' s contribution for Technology Transfer.<br>"Accelerating the transfer and diffusion of energy saving technologies steel sector experience—Lessons learned , Energy Policy, Accepted 1 December 2010" | Accepted. Reference to be included. |
| 6598 | 14 | 65 | 10 | 65 | 12 | Change "to maintain good (…) transfer" into "To increase energy efficiency." The Japan Iron and Steel Federation is one of Asian APP and GSEP members. | Rejected. The text as it stands reflects the peer-reviewed literature quoted and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6599 | 14 | 65 | 24 | 65 | 24 | Add following sentences; Three of the eight sectoral APP task forces (on power generation and transmission, cement and steel) are to continue their activities under the Global Superior Energy Performance partnership (GSEP), with a stronger focus on energy efficiency and environmental performance, and participation expanded to the global scale.<br>For citation: Noriko Fujiwara (2012). Sector-specific Activities as the Driving Force towards a Low-Carbon Economy From the Asia-Pacific Partnership to a Global Partnership. CEPS POLICY BRIEF No. 262.<br>Available at: www.ceps.eu/ceps/download/6569 | Taken into account. The reference quoted by the commentator is not peer-reviewed literature, and thus not appropriate. The information provided is now included in the text. |
| 8007 | 14 | 65 | 24 | 65 | 24 | I support this message that stresses an importance of technology guide book for promoting technology diffusion. An actual success story supporting this message should be wrote here with following sentences; Three of the eight sectoral APP task forces (on power generation and transmission, cement and steel) are to continue their activities under the Global Superior Energy Performance partnership (GSEP), with a stronger focus on energy efficiency and environmental performance, and participation expanded to the global scale.<br>For citation: Noriko Fujiwara (2012). Sector-specific Activities as the Driving Force towards a Low-Carbon Economy From the Asia-Pacific Partnership to a Global Partnership. CEPS POLICY BRIEF No. 262.<br>Available at: www.ceps.eu/ceps/download/6569 | Taken into account. The reference quoted by the commentator is not peer-reviewed literature, and thus not appropriate. The information provided is now included in the text. |
| 14980 | 14 | 68 | 19 | 71 | 14 | Suggest giving a separate subhead – or possibly a separate section – to this lengthy discussion of trade and climate change. Can this be linked somehow to the discussion of trade flows (consumption and production) in 14.2.4? | Taken into account. This part was shortened drastically for the SOD. Link to 14.2.4 is difficult since 14.2.4 considers input-output accounting |
| 6132 | 14 | 68 | 10 | 71 | 29 | Please check heavy duplication with Chapter 13 (13.8.1 pages 36-39). | Taken into account. Section is |
| 11271 | 14 | 69 | 20 | 69 | 22 | Concerning these lines it is necessary to go a little further, particularly concerning the place and role of Mexico ("The effects of NAFTA on Mexico turn out to be small").<br>Two suggestions:<br>The Future of North American Trade Policy: Lessons From NAFTA, Kevin P. Gallagher, Enrique Dussel Peters, and Timothy A. Wise (eds.), Pardee Center Task Force Report, Boston University, November 2009. URL: http://www.bu.edu/pardee/files/2009/11/Pardee-Report-NAFTA.pdf<br>NAFTA and Climate Change by Meera Fickling and. Jeffrey J. Schott September 2011, 212 pp. ISBN paper 978-0-88132-436-5 | Rejected. For results like this we should stick to peer-reviewed literature. |
| 12647 | 14 | 69 | 25 | | | "Liberalizing trade in environmental goods and services" have been discussed in APEC as well.<br>http://www.apec.org/Meeting-Papers/Leaders-Declarations/2011/2011_aelm/2011_aelm_annexC.aspx<br>(Please update as concluded in this September at Vladivostok) | Taken into account. These are very general statements and neither our references nor yours are peer-reviewed. We would replace our references by |
| 15037 | 14 | 7 | 13 | 7 | 13 | "that there ARE serious"… | Thanks for poining this out. |
| 14919 | 14 | 7 | 20 | 7 | 31 | Note that subnational regions are actually discussed in the chapter, e.g., at pp. 49-50. | Yes, we now delete this discussion |
| 5880 | 14 | 7 | 24 | 7 | 25 | Please give the definition of LDCs in a footnote and / or include it in the glossary. | Will be included in glossary, with link to relevant web site for a list of countries |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11270 | 14 | 7 | 26 | 7 | 28 | This chapter considers North America as a region, but composed only by USA and Canada. Mexico is part also of this region, partially in geographical terms, but above all in economic terms, since NAFTA (1994).<br>The interest of looking at this region, with the participation of Mexico, is that integration -both its benefits and disadvantages- could be examined as a process with the participation of two developed countries and one developing country. In this framework it is not possible to avoid the analysis of asymmetries, and it is necessary to be more cautious with some assessments as:<br>9: L: 1-3 This report will treat regions … as actors of cooperation and integration that could further promote mitigation<br>In fact, this chapter mentions NAFTA recognizing this regional integration reality, but contradictions can emerge with the initial definition.<br>p. 68: L 38-42<br>There are nine multilateral preferential trade agreements, among which the best known are (….) The North American Free Trade Agreement (NAFTA)<br>P. 70:<br>1 – 6: In the case of NAFTA, the participating countries … | The question of how to deal with Mexico is indeed a tricky point. In order to keep our analysis consistent with other chapters, we had to ensure that our regions aggregate up to the 5 RCP regions (and Mexico and the US/Can are in two different regions then). But we do consider NAFTA as one of the most important forms of regional cooperation in the chapter. Note also that the regional definition matters only for section 14.2, while in 14.3 regional cooperation itself defines the region. |
| 14920 | 14 | 7 | 26 | 7 | 31 | The text should explain how the 10 proposed regions are used in the chapter when they are introduced here. They are not used universally as the existing text might suggest. Why does it make sense to consider these specific regions? | These are regions that are economically somewhat homogenous and aggregate up to RCP 5 regions. They can be used to illustrate the regional specificities of |
| 14921 | 14 | 7 | 42 | 8 | 8 | The discussion here is really about level of economic development, not about geography. Regions are geographic constructs. Note that the regions selected are constructed in such a way as to emphasize common levels of economic development. Perhaps that should be explicit. | Yes, we make this more explicit now. |
| 2343 | 14 | 7 | | 11 | | Under the section, “Why Regions Matter?” , authors have given very comprehensive description to prove their line of argumentation by using UNDP figures. Here, author can summarized or illustrate one or two figures and its rationality in the text for reducing total pages. | Now implemented. |
| 7791 | 14 | 71 | | | | Add the following sentence “On the other hand, in 2012, APEC leaders committed to promote trade and investment in environmental goods and services and reaffirmed to reduce the applied tariff rate to 5% or less on the goods on the APEC list of Environmental Goods by the end of 2015. Although these political declarations’ legal status is “non-binding” these “soft law” can help to define the standards of corresponding what is nowadays to be expected from a “well-governed State. (M. Dupuy.”Soft law and the international law of the environment”, Michigan Journal of International Law, p.434,1991), also Abbot and Snidal said it is often more practical to negotiate a softer agreement, and this provides for flexibility in implementation.(Abbot and Snidal, “Hard and Soft Law”, International Organization, pp.444-445,2000) | Accepted. The sentence is added and supported by the suggested references. |
| 11795 | 14 | 71 | 28 | 71 | 29 | Delete this sentence. Fujiwara says that APP activities were successful.<br>1.Fujiwara: [Sector-specific Activities as the Driving Force towards a Low-Carbon Economy From the Asia-Pacific Partnership to a Global Partnership],<br>http://aei.pitt.edu/33371/1/PB262_NF_on_Asia_Pacific_partnership_to_global_partnership.pdf | Accepted. The sentence is deleted and replaced by new ones. |
| 10671 | 14 | 71 | 28 | 71 | 29 | Delete this sentence. Fujiwara et al says that APP activities were successful.<br>1.Fujiwara: [Sector-specific Activities as the Driving Force towards a Low-Carbon Economy From the Asia-Pacific Partnership to a Global Partnership],<br>http://aei.pitt.edu/33371/1/PB262_NF_on_Asia_Pacific_partnership_to_global_partnership.pdf | Accepted. See comment 11795. |
| 14981 | 14 | 71 | 30 | 78 | 27 | This discussion of Regional Cooperation on Energy should have a separate section identification so it can be easily found in the table of contents. | Accepted. A title regional cooperation on energy has been introduced. However, some of the examples have been moved |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 7421 | 14 | 71 | 5 | 71 | 14 | Note the risk of using PTA as a back door to climate change policies bypassing the UNFCCC provisions and distorting the international trading system. | Accepted. The risk is mentioned. |
| 7422 | 14 | 74 | 13 | 74 | 28 | Is there any published literature assessing the cost-effectiveness of the EU directives from climate change perspectives? If so please provide citations. | Taken into account. Unfortunately, besides some general estimates provided by the European Commission, there has been no assessment of the cost-effectiveness of EU directives on Renewable Energy and Energy Efficiency from a climate perspective. Only now, the literature of the scientific community is starting to consider the issue, in the context of the interactions between these technology-oriented directives and the EU Emissions Trading System (EU ETS). Available literature (cited in this section) has only evaluated the cost-effectiveness of the support schemes of the EU member states in the deployment of renewables. Specifically, a comparison between the costs of technologies and the support provided by feed-in tariffs, feed-in premiums and quota schemes . Evidence has been found that there is room for optimization of the |
| 14982 | 14 | 75 | 48 | 75 | 49 | This sentence is incomplete. | Accepted. Sentence has been completed |
| 5176 | 14 | 77 | 37 | 77 | 37 | small hydropower - SRREN use small "scale" hydropower, where size is depending on national policies rather than physical or technical criteria - maybe a footnote? (SRREN 5.3.1 and 5.4.3.4) | Accepted. Text has been shortened and sentence was removed |
| 14983 | 14 | 79 | 3 | 79 | 29 | Box 14.5 (REDD+ in the Congo Basin) -- This box should be rewritten to acknowledge and grapple with the actual REDD+ programs that are being implemented in the Congo Basin, for example the Congo Basin Forest Partnership and the Congo Basin Forest Fund, the U.S. government's Central African Regional Program for the Environment and others. As currently drafted, it is principally focused on a series of issues that are generic to REDD+, and as such, are appropriately addressed in Chapter 11. For example, lines 12-19 should be deleted, and the content taken up in Chapter 11.<br>For discussion of the CBFP, see http://pfbc-cbfp.org/home.html (the CBFP website)<br>One example of an article that begins to address the success of REDD-type interventions is:<br>Sayer, J.A., D. Endamana, M. Ruiz-Perez, A.K. Boedhihartono, Z. Nzooh, A. Eyebe, A. Awono, and L. Usongo, "Global financial crisis impacts forest conservation in Cameroon." International Forestry Review, Vol.14(1), 2012.<br>This text box should provide a more comprehensive examination of the subject and draw on existing literature to do so. This may require going beyond the academic literature. | Accepted. Generic REDD issues were deleted. Now the subsection refers to regional cooperation schemes in which integration of adaptation and mitigation are necessary. However, there is not possible due to the page limitations to refer to specific cooperation on-going projects supported by different donors. New elements referred to the Congo Basin Forest Partnership were included in the text. The suggested article was included in the bibliography. |

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| 14984 | 14 | 79 | 30 | 80 | 2 | – Box 14.6 – Forest Activities in Latin America -- Like Box 14.5, this text box should begin with a positive description of the regional scale activities taking place in Latin America before jumping into a normative discussion. Although it is a national-level project, given the scale of it, the Amazon Fund in Brazil deserves mention. A few surveys that may be useful are:<br>-Larsen, Anne M. and Petkova, Elena, "An Introduction to Forest Governance, People and REDD+ in Latin America: Obstacles and Opportunities.' Forests 2011, 2(1), 86-111; doi:10.3390/f2010086<br>-Nasi R., Putz F.E., Pacheco P., Wunder S., Anta S. Sustainable Forest Management and Carbon in Tropical Latin America: The Case for REDD+. Forests. 2011; 2(1):200-217.<br>-Pacheco P., Aguilar-Støen M., Börner J., Etter A., Putzel L., Diaz M.C.V. Landscape Transformation in Tropical Latin America: Assessing Trends and Policy Implications for REDD+. Forests. 2011; 2(1):1-29. | No relevant in this version. The box of forest activities in Latin America was deleted because the examples mentioned in this former box did not refer to any on-going cooperation schemes. This subsection is located under section 14.4 on regional cooperation. and therefore it should be consistent with it. |
| 12648 | 14 | 79 | 31 | 80 | 2 | The Governors' Climate Forum (GCF) also taking on forest activity (http://www.gcftaskforce.org/) | No relevant for the new version of the subesection that only refer to two on-ongoing cooperation schemes (Congo Basin Forests and the Great Green Wall |
| 10912 | 14 | 8 | | | | Since this is report is for climate, then something climate related may be better than a carbon footprint, see Davis, S.J., Caldeira, K., 2010. Consumption-based Accounting of CO2 Emissions. Proceedings of the National Academy of Sciences 107, 5687-5692. | Noted. Footprint indicator no longer is used. I looked at that article and didn't find anything useful to use as a graphical |
| 12493 | 14 | 8 | 17 | | | The dots and diamonds needs to be explained. | Accepted. A footnote was introduced in the first box plot to explain boxes, lines |
| 14922 | 14 | 8 | 17 | | | Need to explain diagram (what do circles, lines represent). Perhaps this will be done elsewhere within the volume. This figure and the text above it (8/9-15) could be deleted to save space. | Accepted. A footnote was introduced in the first box plot to explain boxes, lines |
| 3303 | 14 | 80 | 43 | 84 | 22 | This is a very informative section which nicely complements chapter 13, International Cooperation. | Accepted- no action needed. |
| 12649 | 14 | 82 | 29 | 82 | 31 | The activities in APP were transferred to GSEP(Global Superior Efficiency Partnarship) under CEM. | Accepted-text will be revised to reflect this information based on references |
| 6602 | 14 | 82 | 20 | 82 | 23 | These sentences describe the essence of APP and should not be deleted.<br>As supporting references:<br>Noriko Fujiwara (2012). Sector-specific Activities as the Driving Force towards a Low-Carbon Economy From the Asia-Pacific Partnership to a Global Partnership. CEPS POLICY BRIEF No. 262.<br>Available at: www.ceps.eu/ceps/download/6569<br>Okazaki T, Yamaguchi M (2011). Accelerating the transfer and diffusion of<br>energy-saving technologies steel sector experience ? lesson learned. Energy<br>Policy 39:1296-1304 | Taken into account - suggested references will be reviewed for relevance to this section. |
| 8008 | 14 | 82 | 20 | 82 | 23 | APP and its successor GSEP are typical and globally applicable technology-oriented bottom-up approach supported by both public and private, so called public-private-partnership. This PPP is described in the following references.<br>As supporting references:<br>Noriko Fujiwara (2012). Sector-specific Activities as the Driving Force towards a Low-Carbon Economy From the Asia-Pacific Partnership to a Global Partnership. CEPS POLICY BRIEF No. 262.<br>Available at: www.ceps.eu/ceps/download/6569<br>Okazaki T, Yamaguchi M (2011). Accelerating the transfer and diffusion of<br>energy-saving technologies steel sector experience ? lesson learned. Energy<br>Policy 39:1296-1304 | Accepted - relevant information from these references will be incorporated into this section. |
| 6600 | 14 | 82 | 27 | 82 | 27 | Delete "and the development of a global carbon market." APP and GSEP do not aim to build a carbon market. The Japan Iron and Steel Federation is a member of APP and GSEP. | Taken into account -this will be reviewed for accuracy in line with the original goals of the APP based on its |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7521 | 14 | 82 | 29 | 82 | 42 | This part should be rewriten. The Power, Cement and Steel TF have been sucessfully inherited to GSEP which is official international collaboration scheme for energy efficiency improvement and consequential CO2 emission reduction. And GSEP is one of the WGs of CEM. More information is in the HP of CEM. | Taken into account - suggested references will be reviewed to incorporate information on the GSEP as |
| 8009 | 14 | 82 | 29 | 82 | 31 | Combined with the revision of No3 above, replace "though some projects have reportedly been continued under other governmental agreements" by "three of eight APP task forces (on power generation and transmission, cement and steel) are to continue their activities under the Global Superior Energy Performance partnership (GSEP)."<br>For citation: Noriko Fujiwara (2012). Sector-specific Activities as the Driving Force towards a Low-Carbon Economy From the Asia-Pacific Partnership to a Global Partnership. CEPS POLICY BRIEF No. 262.<br>Available at: www.ceps.eu/ceps/download/6569 | Taken into account - suggested references will be reviewed to incorporate information on the GSEP as relevant to the APP. |
| 6601 | 14 | 82 | 30 | 82 | 31 | Replace "though some projects have reportedly been continued under other governmental agreements" by "three of eight APP task forces (on power generation and transmission, cement and steel) are to continue their activities under the Global Superior Energy Performance partnership (GSEP)."<br>For citation: Noriko Fujiwara (2012). Sector-specific Activities as the Driving Force towards a Low-Carbon Economy From the Asia-Pacific Partnership to a Global Partnership. CEPS POLICY BRIEF No. 262.<br>Available at: www.ceps.eu/ceps/download/6569 | Taken into account - suggested references will be reviewed to incorporate information on the GSEP as relevant to the APP. |
| 9097 | 14 | 83 | 21 | 84 | 22 | it should review the implmentation result of Inter-Regional Technology-Focused Agreements | Taken into account -there is limited literature available reviewing the results of implementation of regional technology focused agreeements and the reviewer |
| 14986 | 14 | 85 | 13 | 85 | 36 | The opening sentence appears to draw a conclusion about regions, but the passage that follows is focused on level of economic development rather than geographic region. | Regions are seen as a mix of geographical and economic |
| 14987 | 14 | 85 | 13 | 85 | 36 | This passage articulates the kind of high-level conclusion that could come from Chapter 14, but it does not seem to me that the basis for the conclusion has been clearly established within the chapter. That is not to say that the conclusion is invalid, but rather that if such conclusions are to be drawn the foundations must be carefully established in the preceding text. | We will now link chapter and conclusions more. |
| 14985 | 14 | 85 | 8 | | | It appears that this section is incomplete. It would be a useful place to draw out the key themes from the chapter. | Will be completed in the next round. |
| 14988 | 14 | 86 | 25 | | | See earlier comments about the definition of regions. These regions are not used consistently throughout the chapter. | We use them consistently when possible. When we follow the literature, we are forced to ue the regions as |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 14989 | 14 | 86 | 36 | | | – The second reason articulated here seems more compelling than the first. While it is true that "mitigation challenges and mitigation/development trade-offs differ greatly by region," the chapter draft has not clearly established that this is a function of geography. Rather it seems likely to be a function of the level of economic development of countries within each region, and hence the aggregate or average level of development of the region. The potential opportunity for regional integration and collaboration could still be a sufficient basis for doing a regional analysis, though.<br>I suspect there may be greater regional commonality than has been explored in this chapter draft, however. For example, many regions share in common natural resources, and are thus exposed to characteristic risk factors connected with climate change impacts (such as the potential change in regional hydrology in South Asia associated with disruption of monsoons and changes in pattern and volume of Himalayan glacial melt; or the effects of the Amazon rainforest on regional weather patterns). Similarly, land use patterns and natural resource endowments differ by region, and that plays a role in determining the pattern of emissions and the relative cost-effectiveness of different mitigation strategies. (The discussion on pp. 43-46 and the associated figures and tables point to one example of this – climate and soil constraints and other associated factors that create regional differences with respect to agricultural potential and associated emissions and mitigation strategies, although the regions used in this part of the chapter don't match up with the official AR5 regions.) Thus, the recommendations for the "best" mitigation strategies and for integration of mitigation and adaptation strategies could vary by region. (This is a reason why it would be useful to treat adaptation within WGIII; not doing so leaves little room for addressing integration of mitigation and adaptation strategies.)<br>Finally, there are different cultural factors or social or institutional elements that operate in common within several of the selected regions that may cause certain mitigation strategies to be better received or more effective in some regions than others. | We believe that regional heterogeneity in the mitigation challenge is a function of geography and economic development (which is reflected in our regional definition); |
| 6950 | 14 | 86 | 25 | 86 | 35 | Suggest to make this FAQ specific to the WGIII report or even to this Chapter as WGI (and WGII?) will not use the same regions. Thus the current title referring to "the AR5" in general is misleading. | Yes will do that. |
| 14990 | 14 | 87 | 15 | 87 | 21 | This discussion begs a few questions: Are there exceptions to this rule? If so, what characterizes them? And what can be done to address the barriers and obstacles that less advantaged countries and regions face, e.g., in order to enable leapfrogging? It would be very useful if the chapter could address these questions. | This is an issue we now discuss more clearly. |
| 5881 | 14 | 9 | 1 | 9 | 5 | Regional cooperation treaties - for example - may also be detrimental to mitigation and / or adaptation if measures one country wants to implement would violate - e.g. - free trade agreements or prohibit the use of certain technologies. Please be sure you do not overlook such possibilities. | Thanks for pointing this out. Will consider carefully. |
| 14923 | 14 | 9 | 22 | | | Is unemployment a development measure? Are these snapshots taken at one point in time or are they averages over several years? If this figure is retained, the individual figures should be given separate letters (e.g., 14.2a, 14.2b) for ease of reference. | Noted. It depends on the prism one uses.<br>Accepted suggestion on the years and |
| 4008 | 14 | all | | | | I found this entire chapter to an exhaustive examination of forests and agriculture…I applaud the efforts of the authors. During revisions I suggest authors focus on what matters most to people: how much is AFOLU contributing currently to GHG? How much could forests/ag mitigate GHG emissions, how could this change under a scenario of rapid climate change ? What do we need to do as a society to ensure AFOLU mitigate instead of contirbute to GHG in the future? | We now focus much more the discussion of AFOLU in our chapter. |
| 13603 | 14 | overall | | | | as I read through this, wondering if it's worthwhile to flag the difference between energy (getting something to do work -- be it fuel, animals, ourselves) and electricity | Where approrpiate, we now make this distinction. |

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| 17118 | 15 | | | | | This chapter does not have any acknowledgement of the global climate advocacy efforts of local governments that has focused through Local Government Climate Roadmap in 2007. A major outcome of the process was the Global Cities Covenant on Climate - the Mexico City Pact which has an international secretariat and regularly monitors progress of signatories. carbonn Cities Climate Registry in an important effort of local governments for measurable, reportable, verifiable climate action, which captures information of more than 170 cities worldwide as of July 2012. Recognition of local governments as governmental stakeholders in para.7 of Cancun Decisions is also important reflection of all these efforts in to UNFCCC processes. | Noted. |
| 14302 | 15 | | | | | Row "United Kingdom" - Note that the 2009 Low Carbon Transition Plan has been superceded by the "Carbon Plan" (2011). See http://www.decc.gov.uk/en/content/cms/emissions/carbon_budgets/carbon_budgets.aspx | Table deleted |
| 4152 | 15 | | | | | My comments are based on the observation that more attention needs to be paid to political barriers to stronger action on climate change due to their significance in preventing progress. The texts below, which have been prepared in conjunction with my colleague Ian Bailey, are designed to help remedy this. A table setting out political barriers and examples of actions designed to overcome them will be sent separately. | Noted. |
| 4153 | 15 | | | | | Climate change itself will create repeated opportunities to strengthen climate policies due to the strong likelihood that it will cause extreme weather events to become more frequent and more extreme (IPCC 2007). The literature on agenda-setting reviewed by Pralle (2009) points out that issues can rise to the top of decision making agendas as a result of dramatic focusing events that grab the attention of the public and policy makers alike (Downs 1972, Cobb and Elder 1983, Hilgartner and Bosk 1988, Kingdon 1995, Baumgartner and Jones 1993, Birkland 1998). To the extent that media coverage connects increasingly severe floods, hurricanes, heat waves and droughts with climate change, public support for stronger climate policies is likely to rise, creating windows of opportunity for activist governments. There is some evidence that this dynamic is already in operation, as opinion polls show that the percentage of respondents who consider climate change to be very serious rose both in Europe after the heat wave of 2003 and in the US after Hurricane Katrina in 2005 (Compston and Bailey 2012: 77).<br>Baumgartner, F. and B.D. Jones (1993), Agendas and Instability in American Politics, Chicago: University of Chicago.<br>Birkland, T. (1998), 'Focusing events, mobilization, and agenda setting', Journal of Public Policy 18 (1), 53-74.<br>Cobb, R.W. and C.D. Elder (1983), Participation in American Politics: The Dynamics of Agenda Building, Baltimore: John Hopkins University Press.<br>Compston, H. and I. Bailey (2012), Climate Clever: How Governments can Tackle Climate Change (and Still Win Elections), London: Routledge.<br>Downs, A. (1972), 'Up and down with ecology: The "issue-attention" cycle', The Public Interest, 28 (summer), 38-50.<br>Hilgartner, S. and C. Bosk (1988), 'The rise and fall of social problems: A public arenas model', American Journal of Sociology 94, 53-78.<br>IPCC (Intergovernmental Panel on Climate Change) (2007), Climate Change 2007: Synthesis Report.<br>Kingdon, J. (1995), Agendas, Alternatives, and Public Policies, 2nd ed., New York: Longman.<br>Pralle, S.B. (2009), 'Agenda-setting and climate change', Environmental Politics 18(5), 781-799. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4154 | 15 | | | | | One of the characteristics of mass audiences is that they are often more open to persuasion by vivid and plausible stories than by logic and evidence (Hajer 1995). For this reason accurate information about climate change needs to be supplemented by messages formulated as stories that take advantage of narrative devices such as beginnings, middles and ends as well as heroes and villains and struggles ending in dramatic resolutions. To some extent this is already being done. The disaster story casts proponents of mitigation as good guys striving against opposition to prevent catastrophe. The justice story stresses how unfair it is that those who have contributed least to climate change are likely to suffer the most. The security story posits that climate change will cause conflict due to effects such as competition over diminishing water supplies and that we therefore need to mobilize as we would to the threat of invasion. A more positive story focuses attention on solutions: climate change is a big threat but we know what needs to be done, the tools are at hand to solve it, so if we stick together and persevere we can do it. The opportunity story builds on this by adding the sub-plot that reducing emissions will involve creating new jobs and business opportunities (Compston and Bailey 2012: 56-63).<br>The development of even more appealing stories may help to increase public support for stronger mitigation. One example of the sort of innovation required is the effort by the Apollo Alliance, a coalition of US labour, business, environmental and community leaders, to liken the required action to the Apollo programme of the 1960s that put a man on the moon (Apollo Alliance 2008). Another is the attempt by a group of economists, journalists and green activists to turn the economic crisis of 2008 to advantage by proposing what they called a Green New Deal (Green New Deal Group 2008).<br>Apollo Alliance (2008), The New Apollo Program: Clean Energy, Good Jobs, http://www.apolloalliance.org/downloads/fullreportfinal.pdf, 4 September 2010, pp. 2-3.<br>Compston, H., and I. Bailey (2012), Climate Clever: How Governments can Tackle Climate Change (and Still Win Elections), London: Routledge.<br>Green New Deal Group (2008), A Green New Deal, New Economics Foundation, http://www.neweconomics.org/publications/green-new-deal, 3 September 2010, p.2.<br>Hajer, M. (1995), The Politics of Environmental Discourse, Oxford: Oxford University Press. | Noted. |
| 4155 | 15 | | | | | Institutional barriers and resistance from major industry groups can inhibit action in both developed and developing countries. The means to address these will vary by country but, in general terms, two options exist. The first involves negotiation with potential opponents on the terms of policy amendments or compensatory measures that may reduce opposition. These may relate to the climate policy under discussion or to other policy areas, such as business regulation (Bailey and Compston 2012). The second is to increase inter-sectoral coherence and governmental decision-making powers by means such as integrating climate and energy ministries (Carter 2008), nurturing cross-party consensus on climate change, requiring the official objectives of all relevant departments to include reducing greenhouse gas emissions, setting up high-profile independent climate change commissions (Giddens 2011), and creating framework policies (such as the UK's Climate Change Act and national climate strategies in China, India and Brazil) that establish long-term goals, targets and mechanisms for climate mitigation policy (Compston and Bailey 2012).<br>Bailey, I. and H. Compston (eds) (2012), Feeling the Heat: The Politics of Climate Policy in Rapidly Industrializing Countries, Basingstoke: Palgrave Macmillan.<br>Carter, N. (2008), 'Combatting climate change in the UK: challenges and obstacles', Political Quarterly 79, 194–205.<br>Compston, H., and I. Bailey (2012), Climate Clever: How Governments can Tackle Climate Change (and Still Win Elections), London: Routledge.<br>Giddens, A. (2011), The Politics of Climate Change (second edition), Cambridge: Polity Press. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2943 | 15 | | | | | in general, I thought this chapgter needed to focus more on program evaluation (the title of this part of WGIII) with less emphasis on program description, background social science such as definitions, etc. | Noted. |
| 14876 | 15 | | | | | Shorten substantially or entirely delete sect 15.5.4.8, /9./10 since long compared to other sub chapters albeit limited in regional scope (US) and scale compared to other existing instrumnets (eg promotion of renewable energy) | Noted. The section on emission trading will be completely rewritten in the SOD. |
| 14877 | 15 | | | | | very limited number of examples from developing countries; too heavy focus on US and Europe | Noted. Despite the paucity of peer-reviewed studies in developing countries, the SOD will include more |
| 14894 | 15 | | | | | There is a substantial overlap between Chapter 15 and Chapter 7 section 11 on policies please align and refer rather than duplicate and contradict | Accepted. |
| 14880 | 15 | | | | | examples from small island states and least developped countries missing | Table deleted |
| 14893 | 15 | | | | | Project Carbon Fund missing; Sources? | Noted. Already covered in Chapter 16. |
| 2581 | 15 | | | | | The role of subnational and local governments in addressing Sustainable Development issues, notably climate change, has been increasingly recognized by the UM System. For instance, the Rio+20 final declaration has 23 matches to "subnationals" (initial draft had just a couple) | Noted. |
| 13616 | 15 | | | | | maybe you've seen this study http://repository.cmu.edu/cgi/viewcontent.cgi?article=1095&context=epp but in case not, think it would be helpful | Noted. |
| 13619 | 15 | | | | | Would like to again flag comment 22 - Abdel Latif (2012) which highlights the 'trigger' of the Kyoto Protocol | Noted. |
| 13621 | 15 | | | | | I just wanted to bring to your attention the report we did for NBS nbs.net/wp-content/uploads/NBS-Executive-Report-Policy.pdf | Noted. |
| 17479 | 15 | | | | | entry for the UK: the 2011 Carbon Plan supersedes the 2009 Low Carbon Transition Plan. Also relevant are the series of Energy Bills and Acts (e.g. Energy Acts 2008, 2010, 2011; May 2012 Energy Bill) which contain provisions for various energy efficiency and low-carbon measures | Table deleted |
| 15398 | 15 | | | | | The executive summary exaggerates the negative cost statement. It claims cost-savings from standards but needs to mention cost of tax/cap and trade. This needs critical assessment of national actions, not merely repetition of government descriptions of plans or directives but assessments of change attributable to policies. Claims about US regional action are simply absurd: California is the only state left in the WCI, and RGGI is unraveling – see Chapter 14 for an accurate description. Combining standards and labeling is completely inappropriate. Studies have isolated regulation – and regulation will in principle restrict choices and impose costs while information has no cost other than administrative. | Accepted. The negative cost statement will be qualified. The section on tradable permits will be rewritten, as will the section on institutions and governance. Standards and labeling will be discussed in different sub-sections. |
| 7501 | 15 | | | | | No comments. | Noted. |
| 5903 | 15 | | | | | Please explain "AI" and "NAI". The table can be shortened to 1 - 2 representative examples for Annex I / non Annex I each or, if you want to include a wider variety, 4 -5 countries max. No table giving examples only should exceed 1 page in length. | Table deleted |
| 11076 | 15 | | | | | The styles of writing vary significantly from section to section, which makes reading difficult. For example, the styles of 15.5.3 and 15.5.4 are very different, although both of them belong to the arguments of explicit carbon pricing instruments. I prefer the style of 15.5.3. It is much more scientific. | Noted. |
| 4289 | 15 | | | | | I am missing the fact that VAs or Laws requring energy management may not only be regarded to include technical measures. This comment holds for the whole chapter. Please see Thollander and Palm (2012) (Improving Energy Efficiency in Industrial Energy Systems - An Interdisciplinary Perspective on Barriers, Energy Audits, Energy Management, Policies, and Programs, Chapter 8 (and chapter 6), ISBN 978-1-4471-4161-7) where it is shown in Figure 4, chapter 8, that energy management could contribute to significantly higher energy efficiency potentials. Please also see Backlund, S., Thollander P, Palm, J., Ottosson, M., 2012. Extending the energy efficiency gap. Accepted for publication in Energy Policy holding the same line of arguments. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18455 | 15 | | | | | (5) In the spirit of helping update the US sub-national portion of this chapter, I point the authors to my 2011 law review article co-authored with Vicki Arroyo (Director, Georgetown Law Climate Center). We asked, what factors seem to explain why some states in the US have moved ahead in the GHG arena and others have not?<br>We found that state action or inaction was likely attributable to a combination of the following factors: dependence on fossil fuels, affluence, presence or absence of energy shocks, energy prices, public salience, political leadership, political culture,<br>professionalized legislatures, and patterns of campaign finance.<br>Vivian E. Thomson and Vicki Arroyo, "Upside-Down Cooperative Federalism: Climate Change Policymaking and the States,"<br>Virginia Environmental Law Journal 29(1)(2011): 1-61. | Noted. |
| 18453 | 15 | | | | | (3) The EU ETS program appears to be included only in Table 15.1.<br>That program should be described, as should the literature on the EU ETS's strengths and weaknesses. | Table has been deleted. EU ETS discussed in Ch 14 |
| 12065 | 15 | | | | | The bar for 2009 seems out of proportion and this development is not explained in the text | Noted. The figure has been revised and this section rewritten. |
| 18008 | 15 | | | | | It is not quite clear to me in what way the second and the third column interact or cover the same ground. | Considered. This table has been deleted |
| 5902 | 15 | | | | | Can be deleted completely - the reader just read almost everything stated here in the executive summary above. | Noted. Will be rewritten. |
| 11080 | 15 | | | | | This chapter can be shortened. Some discriptions seem appropriate in the conclusion chapter, which, very interestingly, lacks in this chapter, and overlap what are mentioned in the Executive Summary. | Noted. Will be rewritten. |
| 4997 | 15 | | | | | The advantage of tradable permits are not only cost-effectiveness but also political easiness compared with tax, which is always politically difficult to introduce. | Rejected. Taxes are used in some countries, so political feasibility varies |
| 4999 | 15 | | | | | It is not clear what the imperfact policy coordination means. | Noted. |
| 12204 | 15 | | | | | What is the goal of this subchapter? It is not clear why it touches on selected sub-issues and others not. | I followed the list of subtitles closely, and addressed – the best as I could – all of them. The list itself was given to me by |
| 12205 | 15 | | | | | The title of the chapter is on mitigation/adaptation capacities. 1.) In the text you also refer to policies and public good characteristics of climate change. It is not clear how this relates to mitigative/adaptive capacities. 2.) it is not clear what you mean by 'capcities', accordingly, the sentence "mitigative and adaptive capacities are fundamentally disjoint" is unclear. In addition, this statement seems to be in contradiction with chapter 4.6.1, page 54, where the authors write that hat there is a strong correlation between the capacity to develop sustainably and climate response capacity (pls. see comment on this text passage above) | I the revised version I removed the economics terminology. It was appropriate since climate protection requires a concerted global action, while adaptation can be carried out locally. Nevertheless, since some reviewers did not like the jargon, I rephrased the relevant sentences. I also removed the words 'fundamentally disjoint'. I am |
| 12206 | 15 | | | | | You write that the stated objective of governments and int. organizations is to meet economic needs of a population. I think this statement is false. Meeting economic needs is one goals among other development goals. | The referee is right. Meeting economic needs is one of the many goals. I rephrased the relevant sentence. |
| 12207 | 15 | | | | | What is the task of this sub-chapter? The content of this sub-chapter is very selective. The title of 15.10 is "links to adaptation" yet here you also include mitigation. | Please see my response to 12204. Mitigation was only addressed to the extent it was unavoidable in the |
| 2962 | 15 | | | | | dealt with elsewhere in WGIII, I think, so maybe delete here. | Noted. Revised section after meeting with Chapters 13 and 16 teams to |
| 2963 | 15 | | | | | this is a subjective judgment, but I felt that this section talked down to the reader. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8499 | 15 | | | | | Governance is not necessarily about institutional change. It would be more accurate to state that governance is about better understanding the actions of governing, and the ways in which formal institutions and actors (eg, elected officials, etc) interact with, grant authority to, and are influence by informal actors and organizations that participate in the process of governance. | Definition of governance removed. Covered in the glossary |
| 2945 | 15 | | | | | this subsection was abstract and not very helpful to policymakers -- I'd suggest deleting. | shortened substantially, with a focus on how and why institutional change is |
| 11082 | 15 | | | | | This chapter is well written. I like this academic flavour. IPCC report is meant to be science-based and this chapter is one of the best examples. | Thanks! |
| 12046 | 15 | | | | | The section focuses very much on the theoretical aspects of institutions and governance and how they have a tendency to block change towards mitigation policy. It should however also address capacity constraints in existing institutions or the absence of important institutions. I would argue that these are also important elements that prevent change in policies, as it is sometimes not a question of lack of will but lack of possibility to bring about change. | Emphasis on role of institutions in restricting change is included. |
| 2946 | 15 | | | | | the individual case studies are too long and detailed, although the table is very helpful. I suggest shortening by 50%. | Ccase studies re-written thematically. Table removed |
| 12049 | 15 | | | | | It is not clear what the objective of this section is and how the list of national policies interacts with the analysis of institutional structures and governance. The table takes up a large amount of space without delivering much information on the issues that should be addressed under section heading 15.2. The text in the table could be shortened considerably and if examples of sub-national policies and responsible institutions would be added could contribute to the discussion on institutions. | Re-written around clear themes and messages. Table removed to be replaced by a map. A sub-section on sub-national policies is included |
| 2558 | 15 | | | | | Quebec province has also a target beyond national, http://www.mddep.gouv.qc.ca/communiques_en/2009/c20091123-cibleges.htm | Table removed |
| 2560 | 15 | | | | | Worth citing the Climate Group´s billion tree endowment, http://www.theclimategroup.org/what-we-do/news-and-blogs/mike-rann-what-states-can-do-part-vii-plant-forests/ | Section re-written to be thematic. |
| 5904 | 15 | | | | | Can be shortened considerably. What does Germany bring into focus that could not be explained / shown at the example of e. g. Denmark or the USA? So adding a new example seems not to be necessary. | Section re-written to be thematic. |
| 11084 | 15 | | | | | The very issue of "Subsidy Reduction" is missing in any case. | Covered in detail elsewhere in the |
| 12050 | 15 | | | | | Agree with author to drastically shorten the section! A new structure could take into account a) the different levels of jurisdictions and how they interact (community, provinces/states, national) and b) the different institutions, actors and governance structures within each level | Section re-written to be thematic. |
| 18728 | 15 | | | | | Inclusion of Germany will add interesting further dimensions to the conclusions on national and subnational trends, notably the concerted effort to define and plan pathways for full decarbonization across all major sectors of the economy over the medium and long term through a carefully balance instrument mix (albeit also highlighting the significant difficulties in getting this balance "right", and the ongoing and controversial debate on individual instruments such as the renewable energy feed in tariff). | German examples will be added |
| 12051 | 15 | | | | | The conclusion section should not focus on policies, but more on the institutional setup and what can be learned from the experiences. I.e. what is important to consider when setting up institutions or defining governance structures for mitigation activities. | Accepted; text modified |
| 10459 | 15 | | | | | This section needs to be expressed in a tabular format | Section shortened into text box |
| 11085 | 15 | | | | | I would prefer delete this section. The concept of NAMA is not matured yet, due to its strong policital implications to developing countries under the UNFCCC negotiation. NAMA used to be a general expression, i.e. just "nationally appropriate mitigation actions", in the Bali Action Plan, but became very much politicized since then. I would suggest IPCC make itself isolated from the ongoing hot political debates under the UNFCCC. | NAMA discussion limited to a text box. It is retained because empirically NAMAs do provide one hook for national actions. |

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| 18729 | 15 | | | | | This section is somewhat fragmented, or incomplete - it successfully introduces the concept of NAMAs based on the evolution of the concept in the climate negotiations (specifically the BAP), proceeds to emphasize the definitional/coneptual uncertainties, but then - in an attempt to draw on empirical case studies - quickly gets lost in "possible NAMAs", with little systematic inference and hence limited added value. At least the concept itself should be given some more attention before leaving the reader to a vague uncertainty; e.g. breaking down the term and what it means for the definition of the concept of a NAMA ("national", "appropriate", "mitigation", "action"); differentiating the options (credited or C-NAMAS); linking the concept to more recent negotiation outcomes (what e.g. of Cancún and Durban?); and drawing on more recent literature (e.g. CCAP (2011). Nationally appropriate mitigation actions (NAMAs) and the Clean Development Mechanism (CDM). CCAP; Levina E., and N. Helme (2009). Nationally Appropriate Mitigation Actions by Developing Countries: Architecture and Key Issues. Centre for Clean Air and Policy (CCA), Washington; Okubo Y., D. Hayashi, and A. Michaelowa (2011). NAMA crediting: how to assess offsets from and additionality of policy-based mitigation actions in developing countries. Greenhouse Gas Measurement and Management 1, 37–46; Olsen K.H., J. Fenhann, and M. Hinostroza (Eds.) (2009). NAMAs and the Carbon Market -- Nationally Appropriate Mitigation Actions of developing countries. UNEP Risø Centre; Wang-Helmreich H., W. Sterk, T. Wehnert, and C. Arens (2011). Current developmens in Pilot Nationally Appropriate Mitigation Actions of Developing Countris (NAMAs). Wuppertal Institute for Climate, Environment and Energy, Wuppertal. | NAMA discussion has been reduced substantially in response to comments. Definitional issues will be covered more completely. |
| 11087 | 15 | | | | | If some aspects of NAMA is to be mentioned, this section deserves to remain, because linking national policies to international support is indeed the core of the concept of NAMA and, therefore, has been politicized. If policy scientist can provide negotiators with any science-based studies, it would surely be highly appreciated. | Section shortened into text box |
| 18730 | 15 | | | | | As noted in an earlier comment, the role of active stakeholder outreach and engagement for the success of policies is borne out by practical experience in a variety of contexts, such as the introduction of complex market mechanisms (EU ETS, Chinese pilot ETS), where understanding and hence acceptance among stakeholders are often lacking. This is indeed an important sections and needs to be included. | New section will be added |
| 18731 | 15 | | | | | While aptly summarizing many of the preceding observations, some of the conclusions do not seem to be backed by earlier sections; one example: "Sixth, since implementation is in its early stages, it is difficult to assess the extent of leakage across jurisdictions, but there are few signs of a “race to the bottom.”" - was this discussed in more detail in a preceding section? This reviewer at least only recalled brief mention of leakage as a potential problem, but no survey or assessment of actual incidences of leakage. | Accepted. The conclusion of this section will not mention race to the bottom issues. |
| 5751 | 15 | | | | | I think the need for gradually removing fossil fuel inventives and biofuels feed-in tariffs is just touched on while it should be more prominent (this is also part of the recommendations by the 2011 OECD-FAO prepared for the G20) | Rejected. This section now just describes in general the different policy alternatives, normative considerations |
| 8500 | 15 | | | | | Note again the importance of typologies for public policy, as well as for instruments (Lowi, etc) | Taken into account. Not only policy instruments but also policy types are now considered in 15.4. Section 15.2 |
| 14882 | 15 | | | | | little information, terms are not used in the further analysis in section 15.5; integrate in 15.5 or delete | Noted. Section 15.5 will incorporate the criteria and 15.6 will follow this |
| 11193 | 15 | | | 26 | 18 | One should add that the subsidy generates a burden to the public finances, which makes the policy vulnerable for policy changes in times of crisis (e.g. downsizing feed-in-tariffs in renewable policies) | Accepted. Revenue demands from subsidies included in text |
| 11386 | 15 | | | 26 | 18 | One should add that the subsidy generates a burden to the public finances, which makes the policy vulnerable for policy changes in times of crisis (e.g. downsizing feed-in-tariffs in renewable policies) | Accepted. Revenue demands from subsidies included in text |
| 3677 | 15 | | | | | Integrate with chapter 3.8. as chapter 3.8. lacks climate change related examples. | Noted. A more practical and illustrative approach to climate change mitigation is |

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| 18732 | 15 | | | | | A brief acknowledgment of the epistemological challenges of the main criterion (environmental effectiveness: how to establish causality in complex physical and socioeconomic systems? How to define the environmental outcome that serves as the benchmark of effectiveness when mitigation policies typically pursue so many different and not always compatible environmental and other (social, economic, innovation etc.) objectives? Etc.) and the inevitable contingency, i.e. proneness to value judgments of all other criteria would seem helpful here, as it is barely discussed in ch. 3. Social science and humanities literature has begun looking at the limitations of the criteria developed in neo-classical economics, but is still scarce. See Mehling, Michael (2002): “Betwixt Scylla and Charybdis? Effectiveness in International Environmental Law.” 13 Finnish Yearbook of International Law 129-182; Erkki J. Hollo, Kari Kuusiniemi, Eriika Melkas and Michael Mehling (2002), “Legal Aspects of Climate Change: Instrument Choice and the Kyoto Mechanisms,” in Understanding the Global System: The Finnish Perspective, edited by Jukka Kayhkö and Linda Talve, pp. 177-182. Turku: FIGARE, 2002 | Rejected. Outside the scope of the chapter: topic covered in Chapter 3 |
| 12052 | 15 | | | | | It is not clear how this section relates to the rest of section 15.3. The following sections mainly describe the policy instruments and do not yet evaluate them. With the definition of criteria for assessment at the beginning of the section the reader expects some form of assessment to follow. I would suggest to move this section to 15.5. | Accepted. This section now just describes policy types: criteria and evaluation are in subsequent sections 15.5 |
| 12054 | 15 | | | | | The categories do not mention energy based standards (e.g. standards set in China on energy use per unit of output) | Accepted. Text Modified: minor change in the text to avoid a closed classification |
| 13712 | 15 | | | | | Rename section "Tradeable permits and offset credits" and revise text to cover both cap and trade (allowance-based systems) as well as baseline and credit systems (project-based offsets). | Accepted. Text modified: incorporation of baseline-and-credit trading systems |
| 11089 | 15 | | | | | The vulnerablity of tradable permits to interferences from other policy instruments should be mentioned here. | Taken into account. This section merely describes the different policy alternatives, whose interactions are |
| 5002 | 15 | | | | | The tradable permits may lower compliance costs but not necessarily reduce administration costs. The administration and political cost to sustain EU-ETS is tremendous, if compared with other scheme such as carbon tax. | Taken into account. This section merely describes the different policy alternatives, whose assessment is |
| 5003 | 15 | | | | | It should be mentioned that there is a concern for the accuracy of the data in carbon footprints since there is no perfect data available. Therefore, the usage of eco-labeling and certicication must be carefully implemented not to mis-guide the consumers. | Accepted. Text modified: no reference now to carbon footprints: further explanations of specific topics is beyond |
| 14883 | 15 | | | | | little information, terms are not used in the further analysis in section 15.5; integrate in 15.5 or delete | Noted. |

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| 18735 | 15 | | | | | This section heavily focuses on economic approaches (CGE analysis) as the central way of assessing/evaluating policies and institutions. While the explanation appears balanced as far as economics is concerned (e.g. in terms of challenges faced and approaches used), it is extremely narrow in disciplinary focus and fails to incorporate the valuable (and, in the real world, highly relevant) contributions of other disciplines. One example is law, which is the means by which policies become operational in most cases and, as a discipline, by definition deals with interactions between sets of rules, principles and rights and duties. Accordingly, interactions between policies can only be fully understood when their potential legal conflicts with existing or future procedural and substantive rules are also factored in, as these can either result in the inapplicability or only partial applicability of the policy, or significantly hamper its implementation (or result in other consequences, such as litigation or liability for damages/compensation). By the same token, the success or failure of policies is often strongly affected by how well these harmonize with the existing legal framework, and how conducive that framework is to their effective implementation. For instance, procedural or institutional rules (which body has what power to play which role in the operationalization of a policy) can be decisive for the real-life application of a theoretically superior policy. Unfortunately, there has been very little jurisprudential scholarship specifically on evaluation of climate change policies, and hence it is difficult to pinpoint seminal research (see, e.g., Hollo, Erkki et al. (eds), Climate Change and the Law, Dordrecht: Springer, 2012); rather, it is necessary to understand the legal system in its entirety (and conversely grasp related scholarship very broadly) to fully capture the role of this discipline in evaluating climate policies. The same would apply to other disciplines that can contribute to the assessment of policies, such as e.g. behavioral psychology and its study of the behavioural factors that motivate or hamper change in human behavior e.g. to reduce emissions. | Noted. |
| 12055 | 15 | | | | | Suggested further literature on ex-post evaluation: Forster, Daniel; Falconer, Angela; Buttazoni, Marco; Greenleaf, James; Eichhammer, Wolfgang; Köhler, Jonathan; Toro, Felipe; Schleich, Joachim; Sensfuss, Frank; Ragwitz, Mario; AEA Group (2009): Quantification of the Effects on Greenhouse Gas Emissions of Policies and Measures: Final Report Appendix I: Detailed Policy Methodology and Results Chapters . Oxford: AEA Group, 2009. | Noted. |
| 12056 | 15 | | | | | It would be helpful to the reader to have a clearer rationale why in this context only ex-post evaluation is considered and not ex-ante. | Noted. |
| 3678 | 15 | | | | | Integrate with chapter 3.8. as chapter 3.8. lacks climate change related examples. | Noted. |
| 5752 | 15 | | | | | It is important to mention and refer to the FAO recently agreed guidelines on tenure governance: http://www.fao.org/docrep/016/i2801e/i2801e.pdf | Noted |
| 18751 | 15 | | | | | There is a conclusion (helpful) after 15.6, but not after the much longer and variegated 15.5. It could make sense to consider a conclusion or summary that seeks to condense the main lessons/outcomes. | Rewritten, will be done. |
| 12057 | 15 | | | | | Each sub-section would benefit from a small overview table of the examples that are mentioned in the section, with some key characteristics and an overall finding / evaluation rating (e.g. high/medium/low effectiveness) | Noted, not sure if this is practicable but will try to do something on these lines. |
| 12058 | 15 | | | | | The difference between 'criteria' and 'ex-post evaluations' is not immediately clear from the text. An explanatory sentence would be useful. | Noted,text rewritten |
| 3679 | 15 | | | | | Integrate with chapter 3.8. as chapter 3.8. lacks climate change related examples. | Noted, will discuss w. Ch 3 |
| 14884 | 15 | | | | | covering 'regulation' and 'information' in the same section seems only appropriate when focussing on energy efficeny standards and labels, however regulation with climate change policy incorporate also eg quotas for renewable enrgy or feed-in tariffs; suggest to cover the two items in seperate sections thereby incorportaing quotas and other regulations in the regulation section | Accepted. Regulation and information separeted. RPS and FIT are dealt with at section 15.6 |
| 3680 | 15 | | | | | Integrate with chapter 3.8. as chapter 3.8. lacks climate change related examples. | Accepted. Coordination will be made. |

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| 5905 | 15 | | | | | The text could be shortened considerably if you refrained from listing case studies / examples and changed the text to "statement (source)". For example, p. 30 l. 23 - 31 could be shortened to: "Building code changes can have an effect on energy consumption. For example, an increase in the stringency in Florida's energy code resulted in a decrease in the consumption of electricity by 4% and natural gas by 6%, compared to residences structured before the code came into effect (Jacobsen & Kotchen 2011)." The statement in lines 23 - 25 is pointless and can be deleted completely. | Accepted. Text modified and shortened. |
| 5906 | 15 | | | | | Please concentrate on core statements and avoid listing studies. Please do NOT start sentences with "X conducted …" or "Y found that …". | Accepted. Text modifed and shortened where appropriate. See 104 for different |
| 18739 | 15 | | | | | Suggested table summarizing cost effectiveness calculations for different policies with comparable metrics would be very helpful and should be included | Noted, not sure if this is practicable |
| 11090 | 15 | | | | | I value the style of this section best, because it is objective and science-based; distinguish the grey literature from rigorous published works; distinguish empirical studies from theory or simulation studies. The style of this section should be a benchmark of other sections. | Noted |
| 3681 | 15 | | | | | Integrate with chapter 3.8. as chapter 3.8. lacks climate change related examples. | Noted, will discuss w. Ch 3 |
| 13714 | 15 | | | | | Please also consider the following empirical literature: : Andersen, M. (2004). Vikings and virtues—a decade of CO2 taxation, in: Climate Policy, 4, p. 13-24; Andersen, M. (2010): Europe's experience with carbon-energy taxation, in: S.A.P.I.EN.S, 3.2, URL : http://sapiens.revues.org/1072; Enevoldsen, M., Ryelund, A.; Andersen, M. (2007). Decoupling of industrial energy consumption and CO2-emissions in energy-intensive industries in Scandinavia, in: Energy Economics, 29, p. 665-692; Godal, O.; Holtsmark, B. (2001): Greenhouse gas taxation and the distribution of costs and benefits: the case of Norway, in: Energy Policy, 29, p. 653–662; Zhang, Z.; Baranzini, A. (2004): What do we know about carbon taxes? An inquiry into their impacts on competitiveness and distribution of income, in: Energy Policy, 32, p. 507–518; Ekins, P.; Pollitt, H.; Summerton, P.; Chewpreech, U. (2012): Increasing carbon and material productivity through environmental tax reform, in: Energy Policy, 42, p. 365–376; Agnolucci, P. (2009): The effect of the German and British environmental taxation reforms: A simple assessment, in: Energy Policy, 37, p. 3043–3051. | Noted, text rewritten |
| 18742 | 15 | | | | | The empirically observed effects of the large-scale "Environmental Tax Reform" in Germany between 1999 and 2006, which incurred successive rate hikes on a number of fuel taxes as well as the introduction of a new electricity tax (hence now called the "Energy Tax") are very instructive in terms of distributional impacts, behavioural effects (and ultimately greenhouse gas reductions) as well as employment effects of recycling revenue into a reduction of non-wage labor cost. See e.g. Buehler, Ralph et al. (2011), "How Germany Became Europe's Green Leader: A Look at Four Decades of Sustainable Policymaking" 2 Solutions (2011): 51-63 and Mehling, Michael (forthcoming 2013), "Germany's Ecological Tax Reform: A Retrospective", in Manuela Achilles (ed.), Sustainability in Transatlantic Perspective: Germany and the U.S. (Basingstoke: Palgrave Macmillan). | Noted, text rewritten |
| 13715 | 15 | | | | | Please include: Burniaux, J.; Chateau, J. (2011): Mitigation Potential of Removing Fossil Fuel Subsidies: A General Equilibrium Assessment, OECD Economics Department Working Papers, No. 853, OECD Publishing.doi: 10.1787/5kgdx1jr2plp-en | Noted, text rewritten |
| 11096 | 15 | | | | | This section is one of the most courageous section in this chapter. The message contained here is very important. Keep this as it is, and include the essence in the Executive Summary. | Noted |
| 12061 | 15 | | | | | Aviation and maritime transport does not fit into the logic of section 15.5.3. Since the section as written mainly refers to the absence of taxes for the sectors and not to other policy instruments under consideration for the sectors it would be better suited to include the text as a box in section 15.5.3.3. | Text rewritten |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18744 | 15 | | | | | The ample evidence on FIT effectiveness in countries like Germany, and the challenges nonetheless faced in setting adequate tariff rates (especially in Spain and Portugal, with an ensuing boom/bust effect) have been discussed in the literature and should be considered - in purely absolute terms, Germany has led renewable energy deployment (at least for certain energy sources such as photovoltaics) for a longer peiod. | Text rewritten |
| 11097 | 15 | | | | | The lessons learned recently in Spain and Germany should be mentioned. | Noted |
| 18745 | 15 | | | | | The assignment of the EU ETS to ch. 14 and national/subnational ETS to ch. 15 may make sense just going by the chapter titles, but that virtually rules our any comparison/side-by-side analysis, as would be useful here. Also, the supranational EU law is considered "domestic plane" in international law. | Noted |
| 11098 | 15 | | | | | This section is one of the most problematic in this chapter. This reads as if it were a gray paper to promote emission trading. Whole section should be rewritten in the style of 15.5.3. What are the issues? What kind of science-based works can be reffered to each argument? Are they grey or rigous published works? Are they empirical studies or theory or simulation? Those questions should be addressed as was the case in 15.5.3. | Text rewritten |
| 13716 | 15 | | | | | Add a section on the Tokyo system, using elements of p. 65, line 27- p 66, line 5, see Nishida, Y.; Hua Y. (2011): Motivating stakeholders to deliver change: Tokyo's Cap-and-Trade Program, in: Building Research & Information, 39, p. 518-533 | Text rewritten |
| 13720 | 15 | | | | | Delete first part of the section, as not referring to greenhouse gas trading, and only retain those parts relating to GHG trading | Text rewritten |
| 12062 | 15 | | | | | The section is unproportionately long compared to the other sections within 15.5.4. Suggest shortening. | Done |
| 3682 | 15 | | | | | Cut chapter by 50% to save space. | Text substantially rewritten and |
| 18747 | 15 | | | | | Two of the helpful lessons coming out from different surveys of the RGGI system include 1. the ability of even a very low-price ETS to influence mitigation in a meaningful way if allowances are auctioned and proceeds used for mitigation acitivities; 2. compliance costs have been minimal, cobenefits significant (see RRGI Inc. and Analysis Group 2011/2012). | Noted |
| 11099 | 15 | | | | | This section is particularly misleading. It sounds as if it deals with ex-post analyses of GHG emission tradings, but it does not. GHG reduction is very different from other polution reductions. This section should be deleted. | Text substantially rewritten |
| 13717 | 15 | | | | | Delete section, as not referring to greenhouse gas trading | Noted |
| 18748 | 15 | | | | | The ample description of criteria pollutant trading systems can probably be abridged if space constraints necessitate doing so, as the value of lessons from conventional pollutant reduction for greenhouse gas mitigation is limited, see e.g. the experiences under the EU ETS. | Yes, done |
| 13718 | 15 | | | | | Delete section, as not referring to greenhouse gas trading | Text substantially rewritten |
| 13719 | 15 | | | | | Delete section, as not referring to greenhouse gas trading | Text substantially rewritten |
| 18749 | 15 | | | | | Not mentioned in this section are two major voluntary agreements on climate mitigation, both of which were only moderately effective or ineffective: the agreements between German inudstry and the government of 1996 and 2000 (Erklärung der Deutschen Wirtschaft zur Klimavorsorge, see http://www.bmu.de/wirtschaft_und_umwelt/selbstverpflichtungen/doc/47777.php; for an independent monitoring report of 2010 by RWI institute, see http://www.rwi-essen.de/media/content/pages/publikationen/rwi-projektberichte/PB_CO2-Monitoring-2010.pdf; largely replaced by the mandatory EU ETS starting in 2005); and the voluntary agreements between European, Japanese and Korean car manufacturers and the European Community (at the time), which were considered ineffective and resulted in adoption of a regulation on CO2 emission limits in 2009. | Accepted. Text modified accordingly. Literature added. |
| 3683 | 15 | | | | | Integrate with chapter 3.8. as chapter 3.8. lacks climate change related examples. | Accepted. Coordination will be made. |
| 12064 | 15 | | | | | The section should be shortened. While Japan is a good example for a functioning voluntary system it would be more useful to discuss the necessary framework that make voluntary agreements more or less successful. | Accepted. Text modified accordingly. |

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| 13722 | 15 | | | | | Replace by "Voluntary agreements have a rather mixed outcome with regards to their environmental effectiveness. They are effective alternatives to mandatory regulations when the target is to achieve small environmental improvements at relatively low cost (Borck and Coglianese 2009). A credible threat of regulation is required in order to achieve stringent targets (Baranzini and Thalmann 2004). Under specific cultural circumstances, such as in Japan, voluntary agreements can also work in the absence of a direct regulatory threat (Wakabayashi 2012) . There, they provide high flexibility and are politically highly feasible." References: Baranzini, A.; Thalmann, P. (2004): Voluntary approaches in climate policy, Edward Elgar, Cheltenham. ; Borck, J; Coglianese, C. (2009): Voluntary Environmental Programs: Assessing Their Effectiveness, in: Annual Review of Environment and Resources, 34, p. 305-324 | Accepted. Literature added. Mixed outcome is mentioned. |
| 2957 | 15 | | | | | you could just cross-reference to the Forestry chapter and delete this section. | Accepted. Section deleted. |
| 3684 | 15 | | | | | Integrate with chapter 3.8. as chapter 3.8. lacks climate change related examples. | Noted, will discuss w. Ch 3 |
| 2958 | 15 | | | | | I would suggest keep the portions of this section that are specific to emission reduction technologies and brutally shortening everything else. | Noted. Section has been shortened. Because of the limited literature on policy impacts on emissions technology, the authors believe that some discussion |
| 5010 | 15 | | | | | Most of the policy measures described in this chapter are the measures for deployment and diffusion of energy efficiency/clean technologies/energies by either incentivatise or mandate them by policies. Assumption behind this is such green technologies/clean energy are expensive and this is basically true. But if clean energy/green technologies become cheper than fossil fuels and ordinerly technologies, such incentives and/or policy measures may not be necessary. Therefore, R&DDD of such cheep clean energy is crucially important for the mitigation. see the following papers: "Climate Pragmatism, Innovation, Resilience, and No Regrets", Bob Atkinson et al., (2011), "The Hartwell Paper, A new direction for climate policy after the crash of 2009", Gwyn Prins et al., Institute for Science, Innovation and Society, University of Oxford and Mackinder Program for the Study of Long Wave Events, London School of Economics, (May 2010) | Noted. |
| 10456 | 15 | | | | | Cut out this section on R&D. This serves no useful purpose, interrupts the flow of the rest of the chapter | Rejected. Theoretical and empirical literature cited in this section demonstrate the importance of |
| 18750 | 15 | | | | | The extensive experience with renewable energy promotion in Germany (feed-in priority and net metering since 1990, feed-in tariff since 2000) and the significant growth in renewable energy technology deployment in the past two years (e.g. >10 GW of new photovoltaic installation in barely a year) might merit more discussion, as they show up a number of second-level/spillover effects (e.g. merit order effect, decentralization of power generation, etc.) while also effectively underscoring how a promotion system, if properly balanced, can function (the "re-balancing" being a challenging and much discussed issue at current). There is substantial gray literature on the topic, as well as some early peer reviewed literature. Instructive also the contrast to the failed policies in Portugal and Spain applying essentially the same mechanism, but with overly generous inventives leading to a "boom and bust" cycle (for the last paragraph "cautionary experience"). | Taken into account. There is additional discussion of these examples in the SOD. |
| 12067 | 15 | | | | | The section very much overlaps with the content of section 15.5 as measures discussed in 15.5. are in most cases (except measures aiming at behavioural changes) finally aimed at accelerating technology deployment. A discussion how far these policies do influence also technology development is useful, but repetition needs to be avoided. Any discussion on the effectiveness of instruments on deployment should be moved to the respective sections under 15.5. | Taken into account. We have better coordinated the discussion of policies that affect deployment between the subsections. |

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| 11101 | 15 | | | | | This is another example of far-from-science-based reports of this chapter. It reads as if it were a piece of anti-IP-protection campaign. Please refer No.15 and rewrite. | Rejected. Different individuals have very different views regarding the effects of IP policy. The conclusions in the chapter regarding the potential consequences of IP protection are supported by the |
| 12068 | 15 | | | | | Are 'environmental policy instruments' as used in the section meant to represent the GHG mitigation policies discussed in earlier chapters? The objective of the section is not clear. It reads like a summary / conclusion section, but the conclusion section comes later. | Noted in part, rejected in part. The text has been expanded to make clear that "environmental policy instruments" in this subsection are, indeed, the kind of generic instruments discussed in the previous subsection. That subsection did not, however, consider the impact of |
| 12069 | 15 | | | | | The content of this section could be moved to the conclusions in section 15.6.8. It does not present any analysis but rather draws lessons from analysis above. | Noted. |
| 18752 | 15 | | | | | There is an inherent tension between the - accurate - affirmation of multiple important objectives of mitigation policy in this section and a) the mention of the Tinbergen rule earlier in the chapter; b) the application of criteria for the assessment of policy instruments (also earlier on in the report) which assume clearly defined, identifiable and uniform policy objectives (whose achievement can be measure in terms of effectiveness, cost effectiveness, etc.). What may be environmentally effective may not achieve any of the other objectives mentioned in 15.7.1; what is successful at accommodating the various priorities listed here may not necessarily be the most environmentally effective; and so on. | Considered. We added a short para at the beginning of this sector to indicate the multiple objetive of mitigation policies. |
| 12070 | 15 | | | | | It is not clear how this section interacts with section 15.3.2. It seems repetitive - consider merging. The second part of the title 'Measures to widen policy goals' is not clear and seemingly unrelated to the first part of the title. | Considered. We have reorganized 7.1-7.3 to a new section which focus on the interaction between policy objectives |
| 18006 | 15 | | | | | The literature and details covered in this paragraph are very interesting, but might or should be covered in the respective sector chapters (particularly Chapter 7). In my eyes, the role of chapter 15 would rather be to provide the link between the framing, the IAM and the sectoral discussions of SD and co-benefits/co-costs with the policy assessment literature and provide an overview of methodological challenges. In contrast to co-benefits and co-costs of individual mitigation options, Chapter 15 could build on these assessments and discuss synergies and trade-offs across different policy goals in different sectors in view of future transformation pathways. | Considered. The linkage with sectoral chapters will be enhanced when related sector chapters are ready. |
| 18753 | 15 | | | | | This section fails to mention some interesting and useful insights from mainstreaming efforts e.g. in Europe at the EU level and that of individual Member States, where substantial institutional restructuring (e.g. formation of Directorate General Climate Action at EU level and appointment of a Commissioner for Climate Action; creation of the Department of Energy and Climate Change in the UK; various national "Climate Laws" or statutes that bring together all relevant climate and energy provisions/rules. There is literature surveying these developments, but I have no concrete citations at hand. | This EU case study has been addressed in 15.2, institution and governance section |

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| 18756 | 15 | | | | | That other criteria than efficiency may be relevant when discussing interactions or parallel application of two or more instruments is mentioned; what is not mentioned in this section is the discussion about the need to promote specific technologies with long lead time, such as CCS or PV deployment, even if the same sectors are covered by a quantity rationing instrument such as an ETS - this has been the rationale to retain feed-in tariffs in Europe despite the existence of a carbon price in the energy sector (carbon prices in the EU ETS will not be high enough in the foreseeable future to incentivize the higher-cost abatement technologies). There is peer-reviewed literature on this, see Braathens - Interaction between ETS and other instruments (2011); Boehringer et al. - RES and ETS Interactions (2009); Philibert - Interactions of Policies for Renewable Energy and Climate (2011).<br>Also, section 15.7.5.1 lists coinciding application of efficiency standards and carbon pricing as beneficially interacting, when this has been a major discussion in the EU about the introduction of the energy efficiency directive (EED) and its potential to displace allowances under the EU ETS cap, thereby creating unwanted supply in the carbon market and depressing prices, see e.g. Ryan et al. - Energy Efficiency and Carbon Pricing (2011); Lecuyer et al. Combining Climate and Energy Policies- Synergies or Antagonism? Modeling Interactions with Energy Efficiency Instruments (2012). | Noted. Some references added. Several of these issues are now covered in 15.6 |
| 2959 | 15 | | | | | isn't this covered elsewhere in WGIII? | Noted. |
| 18760 | 15 | | | | | What is not mentioned is the highly influential U.S. Conference of Mayors' Climate Protection Agreement, see http://www.usmayors.org/climateprotection/revised/, that now comprises 1054 municipalities around the United States and entails a voluntary commitment to reduce GHGs to 1990 levels. | Noted. |
| 12071 | 15 | | | | | No references provided for the section. Why are the barriers provided in table 15.3 only applicable to the Pacific Islands? They seem rather to apply to a wide range of countries. While it of course needs to be stressed that barriers vary between countries it seems possible to identify a range of generic barriers that apply to a wide range of countries. | The comments is noted and appeciated. The barriers are generic and are not specific to the Pacific Islands Countries only. The Pacific Islands Countries was only mentioned to address the need for developing countries case studies etc in |
| 18761 | 15 | | | | | Repeats or refutes some statements in earlier sections, e.g. "not uncommon ... to ... have a number of different policies" (see above in the chapter, Tinbergen rule and instrument interactions; Definition of policy on p. 70, line 15 somewhat idiosyncratic, what is missing is a definition of capacity building (for which ample literature exists. Also (p. 70, l. 18): policies are the outcome of decisions; they tend to guide (implementing) actions, not decisions (unless one wants to enter the complex discussion of hierarchical planes of regulation, with higher-level policies - e.g. fundamental rights, constitutional doctrines - limiting the range of permissible policies at a lower plane); p. 71, l. 3: instruments alone do not ensure progress on mitigation, as the preceding table already highlighted - a multitude of factors, institutional, technical, economic etc. are determinative. P 71, l. 9 - should read "good" policies (not "food" policies)? | A definition of CB according to the United Nations Conference on Environment and Development, is provided in the SOD. Food vs. Good policis is noted and corrected. |
| 18762 | 15 | | | | | Very short and not much substantial content yet. | Noted. This section is only given 2 pages and can't cover all in that space. |
| 15399 | 15 | | | | | Since most of the comparisons of policy instruments between global, regional and local action involve cost-effectiveness criteria, the discussion of cost-effectiveness needs to be considerably strengthened. | Noted. Will be done wherever feasible given the literature. |

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| 15400 | 15 | | | | | A large number of published studies support the conclusion that either a carbon tax or cap and trade are more cost-effective than regulatory programs but the chapter fails to make this comparison. For examples, see the following Goulder publications: Goulder, Lawrence H. & Parry, Ian W. H. & Williams III, Roberton C. & Burtraw, Dallas, 1999. "The cost-effectiveness of alternative instruments for environmental protection in a second-best setting," Journal of Public Economics, Elsevier, vol. 72(3), pages 329-360, June. Parry, Ian W. H. & Williams, Roberton III & Goulder, Lawrence H., 1999. "When Can Carbon Abatement Policies Increase Welfare? The Fundamental Role of Distorted Factor Markets," Journal of Environmental Economics and Management, Elsevier, vol. 37(1), pages 52-84, January. Instrument Choice in Environmental Policy Lawrence H. Goulder∗ and Ian W. H. Parry∗∗Review of Environmental Economics and Policy, volume 2, issue 2, summer 2008, pp. 152–174 doi:10.1093/reep/ren005. | Taken into account. (This section now merely describes the different policy types, whose assessment is covered in Sections 15.5 and 15.6) |
| 3603 | 15 | | | | | The executive summary refers to several issues that are to be discused in section 5.3 (initial resistance to carbon taxes, role of hypothecation), and the introduction to the section states that (institutional) feasibility is a key criterion for assessing policy instruments, yet the whole issue of political feasibility/industry and public acceptance is almost entirely absent from section 5.3. A suggested list of references follows below: Dresner, S., Dunne, L., Clinch, P., Beuermann, C., 2006. Social and political responses to ecological tax reform in Europe: an introduction to the special issue. Energy Policy 34 (8), 895–904; Eriksson, L., Garvill, J., Nordlund, A.M., 2006. Acceptability of travel demand management measures: the importance of problem awareness, personal norm, freedom, and fairness. Journal of Environmental Psychology 26, 15–26; Fujii, S., Ga¨ rling, T., Jakobsson, C., Jou, R.C., 2004. A crosscountry study of fairness and infringement on freedom as determinants of car owners' acceptance of road pricing. Transportation 31, 285–295; Harrington, W., Krupnick, A., Alberini, A., 2001. Overcoming public aversion to congestion pricing. Transportation Research Part A: Policy and Practice 35, 87–105; Hsu, S., Walters, J., Purgas, A., 2008. Pollution tax heuristics: an empirical study of willingness to pay higher gasoline taxes. Energy Policy 36, 3612–3619; Jakobsson, C., Fujii, S., Ga¨ rling, T., 2000. Determinants of private car users' acceptance of road pricing. Transport Policy 7, 153–158; Kallbekken, S., Kroll, S., Cherry, T.L., 2010. Pigouvian tax aversion and inequity aversion in the lab. Economics Bulletin 30 (3), 1914–1921; Kallbekken, S., Kroll, S., Cherry, T.L., 2011. Do you not like Pigou or do you not understand him? Tax aversion and earmarking in the lab. Journal of Environmental Economics and Management 62 (1), 53–64; Kallbekken, S., Sælen, H., 2011. Public acceptance for environmental taxes: self-interest, environmental and distributional concerns. Energy Policy 39, 2966–2973; Kallbekken, S., Aasen, M., 2010. The demand for earmarking: results from a focus group study. Ecological Economics 69, 2183–2190; Loukopoulos, P., Jakobsson, C., Ga¨ rling, T., Schneider, C.M., Fujii, S., 2005. Public attitudes towards policy measures for reducing private car use: evidence from a study in Sweden. Environmental Science and Policy 8, 57–66; Schade, J., Schlag, B., 2003. Acceptability of urban transport pricing strategies. Transportation Research Part F: Traffic Psychology and Behaviour 6, 45–61; Schuitema, G., Steg, L., 2008. The role of revenue use in the acceptability of transport pricing policies. Transportation Research Part F: Traffic Psychology and Behaviour 11, 221–231; Steg, L., Dreijerink, L., Abrahamse, W., 2006. Why are energy policies acceptable and effective? Environment and Behavior 38, 92–111; Sælen, H., Kallbekken, S., 2011 A choice experiment on fuel taxation and earmarking in Norway. Ecological Economics 70, 2181-2190. | Noted. |
| 3600 | 15 | | | | | The review of the effect of carbon taxes should include the recent paper by Lin, B. & Li, X. (2011), The effect of carbon tax on per capita CO2 emissions. Energy Policy 39, 5137-5146. This study finds that carbon taxes in Northern European countries have had mixed effects overall, and for most countries no significant effect at all, on carbon emissions. Also, Bosquet, B. (2000, Environmental tax reform: does it work? A survey of the empirical evidence, Ecological Economics 34: 19–32) provides a useful review that should perhaps be referred to. | Noted. |

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| 15401 | 15 | | | | | The discussion of carbon taxes cannot be confined to a survey of the very limited examples of application of these taxes. There is a large number of published studies, many using CGE models, that show how a carbon taxes or proxies like cap and trade are cost-effective and capable of bringing about emission reductions large enough to meet any feasible temperature goal. This section makes it appear that carbon taxes are nearly irrelevant, despite the many studies showing their advantages over the regulatory and subsidy policies that take up the bulk of the chapter. | Noted. |
| 15402 | 15 | | | | | Discussion of phaseout of fossil subsidies completely ignores the very large subsidies to certain specified renewables now in place in most countries. The notion of technologies competing on a level playing field or cap and trade established by a carbon tax or cap and trade seems entirely missing from the chapter. | Noted. |
| 7560 | 15 | | | | | Eco-point system for housing in Japan has to be mentioned:<br>http://www.env.go.jp/en/wpaper/2011/pdf/22_Chapter4-3.pdf<br>For example, insert the following sentences.<br>Global warming countermeasures in the private sector are an issue that the residential sector should work on, and the government can actively encourage energy-saving in the housing sector, which will create an environmental effect that contributes to the establishment of a low-carbon society, and an economic effect that will stimulate new demand in the domestic market (MOE Japan 2011). | Noted |
| 15403 | 15 | | | | | Discussion of border tax adjustment (BTA) is incomplete in that it does not mention the difficulties of calculating accurate taxes on embodied carbon or WTO obstacles to BTA. On this see Babiker and Rutherford (The Economic Effects of Border Measures in Subglobal Climate Agreements, by Mustafa H. Babiker and Thomas F. Rutherford, 26(4), 2005, 101-128.). and Andrew Greene (Reconciling Trade and Climate: How the WTO Can Help Address Climate Change (with T. Epps) (Cheltenham, UK: Edward Elgar) [forthcoming].; "Trade Rules, Dispute Settlement and Barriers to Regional Cooperation" in Neil Craik, Debora VanNijnatten and Isabel Studor, eds., Designing Integration: Regional Governance in Climate Change in North America. [forthcoming]; "Is There a Role for Trade Sanctions in Addressing Climate Change" (with Tracey Epps) (2008) 15(1) University of California Davis Journal of International Law and Policy 1-30.) | Noted |
| 15406 | 15 | | | | | REDD discussion leaves out perhaps the most important problem with REDD – that the same governance failures that lead to deforestation and are going to be continuing obstacles to reversing REDD. On this see the work of Lee Alston (with Krister P. Andersson, Reducing Greenhouse Gas Emissions by Forest Protection: The Transaction Costs of Redd, February 2011, NBER Working Paper No. w16756) sources they cite. | This section will be deleted. Dealt with in Ch 11. |
| 15407 | 15 | | | | | I do not see any discussion of the literature that would support for the unqualified claim that commercialization needs to be supported by government, and I know that there are many examples of studies that question that claim. See for example: R.G. Newell. (December, 2008). A U.S. Innovation Strategy for Climate Change Mitigation. Hamilton Project Discussion Paper 2008-15 Brookings Institution. | Rejected. First, the claim in the text is not unqualified; we note several issues and concerns regarding government support of technology at the commercialization stage. More important, the claim that there is some appropriate role for government support of commercialization is supported by the literature cited in the section, and additional literature cited in the SPREN |
| 15408 | 15 | | | | | Conclusion 3 on R&D unwarranted – carbon tax would do it, govt purchase a narrow possibility. | Rejected. Theoretical literature, cited in the Chapter, emphasizes that technology markets suffer from distinct market failures that are not addressed by carbon taxes. Empirical and historical literature demonstrate the potential |

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| 15409 | 15 | | | | | The list of problematic interactions between policies leaves out the most important cases in which regulations that mandate a more costly technology drives out cheaper technologies that would be chosen under cap and trade. (Bloomberg paper,"The Price of Carbon," in Electric Light & Power Magazine, Volume 87 (August 2009). ) Aside from this good but overly limited interactions section, the chapter implies that every additional policy measure is a good idea – and that more policies are already better than less. Work by Goulder on how regulatory measures increase cost when added to cap and trade or tax policies need to be discussed. For examples, see the following Goulder publications: Goulder, Lawrence H. & Parry, Ian W. H. & Williams III, Roberton C. & Burtraw, Dallas, 1999. "The cost-effectiveness of alternative instruments for environmental protection in a second-best setting," Journal of Public Economics, Elsevier, vol. 72(3), pages 329-360, June. Parry, Ian W. H. & Williams, Roberton III & Goulder, Lawrence H., 1999. "When Can Carbon Abatement Policies Increase Welfare? The Fundamental Role of Distorted Factor Markets," Journal of Environmental Economics and Management, Elsevier, vol. 37(1), pages 52-84, January. Instrument Choice in Environmental Policy Lawrence H. Goulder∗ and Ian W. H. Parry∗∗Review of Environmental Economics and Policy, volume 2, issue 2, summer 2008, pp. 152–174 doi:10.1093/reep/ren005. | Noted |
| 7561 | 15 | | | | | The "environmental concierge system" in Japan has to be mentioned as an excellent example: http://www.env.go.jp/en/wpaper/2011/pdf/22_Chapter4-3.pdf For example, insert the following sentences. In "The New Growth Strategy: Blueprint for Revitalizing Japan," Cabinet decision in June 2010, the "environmental concierge system" was introduced. In order for households to effectively reduce their CO2 emissions, it will be necessary not only to promote the purchase and installation of low-carbon equipment but also to provide appropriate advice on using it to the individuals having high interest.(MOE Japan 2011). | This section is about Capabity to Formulate Policies. This section has been rewritten with more emphasis on the need for sound data and information in order to effectively formulate and review policies. |
| 7429 | 15 | 0 | | | | Add a subsection (15.5.6.6) on the spillover impacts of response measures citing the most recent literature on this issue. | Rejected. This is covered in Chapter 13 section 13.8. . |
| 12929 | 15 | 0 | | | | The chapter is still in a very draft form, e.g. some sentences are missing and many papers are not quoted in the references. However, I found it interesting, informative and original, especially part 15.7 on synergies and tradeoffs among policies (although this part still requires a lot of work). In general there is a lot of material concerning developed countries and relatively few on developing countries, but this reflects the existing literature. Since the TSU mentioned that the chapter is too long, I concentrate my comments on how to shorten it. | Noted. |

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| 15547 | 15 | 0 | | | | One key issue that does not seem to be mentioned here or in any of the other chapters is the potential problem of fossil fuel prices falling in response to climate change mitigation policies. This could possibly go in 15.7.5.2. In its most extreme guise, this problem becomes the Green Paradox discussed by H-W Sinn. Emissions pricing to tackle climate change may not have the desired impact on emissions or the development of renewable energy if it drives down the pre-tax price of fossil fuels. Policy-makers need to take into account constraints and general equilibrium feedbacks throughout the economy when designing policy instruments and should not assume that market prices necessarily reflect resource costs in real-world settings (Dreze and Stern, 1990). An important example in the context of climate change and renewables policies is provided by the market prices of fossil fuels. These reflect not only the resource costs of extracting the fuels but also the rents accruing to their owners due to their scarcity value. Carbon pricing may simply push down the price received by the producers of fossil fuels, without affecting the final price to users; the scarcity rents from fossil fuel owners would then just be transferred to the authorities applying a carbon tax or to the owners of carbon emission quotas and the rate of extraction of fossil fuels would not be affected. Indeed, if carbon pricing reduces the producer prices of fossil fuels, that will stimulate demand for them in any jurisdictions not applying carbon pricing. The prospect of policies to combat climate change intensifying and the carbon price rising over time may encourage fossil fuel owners to deplete their exhaustible resources more rapidly, undermining policy-makers' objectives for both the climate and the spread of renewables technology (Sinn, 2008). Insecure property rights – perhaps made more so by the risk of coercive international action to curtail the use of fossil fuels – exacerbate the risk. Hence climate change mitigation policies and renewable energy support policies could undermine each other through their impacts on fossil fuel extraction in the near term.<br><br>This analysis suggests that the optimal trajectory for the carbon price for maximising overall social welfare may not be a steady rise at the rate of interest, or the discount rate plus the rate of decay of greenhouse gases in the atmosphere, as often assumed in models of optimal climate-change mitigation policy (e.g. Paltsev et al., 2009). More attention needs to be given to the economics of exhaustible natural resources. Some analyses have suggested that the optimal trajectory is downward-sloping when there are negligible extraction costs, which is not a bad approximation for the largest OPEC oil producers. Such a trajectory would persuade resource owners at least to delay extraction, which would be beneficial because of discounting (Sinn, 1982; Sinclair, 1992, 1994). If these are correct, then policy-makers risk undermining their objectives, including the large-scale adoption of renewable energy, if they introduce a regime that leads to a rising carbon tax over time. Policies to promote renewables may shift the whole carbon price trajectory downwards, increasing emissions (Hoel, 2009).<br><br>But the availability of cheap fossil fuels need not undermine climate-change policies completely.<br>First, the optimal carbon price is likely to rise for some time, even in models where ultimately all the fossil fuels are extracted (Ulph and Ulph, 1994) Hoel and Kverndokk (1996) show that, if the stabilisation of greenhouse gases in the atmosphere is possible with some residual steady-state greenhouse gas emissions, the carbon price should rise until some moment before stabilisation is reached and then fall, so that fossil fuels are conserved until they can be used cheaply and without harming the environment,alongside renewable energy. | Rejected. The chapter discusses national and sub-national policies. Optimal tax policy at this level must be conditional on other jurisdictions' actions, and this is not taken into account in the literaure cited. In any case, for reasons of space, we do not discuss optimal tax policy. |

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| 16957 | 15 | 0 | | | | I have a major dilemma in commenting on this chapter. The topic of assessing policies and (to a lesser extent) institutions has been the prime focus of a book written over the past two and half years: Grubb, Hourcade and Neuhoff, Planetary Economics and the Three Domains of Sustainable Energy Development Taylor & Francis forthcoming (Chapters 1 – 5 submitted, others in draft available on request).<br>Rather than go through in detail, my overall observation is that the chapter could benefit from a clearer consistent structuring of the policies and measures, and an account of how they relate to each other. The key to this would seem to lie in the concluding statement,p.76 lines 3-6, which identifies: "…. Three broad categories of policies for the government to mitigate climate change effectively …"<br>The three broad categories named in this paragraph in fact align almost exactly with the classification of the three domains in our book, and the associated "3 Pillars of Policy", though we do put them in a different order. I think this is no accident: we have converged on a fundamental structural dimension of climate change policy.<br>I would suggest that<br>(a) to the extent possible within the constraints, the chapter is either restructured along these lines, or if this is not possible given the negotiated outline, that the paragraph indicated is moved right up front to inject this basic categorisation into people's minds as they read the rest<br>(b) the accompanying Figure (15.5) is reviewed to see if it can be adapted to align with and reinforce this basic message<br>(c) we share with the Authors of this chapter the full texts of our book, which is structured around these three pillars of policy, seeks to analyse the empirical evidence around them to date, and to then analyse how they interact. Obviously, it would then be up to the authors to decide how useful any of this material is, and to what extent it might be desirable to align terminologies etc.<br>There may be some benefit to swapping the order of the first two categories in the paragraph indicated, so that it leads with regulatory and information measures. This would not only align with the terminology in our book, but more important (for the IPCC) it would align with the theoretical structures of "System 1" and "System 2" decision-making processes introduced in Chapter 2 of the FOD, since these map fairly directly on to (i) regulatory / information, and (ii) price-related, instruments. Note my comments to Chapter 2 also on the fact that many of the other things in chapter 2 that "don't fit" in these two categories are actually manifestations of Third Domain processes, which align with the Policy Pillar of innovation and infrastructure. | Noted. |
| 13753 | 15 | 0 | | | | Overall, the chapter provides a very comprehensive overview over climate policies. It is very relevant and informative. In most instances, the assessment has the right level of detail. It appropriately points to a lot of policies that have been implemented in many countries. However, there are some elements that seem somewhat outdated (e.g. 15.5.4.6-10, which can be replaced by a short summary with a pointer to appropriate references; check with AR4) and in some section, less detail may be sufficient. | Accepted. The sections referred to will be re-written. |
| 13754 | 15 | 0 | | | | There are quite some references that are missing from the reference list. I have not checked all of them and cannot point out, but for example Davis 2010, De Vita et al. 2006, Sterner 2012 are missing. Please check all references. | Accepted. |

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| 6710 | 15 | 0 | | | | As a set of policies to reduce energy service demands is one of keys to reduce GHG emissions, it is suggested that such policies should be mentioned separately. For example, insert subsection " emission reduction policies" in Section 15.3<br><br>As an example of policies to reduce energy service demands, Japanese experience after Fukushima nuclear accident could be referred to. For example, "To curtail power demand, in the summer of 2011, the Japanese government launched an extensive power-saving campaign and imposed a cap on power use for large consumers such as factories. As a result, electric energy sales in TEPCO's service area in July and August 2011 posted a year-on-year reduction of about 15% for large and small consumers (Katayama and Onogawa, 2012)."<br><br>Reference: Katayama and Onogawa, 2012, The power saving behavior of the residential sector in the wake of the Great East Japan Disaster, in Lessons Learnt from the Triple Disaster in East Japan, IGES Policy Report No. 2012-01, Institute for Global Environmental Strategies, 71-88, Referred part is in 72, available at: http://enviroscope.iges.or.jp/modules/envirolib/upload/3986/attach/IGES_2012_Policy_Report_for_Disaster_Research.pdf | Rejected. Emission reduction policies include all policy types. |

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| 18763 | 15 | 0 | | | | Overall, this chapter represents a solid effort to condense the current scientific consensus on the topics identified during the scoping process. There are, however, some overarching comments that can be made:<br><br>1. Some passages, e.g. the table summarizing national policies, can be omitted to reduce overall length and free up more space for sections that are currently underdeveloped. As the table of national policies in Section 15.2.2.1 shows, any attempt to provide a snapshot of ongoing policy developments will invariably be out of date fairly quickly and selective in what it covers (see separate comments on these specific sections), undermining its added value and suggesting a more analytical, holistic approach instead that seeks to distil general lessons and trends. Likewise, the description of historical experiences with in NOx and SO2 trading in the US in Sections 15.5.4.9 and 15.5.4.10 adds little value because it is both old and applies to a generally different context; lessons from the EU ETS or the Regional Greenhouse Gas Initiative (RGGI), partly covered in other chapters, would seem more useful for climate change mitigation.<br><br>2. By contrast, some other sections are still underdeveloped; e.g. 15.9.3 and 15.9.4, which essentially are expanded headlines and contain very little developed substance.<br><br>3. In some cases, the current division of topics between Chapters 13, 14 and 15 renders it more difficult to reach summary conclusions or compare relevant policies and instruments in a fruitful way; e.g. the ample discussion of quantity rationing instruments (emissions trading) in Section 15.5.4 cannot draw on the wealth of experience reached in the European Union with the EU ETS, because that policy - although clearly relevant for the domestic plane and sharing many of the characteristics of national emissions trading systems, such as centralized administration, enforcement through sanctions etc. that set it apart from traditional international regional cooperation - is assigned to another Chapter.<br><br>4. The increased focus on ex-post analysis is highly welcome, and important in various ways (see also comment on disciplinary bias below). However, it has also resulted in frequent description of situations (policy developments and legislation) that are no longer valid because of political developments since the (often older) source cited. This is particularly apparent e.g. in the description of regional climate initiatives in the U.S. in various sections of the chapter. Greater reliance on authoritative policy documents or official websites seems important to avoid this problem.<br><br>5. There are frequent inconsistencies and tensions throughout the chapter's individual sections. For instance, in Section 15.7.1, the affirmation of multiple important objectives of a single mitigation policy seems to partly contradict the earlier mention of the Tinbergen rule (one policy - one market failure/objective) and the criteria for policy assessment applied earlier in the report, which assume clearly defined, identifiable and uniform policy objectives (whose achievement can be measured in terms of environmental effectiveness, cost effectiveness, etc.). Case in point: what may be environmentally effective may not achieve some of the other objectives mentioned in 15.7.1; what is successful at accommodating the various priorities listed in 15.7.1 may not necessarily be the most environmentally effective; and so on. Such trade-offs between different approaches | 1. Accepted. The table will be deleted. 2. Accepted. These sections will be re-written. 3. Accepted. Chapter 14 will be referred to where needed. 4. Noted. |
| 18674 | 15 | 0 | | | | Too long but the discription of national policies can be taken out (needs to be much longer if useful and will probably never pass) – interesting examples can and should be used as case studies. | Accepted. Will be done. |
| 18675 | 15 | 0 | | | | Isn't there a need to coordinate the dub-national aspect with chapter 12 (in reality about urbanisation and what can be done on the urban level) | Noted. |
| 18678 | 15 | 0 | | | | There is some overlap between 13, 14 (but hard to read out in the present version) and 15 regarding description of policies etc + also overlap in relation to earlier chapters (among them c 3). Perhaps better to sort out the general stuff in chapter 13 and do cross-references. Partly repeating the same stuff is far from ideal + there is a need to stay consistent | Noted. |
| 18679 | 15 | 0 | | | | Rebound effects discussed once again. | Noted. |
| 18680 | 15 | 0 | | | | Boarder tax adjustments discussed one again (at least partly based on new/different material) | Noted. |

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| 18682 | 15 | 0 | | | | (Interestingly enough, patents are thereafter used as a measure regarding innovations.) | Noted. |
| 15560 | 15 | 0 | | | | Overall, the chapter contains very interesting information but could benefit from more structure. Across the chapter and within each section, it would be helpful to clearly state the purpose of the chapter/section and the key points of the chapter/each subsection, the contents of the chapter and subsections as well as clearly defined conclusions, both for the chapter in the executive summary and in the individual sections. Presenting the material in visually easy-to-read formats, such as through the use of bulleted conclusions, will make this more readable. At times it seemed that the content of some sections was disjointed while others were very concise. Developing a clear outline for what each section will say may help to identify what text can be cut or tightened to meet the page limit. Including an overall conclusion or key takeaway messages at the end of the chapter, at the end of each main section, and in the executive summary would significantly improve this chapter. Also, the word "however" is overused. | Accepted. The next draft will attempt to do a better job of this. |
| 18471 | 15 | 0 | | | | The interlinkage with other AR5 policy chapters is extremely limited. (The only clear connection is 15.2.3 discussion on NAMAs). A reader misses a clear connection, e.g. a discussion on the implications of international and regional policies on national policy-making. | Noted. |
| 18472 | 15 | 0 | | | | Chapter misses a synthesis of the policy discussions in the sectoral chapters. Where sectoral policies are currently covered in the chapter, it is in a scattered and inconsistent way. One of the key outputs expected from Chapter 15 for the AR5 would be to bring these inputs together for a concise, overarching message about how national policies address the different sectors. This could be done in e.g. a 3rd level heading in 15.5. | Noted. |
| 18473 | 15 | 0 | | | | Consistency between section 15.3 and 15.5 in terms of policy categorization is lacking in two noticeable places:<br>1) Regulations & Standards and Information policies from 15.3 are combined in 15.5. The reason for this combination that appears in 15.5 is that they are 'often' implemented together. This combination is, however, not always the case. It would be much more useful for the reader to evaluate each of these policies individually (which would also allow consisteny with Section 15.3 as well as Chapter 3), then to discuss synergies in 15.7, which is the logical place for policies that are implemented together.<br>2) 15.3 focuses on land and infrastructure planning (e.g. cities), whereas 15.5 on REDD. Why this differentiation and singled focus on individual sectors, each of which have dedicated policy section in the relevant policy chapters? | 1. Accepted. 2. Noted. |
| 18482 | 15 | 0 | | | | I applaud the focus on ex post analysis as an innovation from the AR4. However, this focus cannot EXCLUDE the theoretical literature. As such, at the very least there should be a discussion of both theoretical and empiracle literature, ideally also comparing the two and explaining discrepancies. This is done in an exemplary way in 15.6, but is largely ignored in 15.5. | Accepted. |
| 18483 | 15 | 0 | | | | The quality and consistency of the chapter text ranges widely, with some sections in a truly excellent state and others that would need to be completely restructured and rewritten. The chapter would benefit greatly from a good, strong edit by a single voice to assure a comprehensive storyline throughout. Substantial effort would be needed to bring the chapter up to a high standard throughout in time for the SOD. | Accepted. |

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| 18451 | 15 | 0 | | | | I offer these comments in the spirit of helping the authors achieve the following goals:<br>(a) craft a useful, important contribution to the IPCC report;<br>(b) include recent and relevant research; and,<br>(c) shorten the chapter.<br>The Excel format for offering comments is incredibly clumsy. I have done my best to transpose my comments, which were composed in Word format.<br>I have been a policymaker as recently as 2002 to 2010, when I was member and Vice Chair of the Virginia State Air Pollution Control Board.<br>So I offer comments not only as an academic expert, but also as a former national (EPA) and state air pollution policymaker.<br>One of my current book projects involves climate change policymaking in the US, Germany, and Brazil. | Noted. |
| 18452 | 15 | 0 | | | | 1) To shorten the chapter, I suggest eliminating Table 15.1 and keeping the country descriptions in text. The table provides insufficient detail.<br>Any reader interested in knowing about individual country actions will refer to the text.<br>Careful editing can also shorten this chapter. Many sentences are cluttered with unnecessary words and phrases, and clarity suffers.<br>For example, the following sentence at the top of p. 41 can be shortened, as follows:<br>Current: A problem associated with most carbon pricing systems, but one that is especially significant for RGGI, is that electricity generation and emissions may "leak" outside the cap (Burtraw, Kahn, and Palmer 2005).<br>Shortened: RGGI's design has the potential for "leakage" of electricity generation and emissions (Burtraw, Kahn, and Palmer 2005).<br>It would be useful to describe how Germany's emissions reductions were accomplished by a combination of closing old polluting factories in the former East Germany, implementing the EU ETS, and national energy laws. as should the ways in which those funds have been used to support programs to lower GHG emissions. | Accepted. The table will be deleted. |
| 18454 | 15 | 0 | | | | (4) The US policy descriptions are outdated. The authors should add two or three sentences about EPA's vehicle standards and the Agency's efforts to regulate stationary sources of greenhouse gases under Section 111 of the Clean Air Act.<br>A June 26, 2012 US Circuit Court of Appeals finding wholly supported EPA's claim<br>that greenhouse gases can be regulated under the existing Clean Air Act.<br>The authors should also indicate that plans for new coal-fired power plants in the US have fallen off, because of lower natural gas prices and also because of various EPA regulations for air, water, and waste. See, e.g., Susan Tierney, "Electric Reliability under New EPA Power Plant Regulations: A Field Guide: (www.wri.org/stories/2011/01/electric-reliability-under-new-epa-power-plant-regulations-field-guide). Here is a recent reference for the actions under Section 111 of the Clean Air Act: M. Rhead Enion, "Using Section 111 of the Clean Air Act for Cap and Trade of Greenhouse Gas Emissions: Obstacles and Solutions," UCLA Journal of Environmental Law and Policy 30(1)(2012): 1-50. | Accepted. The material describing US policies will be rewritten. |

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| 18456 | 15 | 0 | | | | (6) The first few paragraphs of the chapter indicate that climate change policy effectiveness will be evaluated in some fashion. Yet the chapter skirts that evaluation, which is absolutely critical for policymakers. Readers will want to know, what policies work to reduce greenhouse gas emissions, and in what context?<br>While recognizing the problems with determining cause and effect, the authors should seek studies that indicate how greenhouse gas emissions, emissions per capita, or emissions per GDP have changed in the places that have initiated policies with direct or indirect effects on greenhouse gas emissions. Information on costs and collateral benefits (e.g., jobs, lower solid waste production, reduced emissions of other pollutants) would be helpful, too.<br>This chapter should address these issues head on, rather than skirting them by citing studies on trading programs for other pollutants. In fact, I believe the section on lead emissions trading should be eliminated and the section on the acid rain program should be reduced to a few sentences. The authors should focus on policies and programs that have affected emissions of greenhouse gases, and they should take care to include programs aimed at pollutants other than carbon dioxide. For example, the widespread closure of old landfills around the world and the spread of recycling programs have led to lower methane emissions. Such programs should be described, as should their impacts on methane emissions. | Accepted. Sharper conclusions will be made where warranted. The section on tradable permits will be rewritten. |
| 3183 | 15 | 0 | | | | This chapter serves a crucial function, for it helps people understand what is known about the design and implementation of national policies. It is a difficult chapter to understand, however, because it comes at the end of the WG3 report when many of the key points (such as on policy design and to some degree on political decision-making) have already been made. Moreover, the chapter is nearly devoid of the insights that come from people who study national policy processes professionally—for example, the entire field of comparative politics and most of the field of public policy decision-making. I don't know what to advise in terms of revision, but one strategy would start with key insights from previous chapters concerning policy design and choice (e.g., chapters 2, 3 and 5) and then, with that baseline, add any comments in addition. You might also consider putting sections 15.3 and 15.4 first in the chapter as they set a foundation for understanding policy choices. Throughout, there might be more discussion of different types of governments (e.g., anoncracies and democracies) and how government type affects political decision making as well as industrial organization.In general, attention to adaptation is pretty thin in this chapter. And since WG3, overall, is thin on adaptation the TSU might advise all of us on whether/how this needs to be beefed up. Throughout the chapter I thought regulation is under-played even though it is the main means of national policy related to emissions controls and the importance of markets is over-played. As analysts we might not like that—we prefer flexible markets to regulatory mandates—but the real world has spoken differently. | Noted. Closer integration with other chapters will be done. |
| 12041 | 15 | 0 | | | | Outline of the chapter: I am not sure if the sub-chapter on NAMAs is appropriately positions within section 15.2. As nationally appropriate mitigation actions are a specific construction of the UNFCCC process but in essence represent different types of mitigation actions at various possible levels they represent a specific form of policy instruments. I would therefore suggest to either include the discussion of NAMAs in section 15.3 or to dedicate a specific new sub-section to the discussion of NAMAs. Another alternative would be to include it as a box within section 15.3, as it is not really a policy instrument in itself, but a way of communicating activities at the international (UNFCCC) level. | Noted. This section will be rewritten. |

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| 12042 | 15 | 0 | | | | A general consideration would be whether the chapter only addresses policies that are specifically designed for GHG mitigation or if it also at least mentions measures that are implemented for other purposes but influence GHG emissions. Especially in the section on institutions and governance it would be good to include a discussion how important it is to ensure coordination between different institutions (especially ministries) to ensure mitigation policies are not rendered ineffective by other policies initiated by other departments for a variety of reasons. | Noted. The chapter does aim to address all policies that have major impacts on GHG emission reduction. |
| 12043 | 15 | 0 | | | | The overall logic of the chapter is not made sufficiently clear in the introduction, and the sub-sections lack a clear explanation of the outline of the individual section structure. In many cases the rationale for the choice of sub-sections and their order is not immediately obvious. A very brief introduction to each section would be benefitial for the better understanding of the reader. | Noted. |
| 2346 | 15 | 0 | | | | It is confused the structure of the paper by adding sub conclusions under 15.2.2.3,15.2.5,15.5.2.4. 15.5.5.4Rather having a conclusion in between subsection, this point can be merged into the main part or can be dragged into a main conclusion. Same issue can be raised "sub Introduction". These leads to exceed of length of the paper. | Noted. |
| 10457 | 15 | 0 | 0 | | | Several topics of this chapter are written in an US centric fashion and should be expanded to include the developing world | Noted. Despite the paucity of peer-reviewed studies in developing countries, the SOD will include more |
| 5900 | 15 | 1 | 1 | 92 | | The text could be shortened considerably if you refrained from listing case studies / examples and changed the text to "statement (source)". This might seem just a matter of style but writing "statement (sources), but see also (source)" is less space-consuming than "X wrote ..., Y found ..., but Z indicated that ...". | Noted. |
| 13613 | 15 | 1+ | | | | Just wanted to point out the NBS study we were involved with (a systematic review regarding climate policies and their effectiveness) which may be of interest http://nbs.net/wp-content/uploads/NBS-Systematic-Review-Policy.pdf | Noted. |
| 13620 | 15 | 1+ | | | | Re-reading the request at the beginning, thinking about the audience (which is rather broad), I would suggest deleting some text pertaining to the general debates e.g. the role of IP in hindering or helping technology diffusion at a general level (still covering the key debates but getting into less details to do with the studies. For example, there is a lot of material on the U.S. Clean Air Act and its implications (e.g. appetite and experience of market based instruments, etc). Without negating the importance and significance of this milestone, I would suggest deleting some of the details. | Accepted. |
| 18719 | 15 | 10 | | 16 | | As discussed during the ERM in Washington DC in August, omitting a table is probably preferable to attempting to define compelling boundaries (which countries and why) and seeking to balance depth and detail with available space. Moreover, inclusion of numerous jurisdictions will mean a proportional rise in the number of regulatory changes and additions, consequently resulting in the overview being outdated even sooner. | Table deleted |
| 18676 | 15 | 10 | | 16 | | Table 15.1 Legislation and Policy (pp 10 – 16) –out? To give a complete overview will be very complicated (and demanding) | Table deleted |
| 10227 | 15 | 10 | | 16 | | Landscape format would improve readability of this table | Table deleted |
| 18469 | 15 | 10 | | | | It may be more useful to replace this table with a crisp comparison map, as was done for the IPCC SRREN (see Ch 11.2, p. 875). This will solve the problem of readability (multiple-page tables are typically discouraged in the IPCC) and also country selective bias which has the potential to be politically problematic. This way the messages of the table will be retained and chapter space saved. For comparison in this map, it would be useful to highlight policies that were covered by the AR4, and those that have evolved since that time. | Comparison map has been attempted for SOD |
| 12931 | 15 | 10 | 16 | 16 | 1 | I suggest to delete Table 15.1 and to discuss its main elements in the text of section 15.2.2.2. Prensention of policies in different countries is interesting, but I suggest to to discuss each country with the same structure, in order to facilitate comparison. | Accepted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12165 | 15 | 10 | 16 | | | The information in this table seems to provide limited value, especially given its lenght - it is unclear to me what the purpose of all the information provided is other than conveying the fact that indeed quite some countries have adopted climate policy or regulation in recent years. The stated objectives seem to originate directly from the countries own descriptions, which generally do not follow a particular structure. Therefore, the table lacks consistency. Also, notwithstanding its lenght, the information does not provide much on the concrete contents of policies. It might be better to rearrange content following a given structure, or reduce in size drastically. | Table deleted |
| 12166 | 15 | 10 | 16 | | | please provide description for abbreviations AI and NAI and change the colomn header from 'type' to e.g. 'status' | Table deleted |
| 6716 | 15 | 10 | 16 | | | What is the criteria to choose the countries?<br>It is better to add the footnote to the policy of Canada, as Canada withdrew from Kyoto Protocol. | Table deleted |
| 17653 | 15 | 10 | 16 | | | I find the table to be of limited use. Given that it only lists G20 countries, the information is mostly limited to some wealthy or at least increasingly wealthy countries. At the same time the table is incomplete and the categorization between legislation and policy seems unnecessary. | Table deleted |
| 18718 | 15 | 10 | 7 | 10 | 8 | The sentence "Finally, national styles and traditions of governance also shape divergence across approaches" is somewhat unclear, especially when considering the examples that follow (China, USA): how are these two specifically divergent, and divergence across what elements/criteria? Within a single policy, across all national policies, or between policies of different nations? | Re-written |
| 3674 | 15 | 10 | 9 | 10 | 9 | Please add "In its long-term plans until 2020, China aims at a reduction of carbon intensity by 40-45% against 2005, an increase of non-fossil fuel share (in primary energy supply) to 15% by 2020 against 2005, an increase of forest coverage of 40mill. ha and of forest stock volume of 1.3bn $m^3$ by 2020 against 2005 and the promotion of Green Economy, Low Carbon Economy, Circular Economy and technology development". | Section has been re-written. Also, the intent here is not to reproduce all national commitments, as that would make the section too long. |
| 8311 | 15 | 11 | | | | For Canada, suggest to delete example of Kyoto Protocol Implementation Act as it will be repealed. Instead add "Sector by Sector GHG Regulations under Canadian Environmental Protection Act" under legislation/plan name. Under Objectives, delete existing text and add, "Regulations to reduce GHG emissions have been introduced for the transportation and electricity sectors so far. Regulations are forthcoming for other emissions-intensive industry sectors, starting with the oil and gas sector." | Table deleted |
| 5252 | 15 | 11 | Table | | | I thought Canada had walked away from the Kyoto 'Accord'. | Table deleted |
| 13231 | 15 | 12 | | 12 | | China: China issued a "Climate Change White Paper" in 2011. It lists all then current climate policies and plans. It supersedes the 2007 document listed here. | Table deleted |
| 5253 | 15 | 12 | Table | | | The EU's targets exclude 'embedded emissions' in imports, and therefore are a dishonest prospectus. | Table deleted |
| 9917 | 15 | 13 | | | | Germany: the situation presentation in this chapter is outdated | Not applicable now - table removed |
| 13232 | 15 | 13 | | 13 | | Indonesia: Indonesia in 2009 announced a national emissions target, and subsequently announced specific policy measures to help achieve it. The 2007 plan is essentially superseded. More informationa can be found in Jotzo, F. (2012), 'Can Indonesia Lead on Climate Change?' in Reid, A.S. Indonesia Rising: The Repositioning of Asia's Third Giant, ISEAS, Singapore. This paper will be made available to the TSU. | Not applicable now - table removed |
| 5254 | 15 | 13 | Table | | | Germany's position is a shambles. Coal use is rising, fossil fuel subsidies continue until at least 2018, carbon emissions are rising rapidly. This Table is a grossly dishonest reflection of Germany's current and prospective position. | Not applicable now - table removed |
| 3119 | 15 | 15 | | | | re. Turkey - very good overview here:<br>http://www.cgseurope.net/UserFiles/file/Ankara%20workshop_june%202012/presentations/Evren%20Turkmenoglu.pdf | Thank you |
| 3120 | 15 | 15 | | | | it would be useful if there was an additional column on national emission reduction targets. These are mentioned for some countries but not all e.g. Germany has a target for 2020 (40% reduction) and 2050 (80%) | Not applicable now - table removed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3117 | 15 | 16 | | | | UK: The Low Carbon Transition Plan was replaced by the Carbon Plan in 2011 (see http://www.decc.gov.uk/en/content/cms/tackling/carbon_plan/carbon_plan.aspx). Also, key features of the 2008 CC Act is that it enshrines the 80% 2050 target in legislation and sets a framework for carbon budgets. | Table been deleted |
| 18677 | 15 | 16 | | 22 | | The same goes for the case studies (pp 16 – 22) | Table been deleted |
| 15562 | 15 | 16 | | | | Under United States of America row - the legislation or plan name is not the Endangerment finding but the Clean Air Act; Recommend that you change the text in the objectives column to be: Based on findings that greenhouse gases endanger public health and that contributions by motor vehicles contribute to greenhouse gas pollution, the CAA has been used to regulate emissions from motor vehicles. | Table been deleted |
| 5000 | 15 | 16 | 10 | 22 | 42 | It is not appropriate to list the specific cases of countries here. | Thanks for this - in the end we have had so many comments about the country case studies that we have decided to go for a descriiption of a particular |
| 13233 | 15 | 16 | 11 | 17 | 5 | Motivations for China's climate policy: The discussion here should be clearer, and it is important to realise that motivations go well beyond fostering energy efficiency. Boyd (2012) identifies as China's motivations (1) energy security, (2) climate change mitigation and (3) technology leadership. One might add reduction in local air pollution to the list. Boyd, O., 2012. “China’s Energy Reform and Climate Policy: The Ideas Motivating Change”, Centre for Climate Economics & Policy, Crawford School of Public Policy, ANU. | Not applicable now - table removed |
| 3675 | 15 | 16 | 11 | 16 | 12 | Please add "One other important impetus of climate change mitigation actions in China is their impact on energy security, especially regarding the reduction of domestic oil demand. As the Chinese government aims at importing crude oil as little as possible, energy security concerns are increasing with growing net-oil imports. Climate change mitigation actions leading to a reduction of domestic oil consumption can reduce the energy security pressure (Oberheitmann, 2009)." Please cite as: Oberheitmann, A. (2009). China’s energy security strategy and the regional environment - Assessment of economic growth and its environmental impact applying a dynamic welfare optimisation approach. Saarbrücken: VDM. | Not applicable now - table removed |
| 12167 | 15 | 16 | 3 | 16 | 4 | In fact I'm wondering if presenting a case study country-wise doesn't make more sense than thematically here, as it makes for a consistent and complete story. I'm not sure whether and which theme would be able to strucure this content with similar value. | Thanks for this - in the end we have had so many comments about the country case studies that we have decided to go for a descriiption of a particular |
| 11083 | 15 | 16 | 3 | 16 | 4 | I prefer keeping the stlye of this section as it is. Present discription on each country is very informative. You may wish to shorten the Table 15.1 rather, by mean of reorganizing themantically here. | Thanks for this - in the end we have had so many comments about the country case studies that we have decided to go for a descriiption of a particular |
| 5255 | 15 | 16 | Table | | | Again, this is a ludicrous and dishonest reflection of the UK position. Delivering cuts of one-third from 1990 levels by 2020? At end 2011, instead of a reduction of over 20% there had been an increase of 20% due to 'embedded emissions'. Sir Robert Watson, Chief Scientific Advisor to UK Department of Environment (former IPCC Chairman) has stressed the need t take embedded emissions into account, and stated this position very clearly in September, 2010, with the then relevant figures. Prof. David MacKay, Chief Scientific Advisor to th UK Dept. of Energy & Climate Change, has said much the same. Meanwhile, the UK's Planning system (e.g. PPS 22, Companion Guide at page 165) makes ludicrously exaggerated claims about capacity factors achieved by UK wind energy developments (see, for example, the actual figures compiled from the operators themselves in the Spring 2012 Bulletin of the International Association of Energy Economics), and UK Planning Inspectors use this 'guidance' to approve schemes which simply burn palm oil from countries like Indonesia despite the figures for associated carbon emissions (and habitat loss) being submitted. | Table has been deleted. Broader discussion of embedded emissions is beyond the scope of this section. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2345 | 15 | 16 | | 22 | | As authors identified, the section with Case studies of national approaches and sub-national implementation has to be curtailed, because they plan to add Germany as a case study. Points can be listed according the form of institutionalization of domestic climate programs in terms of legalization, implementation and co-ordination. | Noted |
| 2314 | 15 | 16 | 1 | 22 | 42 | TSU suggest reduction of the number of pages. Author comments that the sub section must be shortened. In line with the target of the chapter, the section should be presented in a more wide frame and gives the common experiences in developed and in developing countries. Is known that the experiences on developing countries are not enough reflected in the research works and bibliographies as needed, it is, there are a lack of peer-reviewed documents, and this gap must be commented in all the documents. It may be an important conclusion for the further research activities. | Not applicable now - table removed |
| 18720 | 15 | 17 | 14 | 17 | 15 | "creation of provincial carbon markets (Han et al. 2012) will require different forms of justification and possibly access to finance." Jusification vis-a-vis whom? An increasingly difficult issue in this regard is stakeholder outreach and engagement, not only to justify these measures, but also inform and foster understanding, both a prerequisite for acceptance (and hence legitimacy). As for finance, China is a beneficiary of the World Bank $100 Mio. Partnership for Market Readiness, as well as several other initiatives (such as GIZ SIno-German Climate Change Programme) to build capacity and technical preparedness for the adoption of carbon markets. On both issues, see i.a. Mehling, Michael (Ed.), Special Issue: Developing Countries in the Carbon Market: Lessons, Trends and Case Studies. 6 Carbon & Climate Law Review (2012), forthcoming Nov. 2012. | Section re-written to be thematic. |
| 3676 | 15 | 17 | 30 | 17 | 34 | China is also very proactive in climate change mitigation on the city level. In 2010, the National Development and Reform Commission lauched a pilot programme for the development of Low Carbon regions in five provinces (Guangdong, Liaoning, Hubei, Shaanxi and Yunnan) and eight cities (Tianjin, Chongqing, Shenzhen, Xiamen, Hangzhou, Nanchang, Guiyang and Baoding) to develop a Low Carbon Ecomomy and to pilot various other "green lifestyle" policies (Oberheitmann and Ruan, Forthcoming). In addition to this sub-national programme, other cities such as Wuxi City in Jiangsu Province are developing their own Low Carbin City concepts. For 2020, Wuxi even goes beyond the national target as it plans to reduce the CO2-intenbsity of GDP by 50% against 2005 (national target: 40-45%) (Oberheitmann, 2012). Cite as Oberheitmann, A. and Ruan X. (Forthcoming): Low carbon city planning in China. In: Frauke Urban and Johan Nordensvard (Eds.): Low Carbon Development: Key Issues. Text book for Earthscan's Key Issues Series. Oberheitmann, A. (2012). Development of a Low Carbon Economy in Wuxi City. American Journal of Climate Change. Scientific Research Publishing. 1, 64-103 (R). DOI 10.4236/ajcc.2012.12007. | Will refer this material to section on sub-national governance and linkages between levels |
| 2554 | 15 | 18 | 14 | 18 | 14 | São Paulo and Rio are both cities and states. In this case, references are to states. | Thanks. |
| 2553 | 15 | 18 | 16 | 18 | 16 | São Paulo Law (www.sp.gov.br/spcc) has a target to reduce economy-wide CO2 only, but allows for offsets with other GHGs | Thanks |
| 18721 | 15 | 18 | 17 | 18 | 18 | "According to Lucon and Goldemberg(2010a) this represents a rare case of a sub-national entity going beyond national policy": this seems counterintuitive, given how many similar examples are known - both in the developed world (e.g. U.S. cities and progressive states, especially between 2000 and 2008; see in fact next subsection on U.S. on same page, stating precisely that) as well as developing (pilot project and pilot zones in a number of developing countries, e.g. China). The statement would seem a generalization, reflecting a value judgment rather than empirical evidence. | Agreed. Deleted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2555 | 15 | 18 | 22 | 18 | 26 | "Brazil represents a case of a non-Annex 1 country passing national legislation, and then going beyond the plan at the regional level. Its approach is based on sectoral absolute GHG targets, adding to a reduction below the expected trajectory of emissions." In fact regions moved beyond the plan independently and, case of Sao Paulo State, precedently (enacted law 4 days prior to Brazilian NAMAs were announced). Brazilian targets are not necessarily absolute, since trendlines are forecasts. More in Lucon and Goldemberg 2010, already cited in the text. Also, remember that the US is another non-Annex I country and California has a similar case. | Agreed. |
| 2559 | 15 | 18 | 22 | 18 | 26 | Brazilian "sectoral absolute" GHG targets conceal an enormous lock-in effect in the Energy sector, as shows the figure in http://lcs-rnet.org/meetings/2011/10/pdf/R1.3_2%20Emilio%20La%20Rovere%20abstract.pdf | We are not seeking to assess the targets in this section. |
| 18722 | 15 | 18 | 27 | 18 | 46 | The section on the US (not unlike the one on China) illustrates the risk of trying to capture policy developments in different countries with any claim to being up-to-date: because much of the cited literature is from 2009/2010, it fails to reflect the fairly far-reaching (and controversial) progress of the US EPA under the Clean Air Act and attendant endangerment finding to regulate GHGs from mobile and stationary sources. Also, there is a factual error in line 46: only 10 US states are currently engaged in cap-and-trade for GHGs (9 in RGGI on the East Coast; 1 in WCI on the West Coast); even in 2010, the number never reached 23, and can only be due to a misunderstanding of the policy plans and commitments under the then still more active Midwestern Greenhouse Gas Reduction Accord and WCI, with the MWGGA never formally agreeing or setting out cap-and-trade for its members. The MWGGA no longer exists. | Case approach no longer used. |
| 14881 | 15 | 18 | 28 | 18 | 28 | 'gravity on climate change' reads 'gravity on climate change policy' | Deleted |
| 15563 | 15 | 18 | 45 | 18 | 46 | Regarding 23 states having cap and trade system, that number is now outdated. More recent numbers (as of July 2012) are available at http://www.c2es.org/us-states-regions/policy-maps/electricity-emissions-caps | Case no longer used |
| 2557 | 15 | 18 | 47 | 19 | 10 | California AB-32 to Proposition 23 is a very important landmark in the US climate law. More at http://www.reuters.com/article/2010/11/03/usa-elections-california-climate-idUSN0227063820101103 | Case approach no longer used. |
| 18724 | 15 | 18 | | 19 | | Although I am aware that the country-focused subsections will eventually be rearranged and a difficult balance has to be struck between being comprehensive and up-to-date while still occupying only limited space, as a close observer of US climate policy and politics I would list additional defining characteristics in addition to those already mentioned in the FOD: these include - the role of the private sector and, to a lesser extent, civil society and philanthropic initiatives, which are far more often the catalysts and originators of mitigation efforts than e.g. in the more public-authority-driven European Union; but also the all-too-apparent political ideologization of climate change in recent years, which has rendered climate change and any policy response an intensely partisan affair. Peer-reviewed literature on this is still scarce, but see inter alia Dunlap, R. E. & McCright. A. M. (2008). A widening gap: Republican and Democratic views on climate change. Environment, 50 (5), 26-35; McCright, A. and Dunlap, R. (2011) The politicization of climate change and polarization in the American public's views of global warming, 2001-2010, The Sociological Quarterly, 52, 155-194 | Good points. The re-written section does not have country details. Consequently it is hard to accommodate these suggestions. |
| 15564 | 15 | 19 | 12 | 19 | 13 | Delete "diffusion across states" | Case approach no longer used. |
| 15565 | 15 | 19 | 14 | 19 | 15 | Delete "with similar efforts in the Western and Midwestern Regions" as they have fallen apart in recent years. | Case approach no longer used. |
| 18723 | 15 | 19 | 15 | 19 | 15 | See previous comment: these initiatives have largely been abandoned following political shifts at state and local level after the 2010 midterm elections; only California remains committed to setting up a cap-and-trade system on the West Coast, and all Midwestern States previously planning to adopt emissions trading have officially abandoned their plans. Hence, while there is little peer-reviewed literature recent enought to account for the latest changes, it would be advisable to omit reference to these outdated trends because the section appears particularly outdated otherwise (and factually wrong, given current policy realities). | Case approach no longer used. |
| 15566 | 15 | 19 | 25 | 19 | 28 | More recently, particularly because of the state of the U.S. economy, many if not most states (except CA and RGGI states) have moved away from climate change as a primary objective and have either minmized their climate work or reframed it based on its cobenefits value. | Case approach no longer used. Danish example not been discussed in text. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5256 | 15 | 21 | 4 | 21 | 46 | Hasn't anyone mentioned to the authors the weaknesses of the Danish grid system; the resultant need to export large quantities of wind-generated electricity to neighbouring countries (frequently at a loss); and the other result that, instead of supplying 20% of Denmark's needs wind energy struggles to provide half of that. There is a substantial literature on this. Reflect it! | Case approach no longer used. |
| 5257 | 15 | 21 | 47 | 22 | 41 | This section on the UK is a nonsense, due to its complete overlooking of 'embedded emissions'. The transfer of manufacturing capacity from a number of industrialised nations since 1990, and their import of manufactured goods from countries such as China and India, must be analysed and presented in detail. The poor devised subsidy system which (though recently cut by 10%) encourages wind energy developments in locations where there is little wind, or the simple burning of palm oil transported thousands of miles, is ludicrous. The emissions targets are all bogus due to their exclusion of 'embedded emissions'. | No dedicated UK case study |
| 18725 | 15 | 21 | 6 | 21 | 7 | "A Danish Energy Agency was established in 1976, as an agency under the Ministry of Climate, Energy and Buildings": I would advise double-checking that: the agency undoubtedly is now under the Ministry of Climate, but in 1976 I doubt Denmark had a specialized ministry for climate and energy. | Noted. Case approach no longer used. |
| 14307 | 15 | 22 | 12 | 22 | 13 | Note that the Committee on Climate Change was created via the Climate Change Act (unlike DECC - see comment 35 above). It has a legal, statutory, basis and reports to Parliament. | Accepted. But no UK case in revision |
| 3118 | 15 | 22 | 17 | | | there are no 'sectoral carbon budgets'. The UK has set economy-wide carbon budgets but the CCC uses a set of sectoral indicators which it uses to monitor progress. | Accepted. But no UK case in revision |
| 14304 | 15 | 22 | 20 | 22 | 20 | This is incorrect, Great Britain is not made up of 3 devolved administrations. Great Britain refers to England, Scotland and Wales, and the United Kingdom is Great Britain + Northern Ireland. Scotland, Wales and Northern Ireland are devolved administrations of the UK. | Accepted. But no UK case in revision |
| 3116 | 15 | 22 | 20 | | | This should say 'The United Kingdom includes 3 devolved administrations' (not 'made up of' - UK - and indeed GB - also includes England which doesn't have a separate administration). Northern Ireland is not part of Great Britain but part of the UK (i.e. Great Britain = England, Wales, Scotland. United Kingdom = England, Wales, Scotland and Northern Ireland). | Accepted. But no UK case in revision |
| 18726 | 15 | 22 | 20 | | | "Great Britain is made up of 3 devolved administrations" - should read: "Great Britain comprises 3 devolved administrations." Otherwise this creates the impression that Great Britain only is made up of the 3 devolved administrations Northern Ireland, Wales and Scotland | Accepted. But no UK case in revision |
| 2556 | 15 | 22 | 22 | 22 | 22 | How higher are the Scottish targets? Very important to describe | Accepted. But no UK case in revision |
| 14305 | 15 | 22 | 28 | 22 | 30 | This is incorrect. The Office of Renewable Deployment (ORED) and the Energy Efficiency Deployment Office (EEDO) are not separate institutions from DECC. They are simply internal directorates of DECC - the institution is DECC. | Accepted. But no UK case in revision |
| 5258 | 15 | 22 | 42 | 22 | 42 | In the light of the grossly misleading picture given in the forgoing Table of Germany's position, their submission will have to be scrutinised most carefully. | Noted |
| 14303 | 15 | 22 | 8 | 22 | 10 | This is incorrect. Department of Energy and Climate Change (DECC) was not created via the Climate Change Act. DECC was created via a merger of the Energy directorate of the business department (BERR, formerly DTI) and the Climate Change directorate of the Environment department (Defra). The Climate Change Act was a piece of legislation passed after the formation of DECC, and is a policy which DECC is responsible for. | Accepted. But no UK case in revision |
| 3115 | 15 | 22 | 9 | | | the Department of Energy and Climate Change was not created via the Climate Change Act. The Committee on Climate Change (CCC) was but not DECC. It was created by the Prime Minister (Gordon Brown). | Accepted. But no UK case in revision |
| 12002 | 15 | 23 | | | | Please make sure to mention the huge elephant in the room: the CDM has delivered, NAMAs still have not reduced a single tangible, comparable, verifiable ton of CO2 in the way the CDM has delivered one billion. This is not to suggest we do not need NAMAs but it is wrong to present NAMAs as something even remotedly comparable to the achievements of the CDM: It has yet to be proven that NAMAs deliver better than the CDM. Current evidence suggest it does not. | No assessment is made here |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18727 | 15 | 23 | 1 | 23 | 2 | "For the most part, legislation and policies are directed at enabling change at a sectoral or a sub-sectoral level, rather than through direct enforcement mechanisms." This sentence is unclear; does it suggest that cross-sectoral policies are more likely to be directly enforcing than sectoral and sub-sectoral? That needs to be clarified; as the section argues correctly, the density and scope of national (and subnational) mitigation-related legislation has strongly grown in the past five years, and typically has even stricter enforcement clauses/provisions (as obligations become more specific). What this sentence might have been trying to say is that, with sectoral policies, some of the enforcement prerogatives are transferred to sectoral institutions or bodies, rather than leaving enforcement - as is the default - with the central authority of the state. But this is not so entirely evident at sectoral level, unlike e.g. the subnational level, where indeed provincial or municipal entities often are given exclusive implementation and enforcement rights. | Accepted. |
| 5262 | 15 | 23 | 11 | 23 | | ADD: In the French Territorial Climate and Energy Plans, an adaptation component is compulsory, but obligations of results are not. Experimental but promising approaches to adaptation developed from the bottom are funded directly by the national Energy and environmental Agency (ADEME). | The information was considered but not added. |
| 13756 | 15 | 23 | 13 | 24 | 37 | From what I can gather here, these NAMAs are not really national policies but rather a feature or odd byproduct of international negotiations. If there is litte to write about it, be brief. If this has no results, say so. | Section has been reduced to a box. |
| 11086 | 15 | 23 | 32 | 23 | 38 | This paragraph is particularly problematic or incorrect. It is wrong to compare NAMA with CDM, even under the narrow perspective of politicized debates under the UNFCCC. NAMA is negotiated under the AWGLCA, while CDM is under AWGKP. There is no equivalent of NAMA in the AWGKP. CDM should be compared to Various approaches in the AWGLCA. In principle, IPCC report should be science-based and be independant from politicized debates under the UNFCCC. | The comparison is conceptual, not legal. There are potential conceptual points of comparison between NAMAs and CDM. |
| 13710 | 15 | 23 | 46 | 23 | 46 | Insert after"Tyler et al. 2011": " A NAMA encompassing energy efficiency and renewable energy intervention in the Mexican housing sector is described by Hayashi and Wehner (2012)". Reference: Hayashi, D.; Wehner, S. (2012): Mobilising mitigation policies in the South through a financing mix, in: Michaelowa, A. (ed): Carbon markets or climate finance?, Routledge, Abingdon, p. 168-187 | Section has been reduced, leaving no space for additional examples |
| 18474 | 15 | 23 | | | | This is the only section that clearly discusses the impact of international policy on national policies and the interaction therein. It may be useful to expand this section to embed NAMAs ina broader discussion of international and regional policy impacts. | An editorial deicion was made to shrink this section. |
| 2315 | 15 | 23 | 32 | 23 | 38 | The differences among NAMAs and CDM should be completed, giving a more completed view on those differences. Especially, the NAMAs did not generate tradable CERs and that CDM is a basic market based mitigation instrument to fulfill the reduction targets from Developed Countries and NAMA is not. Should be reflected too the NAMA´s financial mechanism that is different from CDM. | NAMAs section has been shrunk, but some discussion of this difference remains |
| 13711 | 15 | 24 | 28 | 24 | 28 | Insert "Okubo et al. 2011" after "Sterk 2010a", as this paper focuses on MRV of NAMAs. | section has been revised. |
| 13223 | 15 | 24 | 24 | 24 | 32 | The text only mentiones the use of carbon credits to provide international support. However, such support could also involve direct financial support, (through grants, loans etc) in bilateral or multilateral settings. in special issue of climate policy these aspects were discussed - 2009 International Support for Domestic Climate Policies. Climate Policy 9 (5). | The section has been shortened and discussions of financing have been removed. |
| 5001 | 15 | 25 | 11 | 27 | 18 | This part is redundant since similar descriptions are in 15.5 | Taken into account. (This section describes the different policy alternatives, whose assessment is |
| 6137 | 15 | 25 | 12 | 25 | 16 | With regard to policy evaluation criteria, promotion effect of technology innovation/diffusion is missing. However, as touched upon in this section, this is basically decided by Chapter 3. I have raised the issue | Rejected (outside the scope of the chapter: criteria classification |
| 2316 | 15 | 25 | 17 | 27 | 18 | If TSU is suggesting reduction of pages and all the items 15.3.3 to 15.3.8 refers that the analyzed issue will be completed in others 15.5 section. Why will not integrates all these issues in the 15.5?. | Taken into account. (This section now describes the different policy alternatives, whose assessment is |
| 12053 | 15 | 25 | 17 | | | The section heading should not only refer to energy policy objectives but rather more generally to 'other policy objectives' | This issue has now been transferred to 15.2. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 5263 | 15 | 25 | 22 | | | ...the policy targets). ADD: In the French approach to adaptation the policy goals are defined from above and policy instruments are in the hands of local institutions. It is hoped that the policy targets will be developed from this. | Noted. |
| 12168 | 15 | 25 | 43 | 25 | 44 | apart from taxes and charges defined per unit of GHG released, they can also be defined only to apply above a given benchmark | Rejected (Given the limited space, this section only describes the main |
| 13757 | 15 | 25 | 6 | | | What do you mean by "leakage"? Odd to mention the "race to the bottom" here. What about the Porter hypothesis? | Rejected (This section now merely describes different policy alternatives. Border tax adjustments are linked to concerns over leakage, but the |
| 11088 | 15 | 25 | 7 | 25 | 10 | This ia a good summary and deserves to be included in the Executive Summary. | Noted |
| 17654 | 15 | 25 | 11 | 49 | 30 | Criteria in mentioned in 15.3.1 are not used for structuring the assessment in 15.5. If these criteria are to be of use at least some reference to them should be included in the policy assessment section. It would also be helpful if sections 15.3 and 15.5 were based on the same structure. In the current draft, subsection 15.3.3 for example includes regulations and standards while 15.5.2 is on regulation and information measures. Note also that the evaluation issues mentioned in 15.4 are not addressed in 15.5. | Taken into account: This section now describes different policy alternatives, whose assessment is covered in Sections 15.5. and 15.6. |
| 12179 | 15 | 25 | 12 | | | although this section announces various criteria that are used to assess policy instruments, the actual assessment of instruments in 15.5. does not clearly follow those criteria | Noted. |
| 11192 | 15 | 25 | 42 | 26 | 33 | In the section 15.3.4 one should stress the existence of auctioning as well as the (positive) effect on effect of carbon taxation on the public finances: The EU 'Climate and Energy Package' foresees an enhanced use of auctioning in the EU Emission Trading System (EU ETS) from less than 4% in phase 2 (2008–2012) to more than 50% in phase 3 (2013–2020). This implies a substantial generation of public revenues. Auctioning (and taxation) complies better with the 'polluter pays principle' and avoids handing out 'windfall profits' to sectors that can easily pass on the opportunity cost of allowances to their customers. Indeed, full auctioning will be the rule in the power sector from 2013 onwards (Saveyn et al., 2011). Saveyn, B., Van Regemorter, D., and Ciscar, JC. (2011). Economic analysis of the climate pledges of the Copenhagen Accord for the EU and other major countries. Energy Economics 33, S33-S40 | Taken into account. (This section merely describes the different policy alternatives. The assessment of EU policies, and particularly the EUETS, is carried out by Chapter 14) |
| 11385 | 15 | 25 | 42 | 26 | 33 | In the section 15.3.4 one should stress the existence of auctioning as well as the (positive) effect on effect of carbon taxation on the public finances: The EU 'Climate and Energy Package' foresees an enhanced use of auctioning in the EU Emission Trading System (EU ETS) from less than 4% in phase 2 (2008–2012) to more than 50% in phase 3 (2013–2020). This implies a substantial generation of public revenues. Auctioning (and taxation) complies better with the 'polluter pays principle' and avoids handing out 'windfall profits' to sectors that can easily pass on the opportunity cost of allowances to their customers. Indeed, full auctioning will be the rule in the power sector from 2013 onwards (Saveyn et al., 2011). Saveyn, B., Van Regemorter, D., and Ciscar, JC. (2011). Economic analysis of the climate pledges of the Copenhagen Accord for the EU and other major countries. Energy Economics 33, S33-S40 | Taken into account. (This section merely describes the different policy alternatives. The assessment of EU policies, and particularly the EUETS, is carried out by Chapter 14) |
| 12170 | 15 | 26 | 11 | 26 | 12 | this sentence requires explanation | Taken into account: Text modified: assessment of the different instruments is now given in other sections of the |
| 18733 | 15 | 26 | 11 | 26 | 12 | The statement "Overall, taxes on greenhouse gases are a preferred instrument for economists" seems overly bold given the long-standing and still continuing debate over price-based (pigouvian) vs. quantity-based instruments, see e.g. Suzanne Scotchmer, " Cap-and-Trade, Emissions Taxes, and Innovation", Innovation Policy and the Economy Vol. 11, No. 1 (2011), pp. 29-54 | Rejected (Text modified: assessment of the different instruments is given in other sections of the chapter) |
| 15567 | 15 | 26 | 18 | 26 | 22 | It would be helpful to include an example to illustrate the types of subsisides that affect the price of fossil fuels because many in the U.S. public (and perhaps elsewhere) do not believe that there are fossil fuel subsidies. | Noted (Text modified to indicate that fossil fuel subsidies exist in developed and developing countries) |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6138 | 15 | 26 | 18 | 26 | 22 | Add after "taxes" in line 18, "in that the marginal abatement cost is equalized". Also add explanation that subsidies contradict the OECD's Polluter Pays Porinciple of 1972. | Taken into account (Text modified with no reference to subsidy to pollution |
| 12169 | 15 | 26 | 2 | 26 | 2 | there are various reasons why a tax rate could be geographically variable - stating that 'ideally' this should not be so , requires explanation of the ideal that is sought after (in this case, undisturbed market optimum for emission reductions) | Accepted (Text modified to avoid normative comments: now this section is only descriptive of policy types) |
| 13234 | 15 | 26 | 23 | 26 | 33 | The paragraph on tradable permits here seems to be the only place where permit trading schemes are discussed from a theoretical perspective. In the context of review of other instruments, two to three pages on the basics and practical operation of tradable permit schemes would be needed. It is true that the EU ETS is discussed in another chapter, and that new emerging trading schemes are reviewed in this chapter. Still, what is missing is a discussion of the basic operation, design options and experiences with tradable permit schemes. Otherwise this chapter is lopsided. | Taken into account. (Given space limitation, this section describes the basic policy types, which were already covered by Chapter 3 and whose practical description may be covered in other sectoral and policy chapters. |
| 6139 | 15 | 26 | 26 | 26 | 27 | Change "and a continuous encouragement of cleaner technologies (Stavins 2003)" to "and theoretically a continuous encouragement of cleaner technologies (Stavins 2003)". Then after this sentence, add "However, it is unclear whether EU ETS induced technology innovation or not (Ellerman et al. 2010). This may apply for domestic cap and trade policy especially if permit price fluctuate". | Taken into account. (Text modified: this section now describes the general policy alternatives, whose particular assessment is covered in Sections 15.6) |
| 18734 | 15 | 26 | 31 | | | The claim of "high institutional feasibility" should perhaps be relativized, given the enormous challenges encountered e.g. in the EU ETS regarding data availability and reliability, registry establishment (also the ITL at international level), market oversight and fraud prevention etc.; and this in a developed country context, which gives rise to the expectation that problems might be even more challenging in a developing country context. See e.g. Ruth Greenspan Bell, Choosing Environmental Policy Instruments in the Real World, Paper prepared for the OECD Global Forum on Sustainable Development: Emissions Trading, Concerted Action on Tradeable Emissions Permits Country Forum (Mar. 17-18, 2003), available at http://www.oecd.org/dataoecd/11/9/ 2957706.pdf; Bell, Ruth Greenspan (2002), Are Market-Based Instruments the Right First Choice for Countries in Transition? Resources Issue 146, p. 10-14 | Taken into account. (Text modified: this section now just describes the general policy alternatives, whose particular assessment is covered in Section 15.6) |
| 15568 | 15 | 26 | 32 | 26 | 33 | The part of the sentence beginning with "prices unrelated to…" through the end of the sentence is unclear. What kinds of administrative costs would be lowered? | Taken into account. (Text modified: now this section only describes the main characteristics of the policy types. Experiences with policies are introduced |
| 4286 | 15 | 26 | 34 | | | Please note that Voluntary agreements (VA) may also be referred to as LTA (Long-term agreements). I suggest a footnote here clarifying this. Your ref to Rezessy and Bertoldi 2011 refers to LTAs. Please also include ref to the Swedish Scheme (Stenqvist and Nilsson, 2011 from the Journal Energy Efficiency). | Accepted. Text modified accordingly. Literature added in section 15.5.5 |
| 13713 | 15 | 26 | 44 | 26 | 44 | Insert after "Croci 2005": ":Voluntary agreements are effective alternatives to mandatory regulations for achieving small environmental improvements at relatively low cost (Borck and Coglianese 2009)." Reference: Borck, J; Coglianese, C. (2009): Voluntary Environmental Programs: Assessing Their Effectiveness, in: Annual Review of Environment and Resources, 34, p. 305-324 | Accepted. Text modified accordingly. Literature added in section 15.5.5 |
| 15569 | 15 | 26 | 44 | 26 | 46 | Sentence beginning with "Some authors… " is poorly worded/confusing. | Noted. |
| 2309 | 15 | 26 | 11 | 26 | 12 | It would be helpful to know for your statement "Overall, taxes on greenhouse gases are a preferred instrument for economists" what your referent is. Do you mean preferred to product charges or preferred to all other polices ( including emissions trading, for example)? I suspect you mean the former, but as written the referent is not clear. | Accepted (Text modified: assessment of the different instruments is now given in other sections of the chapter) |
| 2307 | 15 | 26 | 18 | 26 | 18 | The statement that " subsidies are often described as equivalent to taxes" is a at best misleading and at worst simply wrong. Becuase they have different effects on long run average costs, they imply different entry and exit conditions. | Accepted (Text modified with no reference to equivalence between subsidies -to pollution abatement- and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 2308 | 15 | 26 | 28 | 26 | 28 | The statement that "auctioning, which could allow the use of revenues in a green tax reform fashion" is true, but excessively narrow. In fact the revenues can, and indeed are in operating systems, be used in a variety of manners from incentivizing energy efficiency, to containing costs for heavily impacted industries, to lessening the regressive impact of the program. | Accepted (Text modified: new uses of environmental revenues are contemplated) |
| 2947 | 15 | 27 | | 35 | | is power used in the techncical sense (ability to reject the null hypothesis)? Or do you just mean that the studies are methodologically very difficult and the results aren't very reliable? Clarification would be useful. | Its methodologically weak and it is now clarified. |
| 12178 | 15 | 27 | 14 | 27 | 18 | spatial planning at sea also has important climate change links; both in coastal zones wrt adaptation, and at sea proper wrt renewable energy from wave, offshore wind and tidal. Wrt wind energy onshore, a conection with spatial planning is also obvious. | Rejected (outside the scope of the chapter) |
| 5264 | 15 | 27 | 18 | | | ADD: The French PCET explicitly impose climate objectives in their planning attempting to achieve an equilibrium between density, vegetation and multifonctionality of services. | Rejected (outside the scope of the chapter) |
| 5004 | 15 | 27 | 19 | 28 | 40 | It is not clear what are the points of this 15.4. There seems to be little value added in this subsection. | Now its connected to other subsection |
| 3121 | 15 | 27 | 20 | 27 | 33 | please use wind 'turbines' (or talk about 'windpower') instead of wind 'mills' as 'wind mills' is not really used in relation to modern forms of windpower | Taken into account. |
| 18475 | 15 | 27 | | | | This section is well-written, but misses a link to those criteria outlined in 15.3.1 and Chapter 3.8 as well. Can the methods here be used to provide information on cost effectiveness? Environmental effectiveness? Institutional feasibility? If not, what tools are used to measure those criteria? | Taken into account. |
| 12181 | 15 | 27 | 10 | | | Section could benefit from subheadings to distinguish each of the approaches and tools discussed in the text | Taken into account. |
| 3602 | 15 | 28 | 13 | 28 | 15 | It seems very strange to cite an obscure seemingly unpublished work (Kotani, Tanaka and Managi 2011) to back up a description of the role of experimental economics. It would make much more sense to cite for instance this overview paper by Nobel prize laureate James Heckman in Nature: Falk, A., Heckmann, J.J., 2009. Lab experiments are a major source of knowledge in the social sciences. Nature 326, 535–538. | Noted. |
| 15571 | 15 | 28 | 34 | | | Air pollution and CO2 are not examples of policies. | Noted. |
| 2270 | 15 | 28 | 41 | 49 | 30 | It is strange that the Assessnent of Performance does not include attempts to find out whether greenhouse gases in the atmosphere have changed as a result of these policies. Meaureents over land surfaces are almost completely neglected | Rejected. There is no literature that assesses the effects of policies on GHG concentrations as opposed to GHG |
| 4287 | 15 | 28 | 41 | | | Normally policies may be evaluated ex-post or ex-ante using process or impact evaluation. The latter two types, process or impact, should be explicitly explained. | Rejected. Process evaluations are not prominent in the literature. |
| 15731 | 15 | 28 | 46 | 28 | 46 | "There are fewer ex-post evaluations that provide empirical evidence on the effectiveness of such policies in practice." effectivness and efficiency. And even fewer on the efficacy of such policies… | Noted. |
| 14892 | 15 | 28 | 9 | | | 'cases several polices' Please provide evidence with literature | Noted. |
| 15570 | 15 | 28 | 9 | | | overall paragraph needs editing | Noted. |
| 18481 | 15 | 28 | | | | There is no consistency in the different sub-sections of 15.5 that allows a reader to pull concrete messages. It reads as a mis-match of text pieced together by different authors with very different approaches and emphases. I recommend implementing a common approach/structure to each sub-section that allows a reader to better navigate through them. This could be e.g.:<br>One paragraph listing the countries who have implemented that type of policy<br>Focus on cost effectiveness of that policy-type (including the tools from 15.4 to support the analysis)<br>Focus on environmental effectiveness<br>Focus on institutional feasibility<br>etc. (going through the list of criteria from Ch 3 and 15.3.1)<br>Conclusion | Noted. |
| 18484 | 15 | 28 | | | | It would be useful if every sub-section contained a 'conclusions' section, to bring the main points of the policy instrument together and making the case for the application of uncertainty language. This has been done for Regulations and Voluntary agreements, but no others. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 18485 | 15 | 28 | | | | Several sections (Regulations and Voluntary Agreements) contain text that describes a combination of policies. It would be more useful for ther eader to shift these discussions to 15.7.5 and focus 15.5 strictly on evaluating individual policy types. | Noted. Not always practical to do this. |
| 12180 | 15 | 28 | 41 | | | This section could benefit from following a more clear structure, e.g. by discussing each of the criteria mentioned in 15.3.1. one by one for each instrument. | Rejected. There is insufficient literature for this to be practical. |
| 7522 | 15 | 28 | 41 | 33 | 22 | For the efffective assesment of the performance of policies and measures, credible and fit-on purpose data collection with well organized and credible methodology is indispensable. Data confidentiality is also indispensable to collect credible data from industry in tough competition circumstances. These comments is to be added somewhere in this section. | Noted. |
| 7130 | 15 | 29 | 16 | 29 | 18 | It is a fact that consumers place a greater value on the immediate future and heavily discount future saving, but the behavior of consumers is not as free as it seems to appear in a pure market world. Decisions are influenced by the economic capacity, but, what is more important, the drivers of consumers behavior goes beyond prices. That require governments intervention to increasingly considerer attitudes and beliefs of citizens in relation to climate change in order to influencing consumer behavior at an individual level, with a focus on the promotion of sustainable patterns of consumption and lifestyles, and not only on energy uses. | Accepted. Text added in the information section of 15.3 |
| 5265 | 15 | 29 | 26 | | | ADD: Yet, information is not enough: in a qualitative and quantitative study on mobility in Lyon, 81% of interviewed said that CC was the number one challenge of the 21st century, 81% also said tat the best way for an individual to fight CC was to stop using the car, yet, 56% used their car for all activities on a daily basis (96% had a public transport accessible within 400 meters). They were thus well informed but this did not lead to action (Stéphane La Branche. « La gouvernance climatique face à la mobilité quotidienne. Le cas des Lyonnais ». Revue Environnement Urbain/Urban environment. 2011). | Rejected. Not relevant to the context here. |
| 2948 | 15 | 29 | 27 | | 47 | These three paragraphs would be fine in a social science article, but they aren't really needed here and they just take up space. | Accepted. This part is deleted |
| 15404 | 15 | 29 | 27 | | | This is an unsupported assertion – I have seen no analysis that describes an empirically verified and specific market failure and shows that a specific regulation is the least cost method of achieving it – see many Stavins and Jaffe publications (e.g., Robert Stavins, Judson Jaffe, and Todd Schatzki, “Too Good to Be True? An Examination of Three Economic Assessments of California Climate Change Policy.” Washington, D.C.: AEI-Brookings Joint Center for Regulatory Studies, Related Publication 07-01 (January 2007).)– general reference to market failure does not constitute justification for a mandatory efficiency or technology standard. | Accepted. Text modified and literature added. |
| 12171 | 15 | 29 | 8 | 29 | 9 | The purpose and meaning of the sentence "To keep …. Long term." is unclear - please explain 'appropropriate' for what?, and how any given level of energy price would make economic system less GHG intensive. | Accepted. However this section has been reorganized in the second order draft. |
| 12059 | 15 | 29 | 8 | | | To 'keep' the resulting engery price at the appropriate level: the term 'keep' seems not appropriate here as it suggests that prices are already at an appropriate level. | Accepted. However this section has been reorganized in the second order |
| 18476 | 15 | 29 | | | | This section does not seem to follow the overarching structure of the chapter, nor ultimately the broader report. The text seems to focus unnecessarily on energy efficiency policies, and fails to adhere to the sub-categories of regulations presented in 15.3.1 (emissions, technology and product standards). As mentioned in another comment, it would be more useful to address regulations and information policies separately in 15.5, and then in 15.7 to discuss the synergies that result when they are implemented together. | Accepted. Coordination is across chapeters and sections are made. Syntergies are mentioned in information section. |
| 14885 | 15 | 29 | 19 | 29 | 47 | references lacking | Accepted.References added. |
| 15005 | 15 | 29 | 6 | | | This section should include a discussion of fuel-efficiency and vehicle CO2 emissions standards. These are one of the most significant success stories for energy and CO2 reduction, but are not addressed in this chapter, except in passing. | Rejected. The standards for cars are discussed in ch8 (transport). Literature is not availabe for the crosscutting analysis |
| 3184 | 15 | 29 | 6 | | | section 15.5.2 might usefully disentangle "regulation" from "information" policies. They work in quite different ways. | Accepted. Text modified |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12182 | 15 | 3 | 8 | 3 | 19 | heading for 15.5.4 does not cover all of the sub headings; subheadings are of unequal type, covering countries, es post analyses, and specific compounds trading programs | Noted. Will be rewritten. |
| 6140 | 15 | 30 | 13 | 30 | 20 | It is not clear whether a whole paragraph are based on Gillingham et al, (2006) or not. If not another literature should be cited for the description of lines 13-20. | Accepted. Literature added. |
| 3123 | 15 | 30 | 16 | | | beginning of sentence missing. Refers to Europe and UK. Do you mean European Union here? If so, UK is part of the EU and appliance standards are EU wide. | Accepted text modified. |
| 2949 | 15 | 30 | 19 | | | "remained the same" compared to what -- the previous status quo, BAU, or what? | Accepted text modified. |
| 15572 | 15 | 30 | 22 | | | Can you put the 10.6 USD/GJ in context? | Accepted. Paragraph separated |
| 3124 | 15 | 30 | 25 | 30 | 37 | too many US examples here - there's plenty of evidence on building standards from other countries as well. | Accepted. They are covered in building section(ch9) and they will be cordinated |
| 12932 | 15 | 30 | 38 | 30 | 47 | The existing literature on the reboud effect is much greater: I suggest to quote results from other papers here, like e.g. Barker, T., Ekins, P. & Foxon, T. (2007): "The Macro-Economic Rebound Effect and the UK Economy", Energy Policy, 35: 4935-4946; or Mizobuchi, K. (2008): "An Empirical Study on the Rebound Effect Considering Capital Costs", Energy Economics, 30: 2486-2516. | Accepted. Text added and literature added. |
| 3125 | 15 | 30 | 38 | | | those rebound effect references are ancient - there are plenty more up-to date studies e.g. http://ec.europa.eu/environment/eussd/pdf/rebound_effect_report.pdf (reports evidence from a range of countries), http://www.nature.com/news/2011/110217/full/news.2011.101.html | Accepted. Text added and literature added. |
| 2950 | 15 | 30 | 38 | | 47 | There is more recent literature on the rebound effect. As a starting point, I suggest: For a concise overview of the leakage literature, see Gabriel Weil, Costs, Contributions, and Climate Change: How Important Are Universally Binding Emissions Commitments?, 23 GEO. INTL. ENV. L. REV. 319 (2011). | Accepted. Text added and literature added. |
| 12172 | 15 | 30 | 38 | 30 | 47 | paragraph starts with statement that much of the gains might be erased by the rebound effect, and ends with arguing that a statement that rebound would lead to net increase is grossly exaggerated. Those two statements are not mtutally incompatible, but the closing statement may falsely convey that rebound effect is of not importance. | Accepted. Text modified. |
| 5005 | 15 | 30 | 38 | 30 | 47 | Rebound is a matter but, as correctly described here, total energy consumption can be saved with energy efficiency improvement. In this regard, energy efficiency improvement is one of the key solution factors for GHG mitigation. | Accepted. Text modified. |
| 3122 | 15 | 30 | 9 | | | which country does the study by Davis refer to? This could well be different elsehwere. | Accepted. Text added. |
| 4230 | 15 | 30 | 1 | 30 | 47 | Attention should be given to sustainability rating systems in providing practices (and sometimes standards) and public recognition for improving sustainability, reducing emissions and adapting to climate change. In U.S. practice these include: LEED ratings for sustainable buildings and sites – www.usgbc.org, Green Globes ratings for sustainable buildings – www.thegbi.org, International Green Construction Code – www.iccsafe.org, and Envision™ ratings for sustainable infrastructure – <www.sustainableinfrastructure.org>. | Accepted. The range of policy instruments for buildings are covered in ch9 (building) |
| 6141 | 15 | 31 | 1 | 31 | 6 | Afrer (Price and Lu 2011), add "Akimoto (2012)" as additional reference. For Reference; Akimoto (2012), Potential for Energy Efficiency Improvement and Barriers. In: Climate Change Mitigation, A Balanced Approach to Climate Change. M. Yamaguchi, (ed.), Springer, London pp. 161-177. | Accepted. Literature added. |
| 12933 | 15 | 31 | 2 | 33 | 14 | This section can be shortened and major results summarised. | Accepted. Text shortened as appropriate |
| 18737 | 15 | 31 | 34 | | | Cited source "Kimura 2009" missing from bibliography | Accepted |
| 4288 | 15 | 31 | 34 | | | You may also want to refer to Thollander and Ottosson (2010) and Backlund et al (2012) and Thollander and Palm (2012), when referring to studies concerning energy management practices. (Backlund, S., Thollander P, Palm, J., Ottosson, M., 2012. Extending the energy efficiency gap. Accepted for publication in Energy Policy. )(Thollander P, Ottosson M, 2010. Energy management practices in Swedish energy-intensive industries. Journal of Cleaner Production 18(12): 1125-1133) (Thollander and Palm (2012) (Improving Energy Efficiency in Industrial Energy Systems - An Interdisciplinary Perspective on Barriers, Energy Audits, Energy Management, Policies, and Programs, Chapter 8 (and chapter 6), ISBN 978-1-4471-4161-7)) | Accepted. Text modififed and literature added. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15574 | 15 | 31 | 36 | | | When the chapter says "it" did not deliver, is "it" the companies or the EM? | Accepted. Text modified. |
| 18477 | 15 | 31 | | | | A lot of this material is likely covered in the sector chapters' policy sections. Where that is the case, it is not necessary to repeat the material again in this overarching chapter. | Accepted. This chapter mosly focus on cross sectoral issues. Coordination will be made across chapters in next draft |
| 15573 | 15 | 31 | 1 | 32 | 44 | A table comparing the costs and savings across programs would be interesting/informative. | Rejected. As number of observation is limited and such table is misleading. |
| 2951 | 15 | 32 | 14 | | 32 | 1-2 sentence summary would be sufficient | Accepted. Text shortened as appropriate |
| 17655 | 15 | 32 | 14 | 32 | 44 | It would be interesting to know more about the drivers of the vast differences in cost-effectiveness across countries. Lines 42-44 discuss that only very briefly and a more extensive discussion would add value to this section | Noted. Very intersting question but current literature does not allow that indepth analysis |
| 15576 | 15 | 32 | 20 | | | Do you have information abut the money saved by the companies? | Noted. It is available in the literature cited, but here the money saved by the |
| 14886 | 15 | 32 | 21 | | | reference Khan 2006 missing in literature list | Accepted |
| 14887 | 15 | 32 | 35 | 32 | 41 | example from developing countries missing | Accepted. Chinese cases are added. |
| 18738 | 15 | 32 | 35 | | | Cited source "Kimura 2010" missing from bibliography | Accepted |
| 15577 | 15 | 32 | 5 | | | When did the facilities implement the 46%? | Noted. Since 2001. as it is obvious the |
| 15575 | 15 | 32 | 7 | 32 | 12 | It was confusing what had been implemented; did the 70% include the 7% mentioned on line 10? Maybe 7% wqs implemented but 70% were in progress or planned? | Accepted . Text modified accordingly |
| 12934 | 15 | 33 | | | | I suggest to discuss more carbon/energy taxes and their possible impacts; you will find a more detailed description of carbon/emissions/energy taxes and and their possible impacts in Baranzini, A., Goldemberg, J. & Speck, S. “A Future for Carbon Taxes” Ecological Economics, 32(3): 395-412, 2000. | Considered |
| 6142 | 15 | 33 | 12 | 33 | 14 | Preparing a table summarizing cost effectiveness of each case not only Section 15.5.2.3 but also Section 15.5.2.2, is high appreciated. Also by doing so, Section 15.5.2.2 can be shortened. | Rejected. As number of observation is limited and such table is misleading. |
| 5006 | 15 | 33 | 15 | 33 | 22 | Even though the cost of energy efficiency improvement is negative, such enegy efficiency improvement has not yet achieved in real world. It is worth mentioning here that there are many barriers (social, political, and technical) . Identifing whare such barriers exists and why, then removing such barriers by appropriate policy instruments is the key for the effective policy measures. | Accepted. Barries are emphasized throughout the chapter. |
| 15405 | 15 | 33 | 17 | | | This is completely unsupported by text. | Accepted. Text modified accordingly |
| 12060 | 15 | 33 | 25 | | | Carbon taxes are a 'theoretically' attractive instrument: the 'theoretically' already indicates a negative evaluation, which is not supported by the following analysis in the paragraph, nor supplied with a 'practical' counter-argument. Suggest removing. | Noted text rewritten |
| 15579 | 15 | 33 | 32 | 33 | 37 | This is confusing.  Is it the fault of the deign or the implementation that these instruments are not more prevalent?Is it better to say that one reason policies that economist believe are sound have not been adopted more widely is because economists have failed to account for political challenges? | Noted text rewritten |
| 11091 | 15 | 33 | 32 | 33 | 37 | This is a very important point to be shared among policy makers. The argument is also applicable to emission tradings, and deserves to be included in the Executive Summary. | Noted |
| 12935 | 15 | 33 | 36 | | | The possible impact of carbon/energy taxes is one of the main arguments of the opponents of this climate policy instrument. I thus suggest adding some elements on this. For instance, the specific impact of carbon taxes on competitiveness are discussed in detail in Zhang, Z.X. & Baranzini A. “What Do We Know About Carbon Taxes? An Inquiry into their Impacts on Competitiveness and Distribution of Income” (avec Z.X. Zhang). Energy Policy, 32(4): 507-518, 2004. | Noted text rewritten |
| 18740 | 15 | 33 | 37 | | | Source "Sterner and Coria 2012" missing in bibliography | Noted |
| 15581 | 15 | 33 | 38 | 33 | 42 | Define grey literature; the tone of this part of the paragraph seems negative or accusatory, especially the "seriously claim..." statement. | Considered |
| 15580 | 15 | 33 | 38 | 34 | 4 | This could be better organized and streamlined. Provide the overall message of this paragraph upfront and then offer the supporting statements. | Text rewritten |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17656 | 15 | 33 | 4 | 33 | 5 | The explanation of USD/GJ should be included earlier, i.e. on page 3, line 22, where this measures is mentioned for the first time. | Accepted. It is done at chapter 3. |
| 2952 | 15 | 33 | 40 | | | "seriously claim"? ? I assumed everything in the chapter was serious! | Text rewritten |
| 14888 | 15 | 33 | 40 | | | 'seriously claim' delete 'seriously' since it is ambigious | Done |
| 15582 | 15 | 33 | 44 | | | Couldn't find Hammar et al in references | Included |
| 15583 | 15 | 33 | 46 | | | it lacks transition to the sentence "The various nordic…" | Resolved |
| 2953 | 15 | 33 | 5 | | 14 | delete this paragraph | Rejected. The reason to delete is not |
| 15578 | 15 | 33 | 5 | | | It's great that we can say that the programs save .60 cents (US) for every GJ of energy saved; is that net? Can we say something about every program dollar spent achieves X GJ and Y dollar (or financial) savings to consumers? | Accepted there was mistake in the text and it is corrected |
| 5266 | 15 | 33 | | | | SHORTEN This section is much too long especially since this chapter focuses on institutions, not economic tools. Does not another chapter deal with this issue? It could be reduced to a short section on role of institutions setting up taxes and cap and trade but evaluation of these measures as such is best left for an economic's chapter | Noted text rewritten |
| 17657 | 15 | 33 | 24 | | | Subsection could be shortened and made more concise. How can one measure the efficiency of taxes, subsidies, etc.? Then provide brief overview of results. | Noted text rewritten |
| 12936 | 15 | 34 | 14 | 35 | 18 | The impact of carbon/energy taxes on emissions is of course of fundamental importance and thus most recent literature should be quoted. I agree to concentrate on studies based on countries' experiences and thus with real data (opposed to simulations). Baranzini and Carattini (2012) survey the ex-post literature on the impacts of carbon taxes on emissions: see Baranzini, A. & Carattini, S.: "Taxation of Emissions of Greenhouse Gases: The environmental impacts of carbon taxes", In: Freedman B. (Ed.) Global Environmental Change: SpringerReference (www.springerreference.com). | Noted. |
| 2954 | 15 | 34 | 19 | | 35 | delete this paragraph -- not news to policymakers | Text rewritten |
| 15585 | 15 | 34 | 24 | | | What was the value of the Holland tax? It would be helpful to include a table comparing the taxes and values | Considered |
| 3126 | 15 | 34 | 29 | | | The UK CCL is not just levied on manufacturing plants - it applies to all non-residential energy users (i.e. includes offices, supermarkets, public buildings etc). | Noted |
| 15586 | 15 | 34 | 47 | 34 | 48 | What about the C storage technology? Was it successful? | Considered |
| 15584 | 15 | 34 | 5 | 34 | 23 | These two paragraphs are confusing and the wording could be improved. Were all the numbers in the studies prior to line 5 not empirical?Are the studies described in line 14 empirical or not? And are they more or less rigorous than the studies mentioned on line 5? | Rewritten |
| 15587 | 15 | 35 | 10 | 35 | 18 | This is confusing. Can you explain the differences in policy groups more clearly so that the reader undertsands the action called for? | Considered |
| 11092 | 15 | 35 | 10 | 35 | 18 | This paragraph is informative and deserves attention, but is it appropriate to insert this in 15.5.3? According to page 16 line 23, energy prices in China are differenciated based on energy efficiency rather than carbon content. Would it be more appropriately included in 15.5.3.2? | Considered |
| 12173 | 15 | 35 | 25 | 35 | 26 | sentence requires an indication of the geographical scope it relates to. | Noted |
| 11093 | 15 | 35 | 37 | 35 | 39 | I like this sence of humour. | Noted |
| 11094 | 15 | 35 | 42 | 35 | 43 | Please never delete US or USA here! | Noted |
| 15588 | 15 | 35 | 43 | | | Why would they have had as high of taxes and prices as the UK? | Considered. Question is interesting but somewhat beside teh point here. There |
| 4269 | 15 | 35 | | | | There could also be discussion of fat taxes which have been implemented in a number of countries such as Hungary and Denmark and can reduce consumption of animal source saturated fat and thus livestock related emissions | Considered |
| 12174 | 15 | 35 | 19 | | | given the space given to fuel taxes in this section compared to other proxies for carbon, you might consider putting fuel tax in the heading | Considered, text rewritten |
| 15590 | 15 | 36 | 10 | | | What were the other criteria? | Text rewritten |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5907 | 15 | 36 | 10 | 36 | 16 | Please check the article again. The authors name is Bureau (Benjamin is the christian name) and the results showed - inter alia - that impacts on households differed between type of revenue recycling (some types border on "comparing apples with oranges") and that in a substantial number of cases a welfare transfer from rural to urban areas takes place. It does thus not fully and exclusively support the statement made in the draft. | Noted, thank you |
| 11095 | 15 | 36 | 25 | 36 | 29 | This point is too important to be neglected in the Executive Summary. | Noted, thank you |
| 7426 | 15 | 36 | 31 | 36 | 43 | Note in relation to reduction of subsidies: 1) renewable subsidies are equivalent to fossil fuel taxation, 2) G20 called for the reduction of inefficient fossil fuel subsidies, leaving to countries to decide what subsidy is efficient or inefficient, 3) definition of what portion of the price constitute a subsidy is not standard, particulary when comparing energy producers vs energy importers, and the IEA calculations are inferred from specific interpretation of a subsidy, 4) The extent to which fuel subsides contribute to development and welfare in developing countries. | Noted |
| 15591 | 15 | 36 | 32 | | | On fossil subsidies, give examples;" In 2008 fossil fuel subsidies such as.." | Noted |
| 3601 | 15 | 36 | 4 | 36 | 9 | The discussion on whether consumers correctly internalize the long-run savings from more fuel efficient cars could include a reference to National Research Council (2002. Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards. National<br>Academy Press, Washington, DC) which shows that consumer consider only the first 3 years of fuel savings when considering the value of higher fuel economy, which understates the true economic value of fuel savings by about 60%. | Noted, thank you |
| 15589 | 15 | 36 | 6 | 36 | 9 | Confusing text beginning with "To empirically…". Perhaps better written as: It is difficult to empirically verify how taxes compare to standards, such as the CAFÉ standard, because of reasons already mentioned. Austin and Dinan… , however, used an empiricially based simulation model to find that the tax would be.." | Noted, thank you |
| 18741 | 15 | 36 | 7 | | | "CAFÉ standards" should be explained (and to my knowledge are written without the accent "é", which comes from the real French café - perhaps autocorrect functionality | Noted, thank you |
| 6143 | 15 | 36 | 30 | 37 | 9 | Usually when we take up subsidy as one of policies and measures, it means subsidy for the reduction of pollution. In this sense, subsidy works in the same way as tax does, though this may be against PPP of OECD 1972. What is taken up in Section 15.5.3.3 is a kind of so-called EHS (Environmentally Harmful Subsidy, more strictly saying, Environmentally Harmful Energy Subsidies). This point should be clealy stated at the outset of this section.<br>Second point is that, though G20 or OECD Ministerial Conference support removal of EHS, this is very hard to materialize. The real reason is that those EMSs have their own purposes (eradication of poverty, securing employment, national security). Unless benefit of removal of EMSs exceeds social cost (unemployment etc.) it may not be justified. This issue is now under discussion at the OECD Joint Working Party of Trade and Environment and it will be available before SOD. Suggest to refer to the document and make necessary revision accordingly. | Noted, thank you |
| 18478 | 15 | 37 | | | | Sections 15.5.3.4 and 15.5.3.5 cover topics that are covered in Chapter 8's (Transport's) discussion of policies (See section 8.10 pages 59-65). It is not necessary to repeat the material again in this overarching chapter. | Have read ch 8 and tried to avoid unnnecessary overlap but include cross refs. |
| 8356 | 15 | 37 | 10 | | | I suggest that the title of 15.5.3.4 is rewritten as "Aviation and Maritime transport taxation". | Suggestions noted and considered when |
| 5007 | 15 | 37 | 10 | 37 | 28 | Since Aviation and Maritaime transport are mostly closs national activilies, those issues shoule be handled in Capter 13, rather than Chapter 15. | Suggestions noted and considered when rewriting |
| 14306 | 15 | 37 | 22 | 37 | 23 | This should be updated - aviation is now included in the EU ETS (and has been since January 2012). | Noted, thank you |
| 3127 | 15 | 37 | 22 | | | Aviation entered the EU ETS in 2012. | Noted |
| 17658 | 15 | 37 | 22 | 37 | 23 | The EU includes aviation sector already. | Noted |
| 18743 | 15 | 37 | 23 | | | There is, by now, fairly ample peer-reviewed literature on the inclusion of international aviation in the EU ETS starting in 2012 that might be cited. Some relevant authors include Scott/Rajamani, Bartels, Kulovesi and others. | Noted |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7427 | 15 | 37 | 24 | 37 | 28 | Note the complications related aviation and maritime emissions taxation with respect to WTO and the UNFCCC principle of common but differentiated responsiblities. | Noted |
| 15122 | 15 | 37 | 24 | 37 | 28 | Similar ICAO work (carbon levy of 25$ per ton of CO2) shows much smaller impact on RTK and fuel use: -1.7% and -1.6% respectively much lower than the -5% to -10% range indicated in this paper. | Noted and included thank you |
| 6717 | 15 | 37 | 28 | | | at least 5-10 percent "compared to what"? | Noted, text rewritten |
| 3128 | 15 | 37 | 32 | 36 | | London example - over which time period did those reductions happen? The source quoted is from 2006 - what's happened since? It says the charge is 'stiff' - would be better to say how much it is (i.e. currently £10 per day), so you can compare this with the Stockholm example. | Done |
| 6145 | 15 | 37 | 39 | 37 | 40 | The text describes as "why taxes cannot be used or cannot be set sufficiently high to match the Pigouvian level (i.e. to correspond to marginal damages)". This is very misleading. If you say so, you must know exact tax level where marginal abatement cost equalizes marginal damage (marginal benefit). If you take Nordhaus calcuration for example, optimal tax rate (Pigouvian tax rate) is not so high. To avoid this kind of discussion, it is better just to say "why taxes cannnot be used of cannnot be set sufficiently high to achieve the intended result". | Noted. |
| 6144 | 15 | 37 | 10 | 37 | 28 | Is this section necessary? Policies for air and maritime transportation are enthusiatically discussed at ICAO and IMO and are touched upon other chapter of AR5. In addition, though the title says aviation and maritime transport, nothing has been described on maritime transport here. | Text rewritten |
| 7131 | 15 | 37 | 11 | 37 | 28 | When assessing the performance of policies related with aviation and maritime transport, it is necessary to take a look at the international debate in which many countries oppose the EU decision and requires aviation and maritime transport emission to be dealt with in the multilateral framework, consistent with UNFCCC. If it is adopted at national (or regional level), which means unilateral from an international perspective, that have counterproductive effects, as shown the reaction to the inclusion of the aviation sector in the EU ETS. So, when considering national and sub - national Policies and Institutions, it is necessary to put this analysis also in the international context. | Noted text rewritten |
| 14889 | 15 | 38 | 11 | 38 | 15 | 'deviates more from the cost difference' In which dirrection were the deviations? Does it mean the set tariffs were too low or too high | Text rewritten |
| 14890 | 15 | 38 | 11 | 38 | 15 | FIT will encourage more supply of electricty (from both brown and green producers)' So under FIT more electricty from dirty brown sources is generated than under a TGC? Will there be more electricty geneartion in total? But why is then the electrcity demand higher when costs= prices will be higher? | Text moved and rewritten |
| 14891 | 15 | 38 | 11 | 38 | 15 | social welfare higher' How this? External costs incorporated? | Removed |
| 6146 | 15 | 38 | 11 | 38 | 11 | Cannot find Tamas et al. (2010) in the reference section. | Will add |
| 12175 | 15 | 38 | 28 | 38 | 38 | This paragraph contains a hotchpotch of issues that lack an introduction and of which the link with subsidies, FIT and Certificates is not explained: it jumps from transaction costs to awareness, TWC, low hanging fruit, ambitious saving targets and additionality. | Rewritten |
| 3129 | 15 | 38 | 39 | 42 | | Developing country example is vague and doesn't really fit under the heading of 'Subsidies, Feed-in tariffs, Certificates' as it doesn't mention any of these | Text removed |
| 12176 | 15 | 38 | 39 | 38 | 42 | where is the link with subsidies, FIT and Certificates? | Text rewritten |
| 12937 | 15 | 38 | 43 | 39 | 5 | Not clear to me why this section is inserted here. Moreover, carbon leakage needs to be associated to climate policies in general, not only specifically to carbon taxes. | Agree, section shortened and rewritten |
| 12177 | 15 | 38 | 44 | 38 | 46 | a bit more introduction to topic required. Also, changing 'committed country' to 'country with emission reduction commisions' may make sentence more clear. | Done |
| 7428 | 15 | 38 | 43 | 39 | 5 | Review and reference the recent literature, particularly the special Energy Economics issue reporting models comparion exercise on border adjustment. | Thank you |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7132 | 15 | 38 | 43 | 39 | 5 | As with aviation and maritime transport, border adjustment measures, have to be considered in its impact beyond national borders. It is not a matter of doing a political analysis of that issue, but border tax adjustments cannot be seen in a vacuum, while many consider it as a potential threatens to the international framework of climate change negotiations There is also discussions under the Convention, about if such measures are in contravention of this international legally binding instrument, in particular of Article 3.5.There are also divided opinions on whether WTO law permits border tax adjustments for taxable inputs that are not physically incorporated into the final traded product. | Noted |
| 3130 | 15 | 39 | 35 | | | Australian scheme will now be linked to EU ETS and no longer will have a carbon price floor see http://www.climatechange.gov.au/en/minister/greg-combet/2012/media-releases/August/JMR-20120828.aspx | Noted |
| 17659 | 15 | 39 | 38 | 39 | 39 | Mention the plan to link Australian scheme and EU ETS. | Noted |
| 18746 | 15 | 39 | 39 | | | As a result of negotiations between the EU and Australia, the latter decided to repeal the price ceiling stipulation in order to facilitate linking between the EU ETS and the Australian CPM. Unfortunately this has so far only been documented in the press/news services (approx. August 2012) | Noted |
| 12938 | 15 | 39 | 6 | | | Section 15.5.4 (new approaches to emissions trading): I am surprised that in this section there is no space for a discussion about EU ETS and, more important, I would have appreciated an assessment of carbon markets under the Kyoto Protocol's flexibility mechanisms. | Noted, EU ETS discussed somewhere else |
| 15592 | 15 | 39 | 6 | 39 | 7 | Add Northeast and MidAtlantic U.S. to the title | Section rewritten, so no longer relevant. |
| 15732 | 15 | 39 | | | | I wouldn't agree that the "new approaches" are only approaches that include price management. Australia may give up its price floor up again. What is rally new is the design of existing or planned ETS in Asia (Tokyo, Skorea, China…) that these schemes not focus on the traditional sectors of power and heavy industry but may involve entire cities. These systems include smaller facilities, such as buildings, and include indirect emissions from energy consumption. The entire chapter doesnt mention Asian schemes at all. The Tokyo and Saitama schemes are up and running... | Noted |
| 18479 | 15 | 39 | | | | The title of this section would be better as "Tradable Permits" to reflect the structure in 15.3. The detailed case studies presented here could be reduced to provide a simple summary of the innovative design features that were charachteristic in the different countries, and then to provide a clear evaluation in terms of the criteria outlined in 15.3.1. | Noted, section rewritten |
| 6711 | 15 | 39 | 6 | 41 | 4 | What is the criteria to choose the country/sub-country? "Northeast and Mid-Atlantic U.S. " is not included in the title, but it is presented in 15.5.4.5. | Noted, section rewritten |
| 6147 | 15 | 39 | 6 | 44 | 33 | This section can be shortened and improved if, same as Section 15.5.2.2-15.5.2.3, those actual cases can be gathered in a table so that readers can find pros and cons of each scheme at a glance. As a whole this section is a little bit redundant. There is a room for improvement, for example, by omiting certain schemes that is not so important as well as by logically condensing 15.5.4.10 SO2 trading scheme under CAA). | Noted, section rewritten |
| 15593 | 15 | 40 | 13 | | | If allowances will initially be given out for free, what will happen later? | Noted. |
| 15733 | 15 | 40 | 28 | 40 | 29 | International emissions units can be used: can be used unlimited!!! | Noted. |
| 9265 | 15 | 40 | 23 | 40 | 36 | Australia has recently announced it will link with Europe, with no floor price, so NZ's policy might change. NZ's use of global markets means emitters currently enjoy low prices (~$5), but if there is a change of government then a requirement to buy only local credits (eg $25) might apply. The international market means governments have little control over local credits and hence struggle to use credit prices as a tool to reduce emissions. | Noted |
| 15006 | 15 | 40 | 37 | | | This section should note that emissions have fallen significantly in the RGGI region, although it is difficult to ascertain how much of this is due to the RGGI program. While the price is considered non-binding, it may contribute to a decision context that supports shifts toward lower-carbon electricity generation and energy efficiency. | Noted. |
| 2956 | 15 | 41 | | 44 | | This lengthy review of non-GHG trading systems is relevant but tangential. I would suggest summarizing in at most one paragraph. | Done |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6771 | 15 | 41 | 11 | | 18 | Although the advantage that emissions trading promotes equality of marginal abatement costs across firms, and a large cost saving as described, it is only theorical view. In fact, it is very difficult to allocate initial cap fairly, according to the reviw of Wakabayashi [1].<br><br>[1] Masayo Wakabayasi and Tadashi Sugiyama (A Review on Effectiveness of Emissions Trading Schemes: Empirical Evidences of Their Implementation ) | Noted. |
| 10039 | 15 | 41 | 11 | 41 | 15 | This part should be deleted completely. The introduction of tradable allowance programs for SOx/NOx in the US is based on different background. Conditions of GHG case are different from those of SOx/NOx case, as described in (Wakabayashi, 2007, page40, only Japanse). These literature is listed in the No67 line of this table. | Noted, rewritten |
| 2955 | 15 | 41 | 19 | | 22 | this is too glib -- concentration of CO2 sources might also create hot spots of co-pollutants. This was the basis of a lawsuit in California. | Noted |
| 12939 | 15 | 41 | 23 | 44 | 33 | This material relates to relatively old Emission trading programmes in the USA, which are not ncessarily related to climate policy. I suggest merging sections 15.5.4.7 to 15.5.4.10 in one (short) section only and just describe main results, which could be relevant to emissions trading programmes for climate policy. Otherwise, I suggest to delete all 15.5.4.7 to 15.5.4.10. | Noted, rewritten |
| 5908 | 15 | 41 | 23 | 45 | 11 | These examples are given at greater length than necessary. Please shorten the text. | Done |
| 18480 | 15 | 41 | 29 | 44 | 33 | Sections 15.5.4.8 through 15.5.4.10 could be condensed substantially to save space. It would be useful to the reader to try to pull the main lessons learned from other tradable permits schemes (i.e. those that have not targeted cc mitigation) into one section that is a maximum of a few paragraphs. | Done |
| 5008 | 15 | 41 | 29 | 44 | 33 | Description about lead trading program and SO2 trading program are too much. Those example cases should be either eliminated or condensed to one or two paragraphs at most. | Done |
| 3131 | 15 | 41 | 44 | | | almost 4 pages on US trading programmes that are not about climate change - too much unnecessary detail. Why not analyse the EU ETS instead, after all it is the first large climate trading scheme in the world and has been operating since 2005. Plenty of academic work has been done on it. | Done |
| 6712 | 15 | 41 | 5 | 44 | 33 | The title is of 15.5.4 is "new approaches", but contents from 15.5.4.7 to 15.5.4.10 are not new. They are schemes of reducing air pollutions. It is better to shorten these subsections, especially, 15.5.4.10 (SO2 trading program) and describe the link to CO2 reduction policies. | Noted, rewritten |
| 2310 | 15 | 41 | 1 | 41 | 4 | This is speculation that emissions leakage might occur in RGGI, but now official reports have been published looking at how much leakage has occurred. See "CO2 Emissions from Electricity Generation and Imports in the Regional Greenhouse Gas Initiative: 2010 Monitoring Report" issued by RGGI on August 6th of this year. It found "The monitoring results show there has been no increase in CO2 emissions from non-RGGI electric generation during the first two years of RGGI program operation, 2009 and 2010, compared to an annual average during 2006 to 2008." ( p.6) The report can be downloaded from: http://www.rggi.org/docs/Market/Elec_Monitoring_Report_12_07_30_Final.pdf. | Noted |
| 17660 | 15 | 41 | 29 | | | The source heavily relies on only one source (Ellerman 2003), however, this source is so far not included in the list of references. | Noted. |
| 5267 | 15 | 42 | 31 | 44 | 33 | TAKE SECTION OUT on acid rain - not needed | Done |
| 12940 | 15 | 44 | 34 | 45 | 11 | Laboratory experiments: I am not clear why this section is placed here and what is its aim | Considered |
| 11100 | 15 | 44 | 34 | 44 | 11 | Laboratory experiment is only a part of supporting studies, and it is not fair or misleading just mention one of them. These paragraphs should be shortened and be incorporated in a revised and more science-based report, as mentioned in No. 15 and 23. | Noted. |
| 12941 | 15 | 45 | | | | Section 15.5.4: "Conclusions" are missing | Accepted. Text added. |

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| 12942 | 15 | 45 | 12 | | | Section 15.5.5 (Voluntary agreements). This section needs to add references to the huge literature in this field. For instance, definition of VAs and several contributions surveying impacts on the environment, competitiveness etc., as well as various case studies can be found in the books by Baranzini, A. & Thalmann, P.: "Voluntary Approaches in Climate Policy" Edward Elgar, Cheltenham (UK), 2004; and OECD: Voluntary Approaches for Environmental Policy: Effectiveness, efficiency and usage in policy mixes". Paris: OECD, 2003 and case-studies by OECD. | Accepted. Text modified and literature added. |
| 8010 | 15 | 45 | 12 | 47 | 33 | Fully support. Because the descriptions are based on the scientific facts, although usually only negative aspects of voluntary action plan are highlighted. | Accepted. |
| 5009 | 15 | 45 | 12 | 47 | 33 | Since Voluntary Agreements are widely exercised and well performed in various places in the world, but the details and effectiveness of them are not well recognised, complehensive review of those paragraphs are very important and useful to enhance the understanding of "alternative" approaches. 15.5.5.1, 15.5.5.2, 15.5.5.3, 15.5.5.4 shoule be kept. | Accepted. |
| 5909 | 15 | 45 | 13 | 47 | 20 | This text can be shortened to 1 page. | Accepted, the text is shortened |
| 13721 | 15 | 45 | 18 | 45 | 19 | Delete "USEPA … 2007", as this is a claim from a government institution and not peer-reviewed literature. | Accepted. Text modifed. |
| 6148 | 15 | 45 | 27 | 45 | 27 | After "non-participants" add a new paragraph by inserting "Environmental effectiveness of voluntary agreement varies depending on several factors such as degree of communication between regulators and industries as well as institutional and cultural background. IPCC (2007) describes as 'it must be acknowledged that VAs (voluntary approaches) fit into the cultural traditions of some countries better than others. Japan, for example, has a history of co-operation between government and industry that facilitates the operation of voluntary programmes'. This point is reinforced with ample concrete examples by Yamaguchi (2012)". For references are as follows; IPCC (2007), Climate change 2007: mitigation of climate change. In: Metz B, Davidson OR, Bosch PR, Dave R, Meyer LA (eds) Contribution of working group III to the fourth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge, and Yamaguchi (2012), Policies and Measures. In: Climate Change Mitigation, A Balanced Approach to Climate Change. M. Yamaguchi, (ed.), Springer, London pp. 129-159. | Accepted. Text modified and literature added. |
| 3132 | 15 | 45 | 30 | | | the discount is for Climate Change Agreements, not Climate Change Programs | Accepted. Text modified. |
| 12063 | 15 | 45 | 33 | 45 | 35 | The Dutch example is not exactly a complementary measure, but in fact replaced mandatory regulation. While the example of the UK constitutes a unique comlementary measure most other voluntary agreements were made under the prospect of further (mandatory) government regulation in the absence of voluntary action. [further literature? e.g. Kornelis Blok] | Accepted. Text modified and wording "complementary" is deleted. |
| 6151 | 15 | 45 | 12 | 47 | 33 | Can not find all literatures in this section in the reference section. Please add in the reference. | Noted |
| 2312 | 15 | 45 | 16 | 4527 | | An additonal possibly useful reference for this section would be: Frans P. de Vries, Andries Nentjes and Neil Odam," Voluntary Environmental Agreements: Lessons on Effectiveness, Efficiency and Spillover Potential" International Review of Environmental and Resource Economics vol. 6, Issue 2 (2012) | Accepted. Literature added. |
| 6772 | 15 | 46 | 23 | | 25 | The Japanese Volantary Action Plan by Keidanren (Japan Business Federation) is a very good example which has shown that the measure of volantary action functions effectively, because their performance in terms of energy and carbon intensity was ranking among the best of the world. And also, Rietbergen et al. [1] analyzed the outcome of long-term volantary agreements on industrial energy efficiency improvement in the Netherland.<br><br>[1] Martijin G. Rietbergen, Jacco C.M. Farla, Kornelis Blok (2002)<br>Do agreements enhance energy efficiency improvement? Analysing the actual outcome of long-term agreements on industrial energy efficiency improvement in The Netherlands<br>Journal of Cleaner Production 10 153-163 | Accepted, but the suggeted literature is not added as they are covered in AR4 and AR4 is reffered. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 6149 | 15 | 46 | 28 | 46 | 28 | Add after Wakabayashi 2012, "Yamaguchi (2012)". For Reference; Yamaguchi (2012), Policies and Measures. In: Climate Change Mitigation, A Balanced Approach to Climate Change. M. Yamaguchi, (ed.), Springer, London pp. 129-159. | Accepted. Literature added. |
| 15483 | 15 | 46 | 37 | 47 | 3 | As the title of this chapter is "voluntary agreements as a "major" policy instrument in government mitigation plan", it seems a bit awkward to include the IW target for appliances here, as this is an action aiming only for one object, rather than industry as a whole, or at least a section. When this whole chapter needs to reduce its size by 76 pages to 60 pages, I would suggest this one may be a candidate to be shortened. | Accepted. Text modified and wording "major" is deleted. Also text is shortened. |
| 12943 | 15 | 46 | 7 | 47 | 33 | I am wondering why this section discusses the Japanese VAP only. There are many examples in other countries: see e.g. chapters in Baranzini and Thalmann (2004) or OECD (2003) quoted above. | Accepted. Text modified. Literature added. |
| 6709 | 15 | 46 | 7 | | | Good section. The Japanese Voluntary Action Plan (VAP) by Keidanren (Japan Business Federation) is a good example of voluntary approach for mitigation. | Accepted. |
| 11797 | 15 | 46 | 7 | 47 | 20 | Reasonable analysis. | Accpeted. |
| 15482 | 15 | 46 | 7 | 47 | 20 | Japanese Voluntary Action Plan is highly evaluated here, but there are different view on this VAP. For example, KIKO Network evaluates VAP as ineffective scheme in reducing CO2 for the following reasons and the data of the report from Japan Environmental Society backs up.<br>1)The target as a whole of VAP was not ambitious enough. Keidanren's VAP set 0% in 2010 compared to 1990 level, whereas the governmen's KP achievement Plan set the industry target for 2010 as -4.6%~-4.3%. This comes from the fact that targets of each industry is set by its own industry's voluntary action rather than set by top down by the government.<br>2) Ensuring compliance is difficult as there is no sanction and targets are not transparent and not comparable, which makes the review difficult. This comes from the fact that each industry can choose the target character as they like, such as CO2 emissions, CO2 intensity, Energy, Energy intensity, and also choose industrial production data for intensity target. Also, there was no clear explanation of how to achieve the total reduction target when most industry association chose intensity target.<br>Due to economic crisis in 2008 and earthquake in 2011, the emissions have fallen since 2008, but this reduction is not the outcome of the VAP. The effectiveness of VAP in the absence of effective policy measures such as Emission Trading scheme/carbon tax is not proven at this point, that it is not a balanced view to regard VAP as a successful mitigation policy measures.<br>Therefore, when reporting on VAP, the chapter needs to mention at least about the ineffectiveness and ambiguity of "setting the targets with voluntary bottom-up approach" to maintain the the balance.<br>citation:<br>KIKO Network.2007. "Keidanren Voluntary Action Plan fact sheet",<br>www.kikonet.org/research/archive/mokutastu/FS-kvap-j.pdf<br>Japan Environmental Society. 2007. "report of GHG emissions evaluation committee",<br>http://jaes.sakura.ne.jp/archives/768 | Accepted. Text modied and literature added. |
| 10672 | 15 | 46 | 7 | 47 | 20 | Good analysis. | Accepted. |
| 15069 | 15 | 46 | 7 | 47 | 20 | This section seems to be excessively too long and redundant, given the content in the present format which only talks about the specific case (VAT) in Japan. With consideration on the balance between the sections, this particular section, if needed, should be much shortened. In addition, when a general conclusion is drawn from this section, more evidence obviously need to be provided, not only for the unique specific country (Japan in this case), but also for other countries in the world, unless otherwise, such conclusion is difficult to be generalized which are less meaningful for the global readers of IPCC AR5. | Accepted. Text shorted, and mixed outcome is mentioned in conclusion. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 10040 | 15 | 46 | 7 | | | This section should be kept in SOD because this section shows as a successful example of "voluntary target scheme". Each industry in Japan has voluntary target and the voluntary target scheme has played a big role, as described in (Yamaguchi, 2012, page35 and 154), (Manuel, 2010, page 6 and 13), and (Yamaguchi, 2010, abstract). In addition, there is also a successful example of "voluntary target scheme" in Netherlands, as shown in (Martijin, 2002, page162). These literatures are listed in the No63 line of this table. | Accepted. |
| 9378 | 15 | 46 | 7 | | | This section provides a good example that voluntary action policy works effectively. | Accepted. |
| 18486 | 15 | 46 | 9 | | | While this is an interesting case, the focus and the detail on the policy of one country seems misplaced and interrupts the flow of the text. I might recommend condensing it to a few paragraphs and including it as a box, rather than a section in itself. | Accepted. Text shortened. |
| 15594 | 15 | 47 | 21 | 47 | 33 | Can be formatted more visually appealing and succinctly - like in bullets. What are the key takeways? | Noted. |
| 11798 | 15 | 47 | 22 | 47 | 33 | Delete last sentense. First sentense says [environmentally effective given a proper institutinal framework], which has already implied the meaning of the last sentense. | Noted. |
| 6773 | 15 | 47 | 31 | | 33 | Although it is described that some voluntary agreements have not brought about significant environmental impacts, there is no evivence. The reference of this description should be indicated. If the reference is not clerar, it should be deleted. | Noted. |
| 10673 | 15 | 47 | 31 | 47 | 33 | This sentence is a reiteration of line 22 and 23. And it looks exaggerating negatively. | Noted. |
| 7793 | 15 | 47 | 9 | | 20 | The same comment as above. | Accepted. Section removed. |
| 6150 | 15 | 47 | 9 | 47 | 9 | Add before (Tanigawa 2004), "Yamaguchi (2012) introduced one study that calculated, by applying the same methodology with which Ellerman et al. used for the evaluation of EU ETS Phase 1, the CO2 emissions reduction effect of Keidanren's Voluntary Action Plan was 34.6 Mt/CO2 or 5.6% from counterfactual BAU during 1998-2008. 1998 was the starting year of the Action Plan". For Reference; Yamaguchi (2012), Policies and Measures. In: Climate Change Mitigation, A Balanced Approach to Climate Change. M. Yamaguchi, (ed.), Springer, London pp. 129-159. | Noted. |
| 18487 | 15 | 47 | | | | In Chapter 11 (section 11.10 pages 64-71) there is already an extensive discussion of REDD policies. There is no need to repeat this discussion in an overarching policy chapter. It also begs the question why this one sector's policies are being singled out above the others. | Accepted. Section removed. |
| 15004 | 15 | 47 | 35 | | | This section should be integrated with chapters 11, 13, 14, and 16. See comment on chapter 11, suggesting establishment of a text box in one of these chapters, detailing history of REDD+. | Section removed. |
| 12944 | 15 | 48 | 22 | 48 | 28 | Please better explain the measure of "land-yield elasticity" and the policy implications of the numbers quoted herein | Section removed. |
| 13614 | 15 | 49 | 45 | | 46 | Just to point back to comment 20 that low carbon technologies are unique in a number of ways vis a vis other technologies and so would suggest that this distinction be made clearer | Noted. |
| 18488 | 15 | 49 | | | | The section is well written with clear conclusions. There seems to be some bias toward US examples and the energy sector. It may be useful to pull more from e.g. buildings or industry as well, ultimately to answer the question "Is technology policy equally important for all sectors? If not, for which is it most important and best suited?" | Accepted. The SOD contains additional non-U.S. and non-energy material. |
| 3185 | 15 | 49 | 1 | | | Section 15.6 is heavy on some factors (e.g., IP) and light on others that are key to actual investment and deployment of new technologies. Those include risk management and allocation policies (e.g., PPAs, loan guarantees, soft budgets, etc). I made a similar comment on chapter 13, which I reproduce here: " sections 13.9.2 and 13.9.3. For my taste these sections are overly focused on IP and not enough on other fundamentals such as protection of property, sanctity of contracts, etc. There's a ton of practical (and to some degree academic—such as in the int' finance, int'l investment law and some of the international political economy literatures) experience with how these kinds of factors actually drive investment outcomes and diffusion of technology. Somewhere WG3 should deal with that—if not here then (better) in the industry chapter (chapter 10, which is devoid of most real world industrial concerns) or the finance chapter (chapter 16, which is a mess). " | Taken into account. Different commenters have different views on the appropriate balance among different factors. SOD contains more discussion of behavioral and institutional issues than the FOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3304 | 15 | 49 | 32 | 58 | 36 | Strong section. Keep it. | Noted. Thanks. |
| 6152 | 15 | 50 | | | | It is desirable if a short explanation of why RD&D in 2009 increased so rapidly is added. | Noted. The figure has been revised and this section rewritten. |
| 17661 | 15 | 50 | 4 | 50 | 17 | The paragraph describing Fig. 15.1 is not in line with the facts shown in the graph. For example, the figure only shows expenditures up to 2009 while the text also refers to the year 2010. In addition, the description of the graph states that the “peak investment rate was in 1980” while figure 15.1 implies that this was actually the case in 2009. | Accepted. The Figure has been updated and the accompanying text rewritten. |
| 18489 | 15 | 50 | 3 | 50 | 17 | It would also be useful to know the R&D structures outside of OECD countries. E.g. is there any R&D expenditure in developing countries? How does the situation differ there? | Taken into account. There is limited literature on R&D outside the OECD. We have included brief mention of |
| 5011 | 15 | 51 | 12 | 51 | 22 | Public support for energy technologies R&D is very important and actually brought many important outcomes. See the following paper: "Energy Innovation at the Department of Deffence", Daniel Sareviz et al., Consortiam for Science, Policy, and Outcomes at Arizona State University, March 2012 | Noted. |
| 13615 | 15 | 52 | | | | Same as above (to highlight comment 20) and also to repeat comment 21 (that in addition to 'market failures' alternative approaches take a more systematic view | Unable to understand. There is no figure 15.6.4. The comment does not seem to refer to the figure that does appear on |
| 15461 | 15 | 52 | 1 | 52 | 13 | It may be a good idea to briefly touch upon the ARPA-E project (http://arpa-e.energy.gov) which was driven by the American Recovery and Reinvestment Act. Although DARPA is alluded in the next page, the ARPA-E is directly inspired by the past successes of DARPA. Although the program has been short, it has already spurred $100 million in private investment in its first two years (http://www.sustainablebusiness.com/index.cfm/go/news.display/id/22856). See also: http://theenergycollective.com/cliftonyin/84921/arun-majumdar-made-arpa-e-energy-innovation-leader and http://www.theatlantic.com/technology/archive/2012/09/amid-partisan-bickering-everyone-agrees-arpa-e-is-a-fascinating-experiment/261905/ | Noted. Space limitations, and the need to cover experiences world-wide, preclude a specific discussion of ARPA-E. |
| 5910 | 15 | 52 | 1 | 52 | 6 | Another possibility is that people who are not qualified enter the respective job market and negatively influence research quality. This, in turn, turns up pressure on scientific quality control like review processes and consumes time that could be spend doing research … | Accepted. At a macro level, the consequences for the research process working through this mechanism are the |
| 12066 | 15 | 52 | 15 | | | NIH' as acronym is not explained in the text | Editorial – copyedit to be completed |
| 13617 | 15 | 53 | 3 | | 14 | suggest highlighting the role that the military has played (internet, GPS) (DARPA is referenced but think this distinction is useful). E.g. I am trying to track down studies that I have seen but as the deadline to getting these comments is imminent I can't seem to find it, but there are some that suggest that the military is seriously looking at green technologies as a way to reduce exposure (supply chains in getting fuel / needed energy to their troops) - not only costs but also to reduce casualties | Noted. Space limitations, and the need to cover experiences world-wide, preclude a specific discussion of the military role. |
| 5012 | 15 | 53 | 3 | 53 | 14 | Public support for energy technologies R&D is very important and actually brought many important outcomes. See the following paper: "Energy Innovation at the Department of Deffence", Daniel Sareviz et al., Consortiam for Science, Policy, and Outcomes at Arizona State University, March 2012 | Noted. |
| 6774 | 15 | 53 | 34 | | 35 | The description that FIT has encourged "develoyment of renewable technologies" shoud be corrected to "develoyment of renewable capacity", because FIT has encouraged only renewable capacity as the German case shows in Figure 15.2. □ | Taken into account. The cited text has been reworded. |
| 11799 | 15 | 53 | 35 | 53 | 37 | Delete this sentence. Relationship between [huge expantion] and [cost reductions] is unclear. | Taken into account. The cited text has |
| 6775 | 15 | 53 | 35 | | 37 | Figure 15.3 only suggests that the huge expansion in develoyment appears to have forsterd "economies of scale". In figure 15.3, there is no data that suggests "learning-by-doing" or "incentive for R&D". | Taken into account. The cited text has been reworded. |
| 11800 | 15 | 54 | | | | This figure isn't needed. Refer to No.85. | Accepted. The figure has been deleted. |
| 12945 | 15 | 54 | 7 | 54 | 15 | I suggest moving those 2 paragraphs above, when first discussing FIT | Taken into account. The cited text has |
| 13618 | 15 | 54 | 7 | 55 | 3 | suggest noting that often times these policy levers operate across purposes (e.g. a FIT may have an industrial and innovation goal also at play in addition to reducing GHG emissions) | Taken into account. Interaction of policy goals is discussed in the chapter. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5013 | 15 | 54 | 7 | 54 | 15 | There are many negative/unexpected impact brought by FIT after massive deployment of the policy. Most evident negative of FIT is taht it looks in the existing costly technologies and, as the result, high electricity cost by surcharges for long period, even though new thechnologies may become available and cost may come down in the mean time. See the following book: "The Green Mirage", John Constable, CIVITAS, London, July 2011 | Taken into account. There are diverse studeis of FIT that come to differebnt conclusions. We have tried to represent this literature in the chapter. |
| 18681 | 15 | 55 | | | | IP is discussed on page 55, should be aligned with the same theme in c 13 and perhaps removed from c 15. Refers also to c 16. Messages not aligned? | Accepted in part. The reference to Chapter 16 was an error; the correct cross-reference to Chapter 13 now appears. Chapters 13 focuses on IP policy as an international issue; Chapter |
| 4006 | 15 | 55 | 28 | 56 | 9 | Although I am convinced that strong IP protection supports technological development at least in developed countries and also in developing countries, the discussion here may, as an example, refer to open source software, which is a typical example that the lack of patent protection and the lack of copyright protection (by license agreement of the creators of the software) may produce positive effects on the development of such software. However, I doubt that in fields of cost intensive development of technologies such as in the pharmaceutical sector and also the climate sector (solar industry etc.) IP protection is necessary to allow companies securing their investments and giving them a chance to get a payback on their investments. | Noted. Different individuals have very different views regarding the effects of IP policy. The conclusions in the chapter regarding the potential consequences of IP protection are supported by the published theoretical and empirical literature. |
| 12023 | 15 | 56 | 38 | 57 | 1 | This is an odd statement which is misinterpreted that week IP protection facilitates indigenous technology development. IP protection is important for both domestic technology development and technology transfer. | Noted. Different individuals have very different views regarding the effects of IP policy. The conclusions in the chapter regarding the potential consequences of IP protection are supported by the |
| 13612 | 15 | 56 | 9 | | 18 | I would like to again bring to your attention the work of climate-policy-innovation.org as there are a number of research papers in place to do with climate policy innovation / diffusion (feel free to contact Andy Jordan Andy Jordan (ENV) [A.Jordan@uea.ac.uk] and Dave Huitema Huitema, D. [dave.huitema@vu.nl] for further information about their status (e.g. Auld and I are working on one due imminently) | Noted. |
| 6153 | 15 | 57 | 24 | 57 | 36 | This paragraph descibes situation only in the USA. We need another literature whether the same thing may happen in other part of the world including developing countries. If not, it is necessary to add some caution such as "it is uncertain whether same effect may happen in othe r part of the world". | Accepted. The SOD contains additional non-U.S. material. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15273 | 15 | 57 | 37 | 57 | 39 | Basically, it would be the case that flexible environmental regulations are more effective at inducing technological change, compared with direct regulations which specify a particular technology to achieve regulatory goals. There is a caveat, however, that flexible regulations tend to encourage relatively simple, straightforward technological change, such as end-of-pipe technologies, which will discourage radical, clean innovations, which could be better from a long-term perspective. For example, Yarime (2007) examined the effects of environmental regulation on technological change in the chlor-alkali industry in Europe and Japan. when emission standards introduced were not very stringent, the cost of pollution abatement with end-of-pipe technologies was relatively small, which encouraged companies to focus on this type of technology, rather than clean technologies, as illustrated in the case of Europe. Because the end-of-pipe technologies were effective in reducing emissions to a certain extent, the producers emitting mercury had a strong incentive to continue to use the existing, pullution-laden mercury process, which has functioned to prolong the lifetime of the technologically obsolescent process, leading to technological lock-in. In contrast, stringent regulations worked effectively in creating strong and secure demand for clean technologies such as the ion-exchange membrane process, shifting production companies away from end-of-pipe technologies that would otherwise sustain the trajectory of the pollution-laden mercury process. Such regulations, however, implemented in a very short time period, as was the case in Japan, resulted in inefficient use of resources, as firms were required to make large investments without a clear understanding of emerging technological options. In other words, on the one hand, environmental regulations should be designed to encourage research and development on clean technologies having the possibility of achieving economic and environmental objectives at the same time, rather than end-of-pipe technologies, which only lead to incurring additional costs, except perhaps in cases when immediate actions for eliminating toxic substances are necessary. On the other hand, it is desirable to avoid inducing inappropriate technological choices prematurely in the presence of the uncertainty, diversity, and rigidity inherent in the process of technological change. Therefore, an explicit mandate to phase out the existing pollution-laden technology with a sufficiently long time frame involving a certain degree of flexibility would allow more potential for promoting green innovation, which necessarily requires dedicated efforts on research and development and experimentation.<br>Yarime, Masaru, "Promoting Green Innovation or Prolonging the Existing Technology: Regulation and Technological Change in the Chlor-Alkali Industry in Japan and Europe," Journal of Industrial Ecology, 11 (4), 117-139 (2007). | Accepted. The cited results are now mentioned in the chapter. |
| 15272 | 15 | 57 | 5 | 57 | 6 | For surveys on empirical literature assessing the effects of policy measures on technological change, the following article would also be very useful, with more systemic and integrated views on technological change.<br>del Rio, Pablo, Javier Carrillo-Hermosilla, and Totti Konnola (2010). "Policy Strategies to Promote Eco-Innovation: An Integrated Framework." Journal of Industrial Ecology, 14 (4), 541-557. | Noted. The cited paper is now included in the surveyed literature. |
| 2311 | 15 | 57 | 4 | 58 | 9 | An additonal reference for this section that might be helpful is: Allen S. Bellas and Ian Lange, "Evidence of Innovation and Diffusion Under Tradable Permit Programs' Internationa Review of Environmental and Resource Economics volume 5. Issue 1 (2011) | Noted. |
| 18683 | 15 | 58 | 33 | | | Page 58, line 33 says:<br>“ 4. There is the potential for intellectual property enforcement to impede the diffusion of new GHG technologies, thereby inhibiting both GHG reduction and further improvement of the technologies”<br><br>Highly questionable as a statement! | Rejected. Different individuals have very different views regarding the effects of IP policy. The conclusions in the chapter regarding the potential consequences of IP protection are supported by the published theoretical and empirical |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12024 | 15 | 58 | 33 | 58 | 35 | IP protection is necessary for facilitate technology transfer and diffusion in a sustainable way. To much defensive IP management may slow the diffusion but no IP protection intimidates technology holder to transfer its technologies. I disagree with this conclusion as it does not consider sustainability. | Noted. Different individuals have very different views regarding the effects of IP policy. The conclusions in the chapter regarding the potential consequences of IP protection are supported by the |
| 5014 | 15 | 58 | 33 | 58 | 35 | The argument here is not necessarily supported by facts. In fact, from technology owner view points, technology transfer/licence is incentivatised with patents, thus promoted. Without patent protection, technology owners may keep such technologies as trade secrets and hold within the company. | Noted. Different individuals have very different views regarding the effects of IP policy. The conclusions in the chapter regarding the potential consequences of IP protection are supported by the |
| 15595 | 15 | 58 | 41 | | | Is this line meaning//planning to say that social and economic development are big drivers of climate change? I disagree in the sense that they do not have to be and one can have development while minimizing climate impacts if done thoughtfully. | Noted. |
| 15734 | 15 | 58 | | 58 | | Synergies and tradeoffs among policies: among climate policies? Energy policies? | The title is a mandate from IPCC plenary. In this section, we focus on synergies and tradeoffs among climate |
| 18490 | 15 | 58 | | | | The first three sections of 15.7 (15.7.1 - 15.7.3) have a very useful focus on the link between CC mitigation policies and SD policies, highlighting the developing country perspective. However, much of the text is on co-benefits and other topics covered in Chapter 4. It might be most useful to condense these three sub-sections into one, highlighting only what has not already been covered in other chapters. | Considered. We have reorganized 7.1-7.3 to a new section which focus on the interaction between policy objectives |
| 18491 | 15 | 58 | | | | Again, while the section has a useful link to development policies, it misses a link to policies in any other subject areas, e.g. agriculture, to inform the reader where synergies and trade-offs exist with other topic areas, other branches of government. | Considered |
| 15596 | 15 | 58 | 38 | 62 | 48 | This section coul benefit from a tighter structure or outline, especially 15.7.1, 15.7.2and 15.7.3. It seems a bit disjointed at times. The following sections were very well written and could be models - 15.7.5.1, 15.7.5.2 | Considered. We have reorganized 7.1-7.3 to a new section which focus on the |
| 18005 | 15 | 58 | 45 | | | Although the section relates to SD, SD concepts and SD goals, I have found no cross-reference to Chapter 4 although Chapter 4 is supposed to provide the framing for any SD discussion in the WGIII AR5. For this Section, this is particularly relevant, since SD and the related concepts are not sufficiently explicated. The same applies to the discussion of co-benefits/co-costs and the respective framing in chapters 3 and 4 (which has been nascent in the FOD). Please liaise with the relevant chapters in the cross-cutting meeting to determine a viable labor division and synthesis of results with respect to the co-benefits/co-cost assessment and the relation to SD across chapters. | Considered |
| 11102 | 15 | 58 | 33 | 58 | | This conclusion is wrong, or, at least, one sided. The IPCC report should be science-based and be independent from politicized debates under the UNFCCC. | Rejected. Different individuals have very different views regarding the effects of IP policy. The conclusions in the chapter regarding the potential consequences of IP protection are supported by the |
| 6156 | 15 | 59 | | | | As a measures to mainstreaming mitigation for trade and investment, in addition to Energy subsidy reform in page 60, add "removal or reduction of import duties for environmentally friendly goods and services". There are lots of papers from OECD Joint Working Party of Trade and Environment. | Considered. This table has been deleted in SOD |
| 6154 | 15 | 59 | 11 | 59 | 13 | Better to cite United Nation's MDGs (Millenium Development Goals) and/or "The Future We Want " adopted at the Rio + 20 Conference this year (A/CONF.216/L.1). | Considered. This has been added |
| 5268 | 15 | 59 | 13 | | | ADD: But some negative effects can arise: efforts in France to promote diesel in the past have led to increased NOX pollution problems in several cities. | Need reference to this point |
| 15598 | 15 | 59 | 14 | | | Title is wordy/confusing; Perhaps "Capturing (or understanding) Synergies between Climate and NonClimate Policies"? This section could start with a description of the synergies to set the stage for this content which would reinforce the key points. | Considered. We have reorganized 7.1-7.3 to a new section which focus on the interaction between policy objectives |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7430 | 15 | 59 | 16 | 59 | 21 | Note that there is also a tradeoff between the security of demand for the fossil energy producers and the needed investment to meet actual global demand from these sources. A more integrative and responsible strategy to energy security should allow for all sources of energy in an equal footing suitably corrected for their impacts on GHG emissions. | Need reference to this point |
| 6155 | 15 | 59 | 21 | 59 | 21 | Add "Toichi (2012)" after mitigation. For reference; Toichi (2012), Balance between energy security and mitigation responses: In: Climate Change Mitigation, A Balanced Approach to Climate Change. M. Yamaguchi, (ed.), Springer, London pp. 63-87. | Considered. This has been added. |
| 9271 | 15 | 59 | 29 | 59 | 29 | Spelling mistake "… main raise …" should probably be "… may raise …" | Considered. This has been corrected |
| 6715 | 15 | 59 | 29 | | | It may be "main" should be "may"? "CCS main raise concerns about...". "Main"→ "may"? | Considered. This has been corrected |
| 15599 | 15 | 59 | 30 | | | Why does this raise concerns about energy security? Explain. | CCS may consume more energy then tighten the energy supply |
| 5269 | 15 | 59 | 40 | | | Proposal to add a potential obstacle column: To ENERGY SECURITY add following obstacle column: May lead to<br>- increased coal use<br>- exploration of oil in ecologically sensitive areas<br>-schale gas<br><br>To AIR QUALITY, add following obstacle column:<br>Improving traffic flows decreases pollution in the short term but leads to increased car traffic afterwards;<br>Funding help to replace old but still operational cars reduces pollution but has overall greater ecological footprint;<br>Efforts at increasing diesel motor use in France (less GHG emissions) lead to increased NOx pollution | Considered. This table has been deleted in SOD |
| 2318 | 15 | 59 | 49 | | | The table, should be changed or adequate, The first column should contain the basic target , it is , the mitigation target and the second column may represent the policy options and the last one the synergies. In addition, is a suggested take into account other more synergies. There are more synergies impacts than those that are on the table. | Considered. This table has been deleted in SOD |
| 15597 | 15 | 59 | 5 | 59 | 6 | side impact on climate change" is not very clear. Also, instead of "can widen policy goals…" how about "can achieve multiple policy goals." | We have delted this subtitle in revised text. But widen means to widen the boundary of policy objetives, while |
| 15128 | 15 | 59 | 2 | 59 | 2 | poverty eradication | Considered. We have added pover |
| 15129 | 15 | 59 | 5 | 59 | 5 | many development policies indeed have positive<br>side-impact on climate change | Considered. We have put this into revised SOD text |
| 4270 | 15 | 59 | 12 | | | I couldn't see a discussion of how co-benefits can be incorporated within policy instruments to reduce GHG emissions. Could there be a specific section on this point? | The co-benefit discussion will be addressed mainly by other chapter. This discussion may be more appropriate in |
| 18007 | 15 | 59 | 28 | 59 | 32 | Please provide a cross-reference to and liaise with Chapter 7 to bring the different discussions of CCS impacts across chapters (5, 6, 7, and 11) together. | Considered. However, CCS is only used as an exmaple here to illustrated tradeoff |
| 2317 | 15 | 59 | 33 | 59 | 35 | The use of terms like Green Production, Green Investments and others, should be modified. The AR5 should not use terms and categories that have not a worldwide recognition and a clear understanding for all. I suggest the use of Sustainable Production and Consumption, Investments for Sustainable Development as was recognized in Rio + 20, or, if the author prefers, maintain the Green term, then, must be given a wide explanation for the general understanding on what means all those terms, may be used a references or similar. | Considered. We change to sustainable production and consumption in revised SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9311 | 15 | 59 | 14 | 59 | 38 | Toward a sustainable society, the industry shall deal with recycling policies to conserve natural resources but pre-treatment of wastes in the plant requires further additional energy to dry and cut them. Therefore, it is important to recognize that the industry has to challenge incompatible policy/ies as well as climate policy. In order for the industry to diffuse such co-processing technologies, governmental support in developing country is required for a primary driver of the level of local environmental awareness or waste legislation to collect fractionated wastes from industries and public. ( http://www.jcassoc.or.jp/cement/2eng/eh1.html and http://www.jcassoc.or.jp/cement/2eng/eh3.html ) | This institutional and governance discussion will be mainly addressed in section 15.2 |
| 11077 | 15 | 6 | 1 | 7 | 13 | The Executive Summary misses one of the main points of this chapter, i.e. "Subsidy Reduction" mentioned on line 36 of page 36. | Noted. Will be rewritten. |
| 7423 | 15 | 6 | 10 | 6 | 18 | Should mention that the type of policy does matter when assessing efficiency and cost implications including spillover impacts. | Accepted. Will be rewritten. |
| 7704 | 15 | 6 | 13 | 6 | 18 | This (and some of your other statements in the exec summ) are not supported by the fuller discussion, in this case in section 15.5.5. In reading that section, there is little evidence you report to support this conclusions. Furthermore, many of the references you cite in the text are missing from your reference list. | Accepted. The conclusions will be weakened. |
| 13224 | 15 | 6 | 21 | 6 | 39 | The discussion of carbon taxes and emissions trading is entirely disjoint, when it should be strongly connected. Both instruments put a price on emissions, and thereby a market incentive to reduce emissions. Whether this price signal is implemented by way of a tax (or tax-like instrument) or though tradable permits has important implications for the actual policy design, but it is secondary in principle. The question that needs to be answered is "what are the experiences with carbon pricing - does a carbon price (through tax or trading) provide effective incentives for mitigation?". The discussion here and in the body of the chapter should be recast in this light. | Partially accepted. We will use the term economic instruments to bring out the commonality, but it is useful for policy-makers to be made aware of differences as well as commonalities. As Lines 35-37 point out, there are important pertinent differences, especially in a world with very imperfect policy |
| 3598 | 15 | 6 | 21 | 6 | 22 | The claim that there is robust evidence that carbon taxes are effective in reducing emissions does not seem justified by the discussion in section 15.5.3.1, where it is stated for instance that "there is, however, less rigorous published work that is empirical … on the effect of these taxes". See also comments further down on this specific section. | Text rewritten, new published evidence reported |
| 13215 | 15 | 6 | 21 | 6 | 21 | Add the sentence taken from page 26, line 11/12 : "Overall, taxes on greenhouse gases are a preferred instrument for economists", or a sentence conveying the same message, possibly expliciting the reasons for this preference | Noted will do |
| 7424 | 15 | 6 | 22 | 6 | 23 | It is rather strong statement to say that fuel taxion is a cost-effective way for reducing emissions. To the extent that fuels have different carbon contents, the true Pigovian instrument would a tax on emissions and not the fuels consumed regardless of the progressivity or regressivity of the tax. | Text rewritten, I agree but only partially and fuel taxes should be in proportion to carbon (as the carbon taxes on fuel are |
| 7425 | 15 | 6 | 23 | 6 | 26 | Reconcile this statement with that of page 7, lines32-34. There seems to me some contradiction. | No contradiction, will try to make this |
| 7705 | 15 | 6 | 23 | 6 | 29 | These conclusions are just not supported by the text. Most of the evidence you cite in the text regarding incidence is that taxes are regressive, which is the common finding. You report the opposite here. I also did not find support that people are happy to have their fuel taxes raised. | No, taxes on transportfuels are progressive in most countries. (Note that "most countries" here refers mainly to the poor countries. The US is not a |
| 17652 | 15 | 6 | 23 | 6 | 25 | This sentence as well as the sentence starting on p. 7, line 32 state that there is robust evidence that carbon taxation is progressive in developing countries. Neither sentence gives a reference though. On page 36 this argument is mentioned again and one reference is provided (Sterner 2012). However, if there is robust evidence there should be more than one study cited. | More studies will be cited |
| 5901 | 15 | 6 | 23 | 6 | 25 | This is either not in line with economic theory (poor households will have to pay a higher share of their income just to maintain their level of welfare, e. g. transportation) or a sign that poor households forego these expenses and thus also might be restricted in their possibilities and trade e. g. transportation for other amenities / necessities. Please add a link to the relevant section here and / or add sustaining information here. | Rewritten, will be done. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3599 | 15 | 6 | 29 | 6 | 31 | The claim that hypothecated instruments can make higher fee levels possible is not backed up by any references in secton 5.3 (as indicated it will be). I have, however, added some suggsted references for this further down. | Included |
| 13225 | 15 | 6 | 32 | 6 | 39 | The verdict on emissions trading is unduly negative. Several obstacles to its effectiveness are highlighted prominently and given more space than any positive aspects - which is in complete contrast to the preceding paragraph on emissions taxes which mentions no caveats (many could be mentioned). The discussion of taxes and emissions trading needs to be put on equal footing. I also note here that there is very little substantive discussion of emissions trading in the body of the chapter. This is clearly is an omission in the context of this chapter. Perhaps permit trading is covered in more detail elsewhere, but this chapter really needs to discuss it in-depth, given that many other instruments are discussed in detail. | Rewritten, will be done. |
| 13707 | 15 | 6 | 32 | 6 | 32 | Insert "project-based offsets" behind "emissions trading systems". | Rewritten |
| 11078 | 15 | 6 | 32 | 6 | 34 | Delete the whole sentence from "Economic theory suggests…" to "… medium evidence]! If theory is to be mentioned in the Executive Summary, it should be mentioned in all the paragraph of other policy instruments. "Theoretically" speaking, theories always suggest positive effects of a chosen policy instrument. Otherwise, no governent would have chosen it. Mentioning theories is redundant here. | Will do |
| 13226 | 15 | 6 | 34 | 6 | 35 | Emissions trading "rare and not stringent": the number of schemes in existing is a poor measure of their prevalance, and it is unclear on what the statement of "not stringent" is based on. The EU ETS probably has a much wider coverage of emissions than all the carbon taxes mentioned combined. It has resulted in an average carbon price that has clearly been sufficient to drive some extent of change in industrial practice and investment. Several other countries have implemented ETS or are in the process of doing so. | Rewritten |
| 13701 | 15 | 6 | 34 | 6 | 34 | Replace "medium evidence" by "robust evidence", as there is substantial evidence that emission trading systems have harnessed least-cost reductions, as long as they have not been overallocated. | Considered |
| 13702 | 15 | 6 | 34 | 6 | 35 | Replace "they are so far… high agreement" by "They have spread significantly since 2005, but allocation has initially been relatively loose.  have only been implemented in the last decade. Where combined with stringent caps, they have achieved significant emission reductions; participation has been substantially higher than anticipated [robust evidence, high agreement]. " Reason: With the EU, Australia, New Zealand, several US and Japanese subnational jurisdictions having mandatory emissions trading systems, mandatory ETS cover a majority of industrialized countries. Those systems with scarcity have generated surprisingly high prices and mobilized significant emission reductions. | Rewritten |
| 11079 | 15 | 6 | 34 | 6 | 39 | Shorten and rewrite after revising 15.5.4 completely following the style of 15.5.3. | Done |
| 13227 | 15 | 6 | 35 | 6 | 37 | ETS "cancel the effect of other policies or become redundant": the very same statement applied many other policy mechanisms, under specific conditions. This caveat would be better made with regard to mitigation policy measures more generally, rather than only with regard to ETS. | Do not agree. Will explain better |
| 13703 | 15 | 6 | 35 | 6 | 37 | Delete sentence "When … robust evidence" as it mixes many different issues and redundancy can be argued the other way round (if an ETS exists, other policies may become redundant). | Rewritten |
| 11796 | 15 | 6 | 37 | 6 | 44 | Descriptions should be met with 15.5.5.4 considering No.89. | Considered |
| 13228 | 15 | 6 | 37 | 6 | 38 | Grandfathering of permits may create perverse incentives to increase emissions: it theoretically can do that, but no major emissions trading scheme in existence has resulted in such perverse incentives. This is something of a red herring practice. I suggest re-thinking whether it deserves highlighting in a summary. | Considered |
| 14878 | 15 | 6 | 37 | 6 | 39 | The high costs of grandfathering to final customers needs to be mentioned here as well when stressing the avntage of increasing acceptance i.e. buying acceptance comes at a cost (see eg IEA2010g p8 cited in FOD Chapter 7 p70 ) | Agree, will consider including ref |
| 13704 | 15 | 6 | 39 | 6 | 39 | Add after "medium evidence": "Increasingly, grandfathering has been replaced by auctioning". | Will consider |
| 7706 | 15 | 6 | 40 | 6 | 46 | The discussion of voluntary actions/agreements in the text is that there is little evidence that they are effective, except in Japan.  That is inconsistent with what is said here. | Noted. |
| 13705 | 15 | 6 | 40 | 6 | 40 | Replace "medium" by "limited", and "given" by ", and this requires" | Accepted, mixed outcome is mentioned. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13706 | 15 | 6 | 45 | 6 | 45 | Replace "some" by "in the majority of". Reason: Outside Japan, voluntary agreements have been rather ineffective. See e.g. evaluation by Baranzini, A.; Thalmann, P. (2004): Voluntary approaches in climate policy, Edward Elgar, Cheltenham; Rezessy, S.; Bertoldi, P. (2011): Voluntary agreements in the field of energy efficiency and emission reduction: Review and analysis of experiences in the European Union, in: Energy Policy, 39, p. 7121-7129 | Accepted. Literature added. Mixed outcome is mentioned. |
| 18714 | 15 | 6 | | 7 | | Executive Summary generally would benefit from editing/rewriting to have a more streamlined narrative; currently it is a somewhatrepetitive list of central takeaway messages from individual subsections, and thus difficult to read and understand in isolation of the main text | Noted. Will be rewritten. |
| 18464 | 15 | 6 | | | | It is very difficult for the reader to pull clear messages from the Executive Summary. There are two overarching reasons for this:<br>1) the presentation of messages is scattered. The building blocks are there (from the assessment in Section 15.5), but there is no structured synthesis that allows a reader easy access. This could be in the form of e.g. a table that highlights policy instruments (vertically) and assessment criteria (horozontally), marking which policies have been considered cost effective, environmentally effective, etc. in the meat of the table.<br>2) The uncertainty language integrated into the sentences interrupts the flow. It would be much more useful to keep sentences crisp, and to use uncertainty language in brackets at the end of the section, as is the typical IPCC standard. | Noted. Will be rewritten. |
| 18465 | 15 | 6 | | | | There are a number of messages missing that a reader would expect. These include:<br>- A synthesis of sector chapter policies relevant at the national level (missing from the entire chapter)<br>- The interplay across different policy levels (national, sub-national, city, etc)<br>- A mention of where synergies may arise with policies targeting other subject areas (missing from the entire chapter)<br>- Regional differentiation to the extent possible in a summary | Noted. Will be rewritten. |
| 18466 | 15 | 6 | 6 | 6 | 7 | The introduction promises lessons from a variety of institutional and governance structures from 15.2 (see p. 7 lines 18 and 19)- what are those lessons and why haven't they been included here? | Noted. Will be rewritten. |
| 15600 | 15 | 60 | 1 | 60 | 20 | It seems that this could be tightened to discuss how these different levels of government need to (1) include climate considerations into existing planning (2) create climate-focused planning efforts that explains the non-climate synergies or (3) promote the synergistic benefits of climate mitigation to increae support for action. It seems a bit confusing as written. | This institution and governance discussion will be addressed in 15.2 |
| 5270 | 15 | 60 | 15 | | | ADD: Institutional culture and structure also raise obstacles: a city's mobility department may not work with the road and infrastructure service or with the urban/land planning one. In France, the urban planning services in cities did not work with building construction actors until 2004. The division of urban services by sectors and areas of judicial and administrative competence is a primary and complex institutional obstacle to mainstreaming. | This institutional obstacles have been mentioned in line 6-7 |
| 18754 | 15 | 60 | 34 | 60 | 35 | "As discussed in the previous section, there are important market failures ...": there are so many subsections in the previous section, further specification is needed. | Noted. |
| 5272 | 15 | 61 | 16 | 61 | 28 | paragraph repetitive with previous sections | Section has been thoroughly redrafted |
| 5015 | 15 | 61 | 19 | | | Carbon tax may help spur innocation, but cap & trade may not necessarily. Once carbon market is established and massive credits are traded, existance and growth of the market itself will become a big concern among traders/market players. Development of cheep clean energy technology will destroy carbon market because it will remove the necessity for carbon pricing as a disincentive for fossil fuels. | Noted. |
| 7431 | 15 | 61 | 29 | 61 | 47 | The second best theory in economics explains that adding one distortion in the presence of multiple distortions does not necessarily improve global welfare. In this case taxing oil increases welfare by reducing emissions but also decreases the welfare by decreasing revenues and consumption of nations depending on the production and exports of oil. | Section has been redrafted to clarify |
| 5273 | 15 | 61 | 29 | 61 | 40 | take out? description of economic tools paragraph probably dealt with in other chapters | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18755 | 15 | 61 | 3 | | | "in terms of cost-effectiveness": this is symptomatic of the disciplinary bias/excessive focus on economics: when multiple instruments interact, the consequences are manifold and not only relevant in (economic) terms of cost-effectiveness. More often than not, complete failure of a policy instrument (rather than just diminished cost-effectiveness) will follow from outright conflicts between instruments at the legal level, e.g. when one policy has to be cassated because it is found to be legally inconsistent with prior(higher ranking, or long-established and hence vested) instruments. The complete absence of jurisprudential discussion is a significant weakness here and elsewhere. For an overview of instrument interaction from a legal perspective, see Mehling, Michael (2007), "Implementation of the Kyoto Protocol in Germany: Designing an Integrated Management Scheme for Greenhouse Gases." In Tackling Climate Change: An Appraisal of the Kyoto Protocol and Options for the Future, edited by Wybe Douma, Leonardo Massai, and Massimiliano Montini. 111-134. The Hague: T.M.C. Asser Press, 2007. | Noted. Some discussion of this in revised 15.8. |
| 6157 | 15 | 61 | 6 | 61 | 9 | The implication of this paragraph is very important. In this sense it would be better if we can have another literature other than Tinbergen (1952) as, even if Tinbergen is so well-established, this is rather old one. | Noted. Tinbergen (1952) is often considered the key reference. |
| 5271 | 15 | 61 | 9 | | | ADD: Political science and the sociology of organisation tell us that public policy is only as effective as internal competence, responsibility - and public acceptance - go, unless legal obligations and constraints are used. | Noted. |
| 15736 | 15 | 61 | | 61 | | You seem to consider only the interactions between energy policies. Beneficial or problematic interactions however also occur eg between energy policies and biodiversity or water policies. These interactions may significantly influence the performance of energy policies… What about interactions between climate mitigation and adaptation policies? | Noted. |
| 15548 | 15 | 61 | 1 | | | Schmidt and Marschinski (2009) note that new technologies (e.g. mobile telephones) have often reached a stage where economies of scale in production, and the incentive of rising returns to R&D as output rises, have started to reduce costs fast enough to permit very rapid diffusion throughout the economy. Using a model of energy generation in which R&D responds positively to rising returns and there are several market failures, they find that multiple equilibria are possible, and policy instruments have to be used to push the world economy towards an equilibrium with high renewable energy use. The optimal policy mix entails a tax on fossil energy, a R&D subsidy, an investment subsidy and a fee for employing initial public knowledge equal to the patent fee charged for private knowledge. Acemoglu et al. (2012) examine technical change that responds to the relative incentives across industry sectors, in a growth model with environmental constraints and limited resources. Technical change has to be encouraged in 'green' sectors rather than sectors producing greenhouse gas emissions. They show that profit taxes or other instruments are required in addition to a carbon tax, such as taxes on fossil-fuel energy production and innovation. But if renewables and fossil fuels are sufficiently substitutable as inputs to production, fossil-fuel energy production and innovation only has to be taxed temporarily, until the increased incentive for R&D in renewables has reduced their production costs enough to switch the economy on to a low-emissions growth path. Acemoglu, Daron, Philippe Aghion, Leonardo Bursztyn, and David Hemous. 2012. "The Environment and Directed Technical Change." American Economic Review, 102(1), pages 131–66. Schmidt, R.C. and R. Marschinski (2009). "A Model of Technological Breakthrough in the Renewable Energy Sector." Ecological Economics 69 (2), pages 435-444. | Noted. This applies to 15.6. |
| 12025 | 15 | 62 | 11 | 62 | 19 | In reality, there exists variations for a set of products. While marginal abatement costs are not necessarily attributed to each product line. Product standards work as clear signals for the market and facilitate competition. The argument here is too theoretical which works only in a situation that only one non variable good is produced by (a) company(ies). | Noted. |
| 6158 | 15 | 62 | 32 | 62 | 32 | Add after "Overall emissions fall", "However, in this case cost effectiveness is dilluted as MAC is not be equalized amongst players". | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5274 | 15 | 62 | 33 | 62 | 43 | too economic oriented ! take out and replace with on line 43: One issue in an institution is the 'cost' of learning or having to learn to deal with new issues. Hence, for example, in France local administration have to learn to transform their daily operations into climate friendly objectives and methods while they are also imposed by the central government to develop adaptation strategies without even knowing what type of effects or depth of effects nor when CC will have on their territory. Having to deal with both at the same time appears very difficult. | Noted. |
| 15549 | 15 | 62 | | | | In principle, both carbon pricing and support for renewable energy reduce the cost gap between renewable and conventional electricity generation. But if both are applied simultaneously, their impacts may not be the same as the sum of each implemented separately (De Miera et al., 2008; De Jonghe et al., 2009). The interactions of technology-specific policies – including renewable portfolio standards and feed-in tariffs – with market mechanisms such as a carbon tax, if not properly anticipated by policy-makers, can undermine the efficacy of each individual policy tool, and the suite of climate policies overall (Sorrel and Sijm, 2003; Rathmann, 2007).<br><br>If quantity-based tools (such as quota-based instruments) are used to pursue both climate-change mitigation and renewables objectives, it is possible that the permit price for one scheme will fall to zero (Unger and Ahlgren, 2005; De Jonghe et al., 2009). Conversely, if one price-based and one quantity-based measure are used (e.g. a carbon tax and a renewable portfolio standard), the fixed price imposed by one measure could influence the market price of the quantity-based measure in undesirable ways. Hence coordination of policy instruments and an appreciation of how they will interact are crucial, both at the initial stages of policy formation and later, when circumstances change and uncertainties diminish (or increase) (De Jonghe et al., 2009; Rathmann, 2007; Blyth et al., 2009; Verbruggen and Lauber, 2009).<br><br>One way in which renewables policies may affect the carbon objective is through their indirect impact on the carbon price. By substituting electricity generation away from fossil fuels, renewable mandates reduce the electric sector's overall CO2 emissions. If there is an existing cap on emissions, this reduces the sectoral demand for allowances, and along with it the carbon price. A lower carbon price means that electricity producers' costs decrease, the marginal cost curve shifts, and wholesale electricity prices decrease (Rathmann, 2007; De Jonghe et al., 2009; Stankeviciute and Criqui, 2008). That contributes to a 'rebound' effect, tending to increase energy demand. If the potential impact of renewables policies on emissions is not considered at the time that the emissions cap is set, their impact is likely to be entirely offset by this and other induced increases in demand. Introducing financial support for renewables in addition to a carbon price signal, without adjusting the overall cap on emissions, will tend to lower the carbon price, because it reduces the level of abatement required from emissions sources within the trading scheme. The supply of allowances is fixed by the cap and the price of allowances will fall to bring the demand for allowances back into balance with the supply; the renewables support will just have redistributed the sources of emissions. Policy can therefore fall into a trap in which carbon markets appear more and more insufficient on their own, apparently justifying more and more direct, technology-specific, support (Blyth et al., 2009). The weakened carbon price signal can then point path-dependent technological development and investment away from low-carbon technologies.<br><br>In principle, both carbon pricing and support for renewable energy reduce the cost gap between renewable and conventional electricity generation. But if both are applied simultaneously, their impacts may not be the same as the sum of each implemented separately (De Miera et al., 2008; De Jonghe et al., 2009). The interactions of technology-specific policies – including renewable portfolio standards and feed-in tariffs – with market mechanisms such as a carbon tax, if not properly anticipated by policy-makers, can undermine the efficacy of each individual policy tool, and the suite of climate policies overall (Sorrel and Sijm, 2003; Rathmann, 2007) | Noted. |
| 15735 | 15 | 62 | | 62 | | Policies at the same jurisdictional level also can yield problematic interactions: also at different jurisdictional levels. Eg an EU policy can interact with a national policy… | Accepted - this is now covered in SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17662 | 15 | 62 | 1 | | | This subsection should be based on a larger set of references. An example could be:<br>Fankhauser, Samuel and Hepburn, Cameron and Park, Jisung (2011) Combining multiple climate policy instruments: how not to do it. Centre for Climate Change Economics and Policy and Grantham Research Institute on Climate Change and the Environment working papers, 38. Centre for Climate Change Economics and Policy and Grantham Research Institute on Climate Change and the Environment, London, UK | Accepted. Section modified and some references added. |
| 5016 | 15 | 63 | 1 | 63 | 49 | CO2 mitigation action may not be taken without global scale regulation, but energy savings will be a different issue, because energy savings will bring economical and national security benefit even if the action is independent from other countries. Therefore, mitigation should focus on energy savings (efficiency improvement). This is no regret strategy. This argument is further explained in the following paper: "The Hartwell Paper, A new direction for climate policy after the crash of 2009", Gwyn Prins et al., Institute for Science, Innovation and Society, University of Oxford and Mackinder Program for the Study of Long Wave Events, London School of Economics, (May 2010) | No longer applies to revised 15.8 |
| 18757 | 15 | 63 | 24 | | | the benefits of "less hierarchical and collaborative forms of governance" are cited; but earlier on the page, Ostrom is quoted invoking the importance of trust in agreed-upon action. Omitted is any discussion of the value and importance of formal arrangements and law precisely in fostering such trust and channeling expectations with a higher degree of reliablity (due to formal procedures and threat of penalties for non-compliance). It is almost counterintuitive to suggest that informal governance is better able to instil trust when the very justification of law (e.g. a formal contract rather than an informal "gentlemens' agreement") is that it is more predictable and creates greater stability; and when often enough, legally vested rights and procedures are needed to ensure that the less economically or politically powerful stakeholders are engaged and involved through public participation, access to information and other LEGAL rules. Different positions have admittedly been taken on this question, but in this case an entire dicipline's relevance is simply blended out and thereby essentially marginalized. | No longer applies to revised 15.8 |
| 6776 | 15 | 63 | 30 | | 37 | Although it is described that multiple benefits are created by diverse actions such as cost savings and the creation of green jobs, in fact it is very difficult to create multiple benefits. Accorng to Tol (2012) [1], it is wishful thinking that green energy will solve the probrems probrems of sluggish growth, high unemployment, peak oil, energy security and climate change.<br><br>[1] Tol, Richard (2012) Green Growth: Killing Five Birds with One Stone? In Intereconomics. Volume 47, Number 3, 151-154. Springer Berlin / Heidelberg | Noted. |
| 18492 | 15 | 63 | | | | The quality and structure of the subsections in 15.8 varies widely, beginning with a very strong discussion of local and municpal level policies. The discussion of state and perfectural level policies (15.8.2.2 and 15.8.3) could use substantial effort to bring it up to a comparable quality. | Noted. 15.8 has been entirely rewritten. Much of it has been moved to 15.2. what remains is more tightly focused. |
| 8357 | 15 | 64 | 1 | 66 | 8 | How about adding table which shows regional, national and local/state mitigation target. For example, EU/UK/London, USA/California/LA etc. | Noted. |
| 18493 | 15 | 64 | 6 | | | Please compare text with that in Chapter 12 (Section 12.6 pages 36-43). The topic is the same - consistency would need to be assured, and duplications minimized. | Noted. |
| 3133 | 15 | 65 | | | | there is no reference to the figure and the C40 in the text - need to explain what the C40 are | Noted. |
| 5911 | 15 | 65 | | | | Figure is not referenced in the text, can be deleted. | Noted. |
| 15601 | 15 | 65 | 21 | 65 | 26 | Data about state actions can be updated by checking out: http://www.c2es.org/us-states-regions/policy-maps | Noted. |
| 18758 | 15 | 65 | 27 | 65 | 30 | RGGI is no longer an effort to develop a carbon market, it is an existing market that has seen active trading since January 2009; moreover, since 2011, it no longer consists of 10 states given the departure of New Jersey. Here, reliance on older sources resulted in a factual inaccuracy, but the cited website (www.rggi.org) contains sufficient material to update the above statements. | No longer applies to revised 15.8 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 3134 | 15 | 65 | 31 | | | surely Tokyo example is municipal, so should be in previous section. Could use other examples here, e.g. German Laender (states) - most of which have climate change targets and policies (see [in German] http://www.umweltdaten.de/publikationen/fpdf-l/4146.pdf) | Noted. |
| 13723 | 15 | 65 | 31 | 66 | 5 | Move text on Tokyo emissions trading system into section 15.5.4 | Noted. |
| 5275 | 15 | 65 | 4 | | | add: It is also a matter of recognising and addressing the ways in which CC impacts the understanding and the cultures of the processes of urban development and infrastructural provision in the urban context. | Noted. |
| 2313 | 15 | 65 | 28 | 65 | 30 | Actually the actual reduction in RGGI emissions has been pretty dramatic. According to official data "CO2 emissions in the RGGI region have declined from approximately 184.4 million tons in 2005 to 123.7 million tons in 2009, or 33 percent." see "Relative Effects of Various Factors on RGGI Electricity Sector CO2 Emissions:2009 Compared to 2005<br>Draft White Paper – 11/2/10" available at: www.rggi.org/docs/Retrospective_Analysis_Draft_White_Paper.pdf | No longer applies to revised 15.8 |
| 2960 | 15 | 66 | 48 | | | I don't understand what ther reference to "24 businesses" means. Is the idea to be able to make more use of baseline power through night operations? Or what? | No longer applies to revised 15.8 |
| 18759 | 15 | 66 | 7 | 66 | 8 | Since the political shift after the midterm elections of 2010 at state and local level, the states mentioned (Arizona, New Mexico, Oregon and Washington) have all abandoned plans to develop emissions trading/cap-and-trade systems. | Noted. |
| 5276 | 15 | 67 | 44 | | | ADD: Several non financial factors play a role in this: perceived political gain and losses, image, and objectives; local definitions and perceptions of quality of life; taking into account poorer people, competition between innovative cities…. | Noted. |
| 3135 | 15 | 67 | | | | too many US examples (except the brief mention of Sao Paulo at the end) | Noted. |
| 13235 | 15 | 68 | 13 | 69 | 25 | The discussion of overlapping policies at national and sub-national level (in particular with a national cap-and-trade scheme) should acknowledge that subnational policies have the effect of shifting the composition of overall abatement under the national cap between regions and sectors, and in many cases this is the desired effecxt. The same goes for sectoral policies (eg renewable energy targets). The overall cap and permit trading price is simply the residual policy action after subordinated policies take their effect. Indeed, this is less efficient than the theoretical ideal of having only a cap and trade scheme; but in reality there will always be specific policies that have an impact on emissions levels. | Accepted; text modified |
| 2961 | 15 | 68 | 20 | | 42 | It seems to me that leakage deserves more discussion than this. It's a significant issue for policymakers. A good starting point would be Joshua Elliott et al., Unilateral Carbon Taxes, Border Tax Adjustments and Carbon Leakage (2012), available at http://ssrn.com/abstract=2072696. | Accepted. Leakage is now covered in other chapters, including chapters 3 and 5 |
| 5018 | 15 | 68 | 13 | 69 | 25 | The leakage issue is a fundamenal flaw in the current mitigation policies, which only focus on process emission (carbon production) and pay no or little attention to carbon consumption. Policy coordination and creative accounting methodology are needed not only amon nations but also between local and central governments. The issue is elaborated in the following paper: "Climate-change policy: why has so little been achieved?", Dieter Helm, Oxford Review of Economic Policy, Volume 24, Number 2, 2008, pp.211-238. | Noted. |
| 3136 | 15 | 69 | 27 | | | the Convention' - first mention needs to spell out that this is the UNFCCC, then can refer to 'the Convention' subsequently. | Noted. The reference to the UNFCCC and the Convention is no longer included |
| 5277 | 15 | 69 | 6 | | | ADD: In France, some adaptation packages in the territorial climate and energy plans serve this purpose of experimentations to see if they are replicable on other territories with different natural and socio economic and political conditions | Noted. |
| 4998 | 15 | 7 | 15 | 8 | 25 | This introduction should be much more concise and simple to be less than two paragraphs. | Noted. |
| 12930 | 15 | 7 | 27 | 8 | 19 | This material can be dramatically shortened: I suggest that it is not necessary to summarise results here: a very short presentation of the chapter content is enough. | Noted. Will be rewritten. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12044 | 15 | 7 | 27 | 7 | 44 | The paragraphs seem to already include main findings (repetitive to the executive summary) instead of providing the background of the analysis and guidance on the logic of the document. Also for the sake of shortening the document it would be advisable to concentrate on providing the framing for the analysis and rationale for the structure of the chapter. Text between lines 27 and 44 could be deleted. | Noted. Will be rewritten. |
| 6133 | 15 | 7 | 28 | 7 | 29 | The text describes as "standards for appliances and buildings to promote energy efficiency". How about adding "automobile" between appliances and buildings. It is proved that introduction of fuel standard for automobile is effective (refer to lines 2-3 of page 30 of this chapter). | Noted. Will be rewritten. |
| 13755 | 15 | 7 | 32 | 8 | 22 | This material presents a summary, not introduction. Please merge with summary. | Noted. Will be rewritten. |
| 13229 | 15 | 7 | 32 | 7 | 36 | Tradeable permits "main advantage cost-effectiveness": the same goes for emissions taxes. In addition, a key advantage of tradable permits in practice is that they allow an emissions price to be formed in markets, which is the strong preference of many governments and many industry stakeholders. | Noted. |
| 13708 | 15 | 7 | 35 | 7 | 36 | Replace by "Emissions trading and project-based offset systems have spread rapidly since the mid-2000s and triggered cost effective reductions. However, allocation of allowances is prone to political influences that can lead to negative redistributionary impacts". | Noted. |
| 6134 | 15 | 7 | 35 | 7 | 35 | what does "increasing in frequency" mean? | Noted. |
| 13709 | 15 | 7 | 37 | 7 | 44 | Replace by "Voluntary agreements require a credible threat of regulation in order to be environmentally effective. A governmental review or consultation process during implementation, as well as accompanying measures such as subsidies for energy audits and equipment can improve their performance. Under these conditions they provide high flexibility and are politically feasible." | Accepted. Regulatory threats are mentioned. |
| 7792 | 15 | 7 | 37 | | 44 | Support the descriptions on the achievements through Voluntary Action Plan in Japan cited as (Tanigawa, 2004) and (Sugino and Arimura 2011). In addition to these documents, Yamaguchi M. (2012) also proved that voluntary approaches “may work well” in various business cultures and traditions.<br>Besides, Chen and Hu (2012) proved that voluntary GHG programs in Taiwan achieved “actual CO2 reductions highly exceed target goals, e.g., 33% more than the target value of 4.02 Mt during the 5 year span for the six industrial sectors”.<br><br>(Chapter 7 of “Climate Change Mitigation – A Balanced Approach to Climate Change-” Mitsutsune Yamaguchi, et al,, Springer (2012))<br>(“Voluntary GHG reduction of industrial sectors in Taiwan” Liang-Tung Chen and Allen H. Hu Chemosphere 88 (2012) | Accepted. Literature added. in section 15.5.5 |
| 15561 | 15 | 7 | 38 | | | Voluntary agreements have (the potential to?) be… | Accepted. Text modified in section |
| 6135 | 15 | 7 | 38 | 7 | 38 | It is empirically true that a voluntary agreement can be environmentally effective in several regions. However, evidence is needed to prove it have been cost effective. MAC will never be equalized. | Noted. Literature suggest mostly low to negative costs opporutnities were addressed by VA, as such costs are not |
| 12022 | 15 | 7 | 39 | 44 | | With regard to VA, fear of lost reputation works very significantly as well. | Accepted. Text modified accordingly in |
| 10038 | 15 | 7 | 41 | 7 | 44 | This part should be deleted completely because there are successful examples of "voluntary target scheme" in the world. Each industry in Japan has voluntary target and the voluntary target scheme has played a big role, as described in (Yamaguchi, 2012, page35 and 154), (Manuel, 2010, page 6 and 13), and (Yamaguchi, 2010, abstract). In addition, there is also a successful example of "voluntary target scheme" in Netherlands, as shown in (Martijin, 2002, page162). These literatures are listed in the No63 line of this table. | Accepted. Text modified accrodingly |
| 18467 | 15 | 7 | | | | The introduction comprises a lot of the same text as the Executive Summary. It would be more useful (and would save space) to shift the results of Ch 15 that currently appear in the intro to the Executive Summary (or simply to remove the duplicated text), and focus the introduction only on drawing a map of the chapter for the reader including e.g. an explanation of how sections 15.5 and 15.6 fit together. (There's already great text on this on p. 49 at the beginning of 15.6.1 - you could use that!) | Accepted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18715 | 15 | 7 | 16 | 7 | 17 | Broad wording "the diversity of institutional and governance structures that have been created across the world" suggests it might include governance levels other than the domestic (national and subnational); specification may be needed ("the diversity of national and subnational ... structures") | Accepted. |
| 18494 | 15 | 70 | | 71 | | There is not a single reference in 15.9. Section should be rewritten to clearly focus on the peer-reviewed literature on the national considerations for capacity building. | The revised version has now been based on peer reviewed materials and more |
| 9918 | 15 | 70 | 5 | | | An analysis of 104 empirical studies of innovation to change showed the following barriers, that could refine and structure the discussion of barriers:<br>Issues of resourcing (76%), for instance, “not enough resources” (Post and Altman 1994), “lack of adequate resources such as time and staff” (Adams and McNicholas 2007), limited or no budgeting (e.g. Harris 2000 and Anumba et al. 2006), access to capital and lack of time (Rohdin and Thollander 2006).<br>Issues of capabilities (75%), for instance, “low technology literacy” (Stewart, Mohamed and Marosszeky 2004), “ill-equipped in terms of training and expertise” (Whitaker 1987), “employees are not trained” (Tamimi and Sebastianelli 1998), “lack of understanding” (Waldron 2005), “lack of technical skills” (Rohdin and Thollander 2006), “lack of skill, knowledge and expertise” (Kirkland and Thompson 1999), etc.<br>Issues of communication (64%), for instance, “communication barriers” (Heide, Grønhaug and Johannessen 2002), “communication overload and distortion” (Allen 2002), “lack of communication within the team” (Attaran and Nguyen 1999), “lack of communication among those sharing responsibility for different aspects” (Kunda and Brooks 2000), “poor communication practices that damaged employee commitment to projects” (Jacobs et al. 2006), “tension among departments arising from the incompatibility of actual or desired responses” (Aggarwal 2003), etc.<br>Issues of organizational structure (62%), for instance, bureaucracy (e.g. Molinsky 1999; Borins 2000; Abdul-Hadi, Al-Sudairi and Alqahtani 2005), “salary structure” (Al-Qirim 2007), “complexity, centralization, and formalization”(e.g. Allen 2002), “rigid organizational boundaries” (Butler 2006), “departmental fortresses” (Cicmil 1999), and organizational structure (e.g. Scarbrough and Lannon 1988; McGaughey and Snyde 1994; Yauch and Steudel 2002).<br>Abdul-Hadi, N., Al-Sudairi, A. und Alqahtani, S. (2005): Prioritizing barriers to successful business process re-engineering (BPR) efforts in Saudi Arabian construction industry, In: Construction Management \& Economics, Vol. 23, Nr. 3, S. 305-315.<br>Adams, C.A. und McNicholas, P. (2007): Making a difference: Sustainability reporting, accountability and organisational change, In: Accounting, Auditing and Accountability Journal, Vol. 20, Nr. 3, S. 382-402.<br>Aggarwal, N. (2003): Organizational Barriers to Market Orientation, In: Journal of Management Research, Vol. 3, Nr. 2, S. 87-97.<br>Allen, R.Y.W. (2002): Assessing the impediments to organizational change: A view of community policing, In: Journal of Criminal Justic, Vol. 30, Nr. 6, S. 511-517.<br>Al-Qirim, N. (2007): The adoption and diffusion of E-commerce in developing countries: The case of an NGO in Jordan, In: Information Technology for Development, Vol. 13, Nr. 2, S. 107-131.<br>Anumba, C.E.H., et al. (2006): Understanding structural and cultural impediments to ICT system integration: A GIS-based case study, In: Engineering Construction & Architectural Management, Vol. 13, Nr. 6, S. 616-633.<br>Attaran, M. und Nguyen, T.T. (1999): Design and implementation of self-directed process teams, In: Management Decision, Vol. 37, Nr. 7, S. 553-561.<br>Borins, S. (2000): What Border? Public Management Innovation in the United States and Canada, In: Journal of Policy Analysis and Management, Vol. 19, Nr. 1, S. 46-74.<br>Butler, J.C. (2006): Ten Lessons Learned: Data Warehouse Development Project, California Department of Fish and Game, In: CrossTalk: The Journal of Defense Software Engineering, Vol. 19, Nr. 10, S. 16-20. | The comments on the barriers are noted and appreciated. As a result of the Las discussions at Vigo, barriers are no longer prominent in the revised draft. |
| 5278 | 15 | 70 | 5 | | | ADD: to the institutional barriers? add: sectoral approach by services, lack of competence, low priority given to CC, lack of translation of knowledge into practices/policies, lack of policy enforcement, political ideology, | There are indeed numerous barriers. The comments on the barriers are noted and appreciated. As a result of the LAs discussions at Vigo, barriers are no |
| 6159 | 15 | 71 | 29 | 71 | 29 | After Aaheim et al. 2009, "Section 1.4.5 of this report". | Done |

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| 6160 | 15 | 71 | 30 | 71 | 30 | It seems like the term policies mean policies for adaptation. If so please make it clear. If not also meke it clear. | Done |
| 6713 | 15 | 71 | 9 | | | "Food policies" is important, but it is one of many other important climate policies. It is not adequate to pick up only "food policies" here. | Comment is noted. This is a typo error, should have been "good" policies rather |
| 5280 | 15 | 72 | 12 | | | ADD: it also means, for policy makers a new policy culture that take into account probable and uncertain local and long term/future impacts of CC and integrate this into an ecosocial system vulnerability analysis … | Good comment, but it would be difficult to support an appropriate claim with the |
| 5279 | 15 | 72 | 36 | | | ADD: France has decided to legally oblige communities of 50 000 and over to integrate adaptation as well as clean energy objectives in all planning documents while leaving 'free' the methods by which these will be attained, following a territorially based analysis of both GHG emission quantity and sources and adaptation strategy (following a natural vulnerability analysis). This vulnerability includes in some of the most experimental territories an analysis of the social, institutional and economic activities and vulnerabilities. But adaptation raises a key issue for policy making: profoundly anchored in specific territories, it remains difficult to develop nation wide adaptation strategies that go beyond simple statement of general objectives… | Good comment, but it would be difficult to support an appropriate claim with the relevant literature. Moreover, LAs were instructed not to rely on government documents; everything should come from peer-reviewed academic literature. |
| 12208 | 15 | 73 | 21ff | | | You write that 'particularly the BASIC countries and emerging economies have set up financing schemes'.<br>1.) What are financing schemes? Do you e.g. refer to sources of finance, instututions, facilities or funds? (compare also Table 15.4 - here you say "sources of climate finance";<br>2.) Is your statement ('particular') justified and based on counting countries? What about countries like Bangladesh, Philippines, Ethiopia, Rwanda, countries that establish an NIE under the AF etc.? | Noted. Revised to reflect comment. |
| 5281 | 15 | 73 | 7 | | | COMMENT I entirely disagree: since 2004-2005 almost all UNEP, UNDP, EU and World Bank texts on development and aid integrate CC mitigation and energy (such as in the Millennium development goals). Some national development agencies are following the lead.PNUD. Human Development Report 2007/2008. Oxford University Press, 2008. 399 p.<br>PNUE. Assessment of Impacts and Adaptation to Climate Change Final Report of the AIACC Project. 2007, 250 p.<br>UNEP. CCCC. Kick the habit. A guide to climate neutrality. PNUE. 2008. 202 p.<br>UNEP. Human Development Report, 2007/2008.<br>World Bank. Towards a strategic framework on climate change and development for the World Bank Group. Concept and issues paper consultation draft. 2008. 46 p. | Indeed, development agencies adopted documents to acknowledge the need to support mitigation and adaptation problems. Nevertheless, there is little evidence that these documents resulted in concrete steps analyzed in peer-reviewed literature |
| 6714 | 15 | 74 | 2 | | | It is better to clarify the criteria of picking up these eight funding mechanisms among others. I am afraid that the list is old. Also it is better to write the ending year if it is fixed in "Operational date". Now the start year is only mentioned. For example, Hatoyama initiative is declared at COP15 which says that "As for assistance up to 2012, under this initiative Japan will provide financial assistance to developing countries". | Noted. Already covered in Chapters 13 and 16. Section therefore revised to delete. Subject no more appropriate here. Nevertheless, note that not all the |
| 12209 | 15 | 74 | 8 | | | On your statement "Most low-income...."<br>1. Compare comment 73/line 21ff; your statement is unclear as it is not clear what you mean by 'financing scheme' and the conclusion that these countries rely on multilateral funds e.g. Do you refer to the institutions e.g. or do you refer to the sources of finance? There is a difference between the source of funding and the institutional set-up for distributing it.<br>2. If you refer to financing schemes in the sense of institutions then your sentence is not correct. Every country has institutions and public financial management systems in place, which are i.a. being used to channel funds from development cooperation. | Noted but not necessarily agreeing to your point of view. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12210 | 15 | 74 | 9 | | | a) You make very general statements and suggest conclusions on the state of climate change policies and implementation in developing countries which are not based on arguments and which are not based on scientific findings. ("Besides, the policies.....Such somehow renders their national climate change policies ineffective and susceptible to external risks". (what kind of external risks)<br>b) You implicitly suggest that a dedicated climate change fund is a prerequisite for effectiveness. This is not a scientific finding and evaluations. Many countries are still in the process of setting up dedicated institutional arrangements and it is too premature to draw any conclusion on the quality of operations and impacts e.g. | Noted and corrected. |
| 5282 | 15 | 75 | | | | TAKE OUT figure 15.5 or formalise style | Accepted. Figure deleted |
| 6718 | 15 | 75 | 11 | 75 | 14 | It is often said that "More immediate priorities such as access to water, food security and energy have been the main drivers for climate change agenda." However, it is not clear how "access to water" drives climate change agenda. In Chapter 15, several water issues are discussed. They are irrigation, water-use regulation for ethanol production, ability to raise prices for water, water conservation, water quality and projects to improve water supply to cope with lower and irregular rainfall. No explanation of link "access to water" with climate policy. Please explain how "access to water" drives climate policy. Also please explain what "skill leadership" means to drive climate policy from the points of water, food security and energy. | Noted. However space allowed is too short to provide detailed explanations. |
| 12211 | 15 | 75 | 15 | | | You state that national institutions dedicated to climate change are more successful if such institutions or agencies are coherent with cabinet entities...."<br>Compare my comment on page 74/line 9: I think there is little scientific evidence for such a general statement which suggests that this is the best option for every country. | Note however that there a lot of experiences taking place in developing countries which are not necessarily covered by scientific literature. Such good policies cannot be swept under the carpet under the guise of "not covered |
| 12213 | 15 | 75 | 22 | | | I thought the primary role and function of the IPCC is to synthesize existing scientific literature and debates. Unless the suggestions presented here reflect a scientific debate - if so pls. insert the respective literature - the task of drawing conclusions should be left to political debates. | Accepted. Suggestions deleted. |
| 18495 | 15 | 75 | 22 | 75 | 41 | Please be careful with policy prescriptive language (e.g. wording such as 'should', 'suggestions', 'recommendations'). Note the IPCC assesses literature and is therefore policy relevant, but not policy prescriptive. | Accepted. Suggestions deleted. |
| 12212 | 15 | 75 | 75 | | | On this point: There is a huge body of literature - besides the two you are refering to and which are missing in the list of references- on the topic of aid or development effectiveness or public financial management just to cite two relevant fields. It is not clear why you draw this and not another equally relevant/possible conclusion. | Noted. Some of the literature you are referring had already been covered in Chapter 13 and also quoted by the two references cited in their papers. One |
| 2319 | 15 | 75 | 43 | 75 | 43 | The data gap is a very important issue that must not be forgotten. The current statistic information did not help the analysis of the mitigation and adaptation needs and activities. For this reason the absence of this kind of data sources, and the necessity to face and solve this lack of information, should be an important outcome in all the chapters that must lead with the financial issues in the AR5.This is a very important issue that must not forgotten. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 3284 | 15 | 76 | 1 | | | It is a good idea to have introduced more than two categories of policies. ....(continues)<br><br>It may be, though, a good idea to give the author(s) more time to refine the proposed categrisation of policies asking him(her, them) to refer to many of other similar multi-faceted policy categorisation proposals.<br><br>For example, World Business Council for Sustainable Development(WBCSD) has proposed in its publication, WBCSD(2010) "Enabling frameworks for technology diffusion", five categries of national policies:<br><br>1) Strong signals from governments towards toward low-carbon growth, either through national targets or regulartory measures.<br>2) Adequate institutional and regulatory frameworks to support technology development and/or deployment<br>3) Adequate absorptive capacity<br>4) Economic and financial incentives, such as funding, financing, fiscal or tax measures and the absence of perverse subsidies or trade barriers.<br>5) Removal of barriers to energy efficiency.<br><br>It seems to me that the draft proposal only refers to 4), 5) and 2). The author(s) might have the cost-curb of McKinsey & Company in his(her, their) mind(s), which is good, but the world may be more complicated. | Noted. Text modified |
| 13622 | 15 | 76 | 15 | | 18 | See comment 61 above | Rejected. As comments are not given |
| 18496 | 15 | 76 | 3 | 76 | 8 | It is unclear upon what this text is based, and why it is placed here. The output of Section 15.5 does not come up with the same conclusions, and the terminology is inconsistent with that laid out in 15.3 for evaluating policies. The figure is logistically inconsistent, and seems to make recommendations that again do not match the output of the chapter (e.g. sequential policy steps, starting with carbon pricing?)? I would recommend removing this entire 1/2 page including the figure. | accepted. Text modified. |
| 2320 | 15 | 76 | 1 | 76 | 6 | The logics of the graphic and steps should be clarified, must be explained that, those steps are a very, very small example of options in reducing GHG emissions. | Accepted. But graph will be deleted in SOD |
| 14308 | 15 | 77 | 1 | 77 | 24 | These are similar to the 3 legs of an effective policy framework identified by the Stern Review (carbon pricing, technology policy, and removing barriers to change (e.g. behavioural)). See http://webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/sternreview_index.htm | Noted. Text modified using the reference. |
| 5017 | 15 | 77 | 10 | 77 | 19 | In addition to the three measures described in this paragraph, domestic competition among players within local market will be a very important incentive/mechanism for efficiency improvement. Fuel efficiency improvement among Japanese automotive companies has been accelelated by severe competition among the companies to be the best among competitors. The role of domestic competition for technology innovation is explained in the following paper: “Success as the Source of Failure? Competition and Cooperation in Japanese Economy”, Hiroyuki Tezuka, Sloan Management Review, Winter 1997 (Vol.38 No2), Cambridge, MA | Accepted. This is covered in transport section (ch8) |
| 5283 | 15 | 77 | 12 | | | processing information... ADD: Firms and individuals’ behaviours are not only economically rational, they use multiple rationalities, only in part owing to: costs of acquiring and processing information; social and individual representations, values, beliefs and ideas about CC, its impacts and especially about an individual’s capacity to act and have an effect on CC are key. | Noted. But due to space limit the text has to be simple |
| 5284 | 15 | 77 | 13 | | | COMMENT: This phenomenon has become widely known in terms of behaviourial economics since the AR4. / The links beteween information, rationalities, decisions and behaviours have been a major subject of study for a century in sociology why mention specifically behavioural economics? | Noted. Text deleted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13230 | 15 | 8 | 11 | 8 | 12 | Sub-national initiatives "backed by theoretical literature": I doubt that the theoretical literature had much influence in spawning sub-national initiatives. Rather, sub-national initiatives are usually borne out of a political will or impetus for sub-national governments to make some tangible contribution on climate change mitigation. They are often in conflict with national policies, or contribute nothing extra in aggregate, but cater to local preferences. | Noted. |
| 10225 | 15 | 8 | 17 | 8 | 18 | Isn't this leakage? | Noted. |
| 2944 | 15 | 8 | 20 | 8 | 22 | "the link is not obvious" isn't very informative. Even "complex" would be better. | Noted. |
| 10226 | 15 | 8 | 21 | 22 | | There is also a huge potential for conlict/trade-offs in this sector/domain, i.e. bioenergy or food production, reforestation/afforestation or bioenergy/food, urbanization or agroforestry etc. (also relevent for p. 7, l. 11-13) | Noted. |
| 14879 | 15 | 8 | 27 | 9 | 15 | a graph depicting the relation between institution, governance, policy and paradigms would be helpful | Noted. |
| 12045 | 15 | 8 | 4 | 8 | 19 | See comment 2: these paragraphs also already include conclusions and should be moved to the conclusions section or deleted. At this point in the chapter they are not yet sufficiently supported by analysis. | Noted. This is a definition of institutions and governance and an explanation of how governance shapes policy. Will |
| 11081 | 15 | 8 | 9 | 8 | 10 | This is very true. Tradable permit programmes are not only problematic but also very vulnerable when policy cordination is imperfect, which is always the case in the real world. | Noted. Will be rewritten. |
| 6136 | 15 | 8 | 9 | 8 | 10 | Some reasons or evidence may be necessary to probe why tradeable programs are particularly problematic when policy coordination is imperfect. One example I can think of is the case where, in one hand, cap and trade policy is adopted, and on the other hand, renewable obligation or energy efficiency standard are introduced applying to the same players or sectors. | Noted. |
| 18468 | 15 | 8 | | | | A lot of terminology is used in this section that is not clarified, e.g. legislation, plans, policies, strategies. Please clarify their differences up front. Consistent application of these terms throughout the chapter would be ideal. | Accepted |
| 18470 | 15 | 8 | | | | This section is currently 14 pages. A lot of the messages of the sectin get lost in examples which are sometimes unclear how they relate to the rest of the chapter. It may be useful to significantly shorten the section (to e.g. max 6-7 pages) and focus on pulling out the key messages. | Accepted |
| 18716 | 15 | 8 | 42 | 8 | 42 | "how these decisions are made, and whether and" - I would add: "how these decisions are made, HOW WELL THEY WORK, and whether and" | Accepted |
| 18717 | 15 | 9 | 23 | 9 | 25 | "In many (though not all) high-per-capita-emission developed countries, provincial and local governments have been active in autonomously developing the policy framework for climate mitigation." My observation has been that in developed countries, the impetus also often flows from the national/centralized level: I am e.g. thinking of all major renewable energy and energy efficiency legislation as well as energy taxation and emissions trading in Germany, where the federate Länder merely implement the nationally defined objectives; or the comprehensive national climate laws in many countries; or the (albeit failed) Waxman-Markey/Lieberman-Kerry legislative initiatives in the United States, and the current fallback to EPA regulations for emissions from mobile and stationary sources; or indeed throughout Europe the inordinately influential role of the EU in adopting governance frameworks for climate policy that are then manadatory to the (national governments of the) Member States. So while the local and provincial levels are undoubtedly important, I would not contrast their role to that in developing countries so emphatically | Accepted: emphasis changed |
| 12047 | 15 | 9 | 26 | 9 | 28 | The last two sentences of the paragraph don't fit in the logic of the text before and 'drop out of the sky' without clear line of argumentation. In general the paragraph lacks references. | Accepted |
| 12048 | 15 | 9 | 30 | 9 | 30 | The term "proliferation" of policies seems inappropriate at this point, as it indicates a negative, unnecessary or unintended development. If the intention of the authors is to criticise the development of more and more climate policies they need to be more specific and provide argumentation for that. Same applies to the title for section 15.8.2 | Accepted |
| 15730 | 15 | 9 | 37 | 9 | 37 | "EU Directives provide the basis for national actions in several European countries". In all! EU countries. There are almost no national actions in EU 27 that are not based on an EU policy framework… | Not applicable now - table removed |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5251 | 15 | 9 | 48 | 10 | 2 | The UK's Climate Change Act is based upon a false and dishonest prospectus. The fancy emissions reductions targets completely overlook those emissions 'embedded' in imports. They are therefore ludicrous, as will be seen from further comments below. For this reason the whole section as it relates to industrialised countries is grossly misleading and needs to be rewritten. | The chapter welcomes all comments and will ensure that all data used is references |
| 5260 | 15 | 9 | 8 | 9 | 9 | ADD: Young (2006) shows that an institution's identity and structure can prevent it from reaching environmental objectives (institutional misfit). Important factors playing a role are: spatial and temporal which require institutional culture to adapt to ecological time (long term) and spatial (both local and global but differentiated at the local levels) Young et Ekstrom (2009). | Added selective citations |
| 2816 | 15 | 9 | | 22 | | Catalogue of national legislation excludes notably Israel and Guyana. Climate plans for these countries are summarised in Clapp et al (2010)("Low Emission Development Strategies", OECD/IEA, http://www.oecd.org/env/climatechange/46553489.pdf ), with references to source documents for both countries. see e.g. table on pgs 25-26 of Clapp et al | Not applicable now - table removed |
| 2817 | 15 | 9 | 29 | 10 | 14 | Criteria for evaluating success of national climate plans are proposed in Clapp et al (2010) "Low Emission Development Strategies", OECD/IEA, http://www.oecd.org/env/climatechange/46553489.pdf, which include e.g. linkages to national budget, integration with development and economic strategies (see pg 18 of Clapp et al). | Incorporated into SOD |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 5261 | 15 | 9 | 29 | | | ADD: Some French cities started implemented local climate plans or climate strategies in 2006. But in 2012, the national government established compulsory Territorial Climate and Energy Plans for all public administrations representing at least 50 000 people, including several innovations: 1) the plans include both mitigation and adaptation measures – but more experimental for the last) and 2) an energy component. These plans adopt the EU 20/20/20 objectives. Then, 3) the PCET supersede all other planning documents: mobility, urban planning, transports, land use, construction, non carbon mobility…, must conform to the PCET. The adaptation segment in most cities focuses on water management and urban heat. Low or non carbon energies are strongly promoted, a well as passive forms of energies such as isolation.<br>Adaptation and mitigation are associated in the increased use of parks and vegetation on buildings but debates arise as, for example, the orientation of building. A north-south orientation may be good for heat in the winter but will be too hot in the summer and could increase air conditioning use (most of France is expected to consume more energy for cooling of in the summer than for heating in the winter by 2040-50).<br>The legally binding aspect concerns only administrations. The plans are voluntary for other actors on the territory (industries, other firs, universities…) who are encouraged to sign a charter. No penalty (so far) has been planned for communities who do not reach their targets.<br>While the different PCETs are supervised from far by the National Environment and Energy Agency (ADEME, which also developed a carbon footprint evaluation method), the Agency also funds specific, experimental and promising or ambitious PCETs. Note that little technological innovation is actually used. Rather, the emphasis is on policy innovation through new linkages between services, and efforts at mainstreaming the 20/20/20 climate objectives throughout the sectors, departments and institutions.<br>Main methods are:<br>Urbanism: land use aimed at decreasing $co^2$ (a polycentric approach is recommended in most PCET and some go further by adding the criteria of multifunctionality of services)<br>Mobility: decreasing the status and place of cars in dailylife<br>Building codes: maximum $co^2$ emission standards and energy consumption by $m^2$<br>Education programmes<br>Industries: assistance in reducing energy consumption<br>Administrations: all areas of competences and responsibility plus own activities, buildings, engines…<br>Interestingly, there are only few economic measures and tools. For example, PCET do not include cap and trade or emission exchanges. | Table is no longer being used. This is useful information. But it would be helpful to have peer reviewed publications for citation. |
| 4122 | 16 | | | | | Please review chapter 4 section 4.3.8. If you feel that this section contains redundant and/or inconsistent duplications of chapter 16 discussions, please advice chapter 4 authors on how to revise their section. | Noted. Chpater 4 is a framing chapter and chapter 16 provides details. |
| 4145 | 16 | | | | | Please add an assessment of the literature on fast-start finance, including findings on flows and their effectiveness. | Noted. Will be impleented for SOD. |
| 4147 | 16 | | | | | Overall, the chapter covers many important issues. Most issues are described in qualitative terms by answering the question "what is there?" in terms of finance instruments and insitutions. It would b useful to add a more quantitative assessment of "how much is there and to what effect?". | Noted. Will be impleented for SOD. |
| 4148 | 16 | | | | | It would be useful if you developed a storyline that guides the reader through your chapter and highlights how all these issues relate to each other and why they are treated in this order. At the beginning of each section, it should be stated how this section relates to preceeding ones. | Accepted. Will be implemented for SOD. |
| 4149 | 16 | | | | | If would be useful to synthesize numbers written in the text in more tables and figures. | Taken into account. Will be |
| 4150 | 16 | | | | | Please state at the beginning of your chapter how it relates to preceeding policy chapters (13-15). It would also be useful to highlight the relation of your chapter to the AR4. What has happened since? How was climate finance treated in the AR4 (if at all) and how do you expand on this assessment? | Accepted. Will be implemented for SOD. |

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| 13450 | 16 | | | | 16 | This section is unacceptably weak, with major gaps in coverage and repeated use of overly simplistic concepts. For example, the section does not address the potential for emissions mitigation in the ag sector of Industrializd Countries or the issue of financing measures to achieve this potential. The section does not address the impact of existing tax and subsidy policies on emissions-intensive activities or the financial potential of reducing or redirecting these subsidies, particularly in the cases of industrial agriculture and factory-like facilities for livestock production. | Taken into account. Section will be rewritten. Potential for ag sector is outside of the scope of this chapter - but can be found in chapter 11. |
| 15410 | 16 | | | | | see separate file: "wdavidmontgomery - general comments on chapter 16.doc" | Noted. Comment will be considered in the restructured section on enabling |
| 12839 | 16 | | | | | Check ODA (Abrev. clear to all readers?) | Will be addressed by the glossary |
| 7502 | 16 | | | | | No comments. | Noted. |
| 10614 | 16 | | | | | Comments on Chapter 16 as received from Chapter 8 LA Alan McKinnon <Alan.McKinnon@the-klu.org> follow below. | Comment not clear. No comments follow below. |
| 8744 | 16 | | | | | The public can also rasie money for climate measures through ordinary taxation | Noted. Addressed in SOD. |
| 8745 | 16 | | | | | Effective governance is also for getting those providing the finance (especially in developed countries) to provide more finance/and not cut of the finance stream. | Noted. |
| 16428 | 16 | | | | | All finance figures should be reported in constant USD values (e.g. 2010 USD values) to make them comparable (or at least it should be noted if current USD are used) -> in most of the cases throughout the whole text, it does not become clear whether current or constant USD values are used (notable exception: page 5, line 15) -> why is it important? Take e.g. the USD 100 billion commitment for 2020: will have a very different meaning, if we assume 2020 USD and not 2010 USD... | see comment 12821 |
| 2793 | 16 | | | | | Throughout this chapter there is a confusion between the public sector funding of the gap in cost between clean energy and polluting energy and the private sector providing investment funds to invest against those "subsidy" mechanisms. This is a common and very damaging mistake which I am afraid permeates the whole chapter in this case. I think the distinction between these two very different things needs to be made early and then applied rigourously throughout. I will highlight a number of examples | Noted. Will considered in rewrite of chapter for SOD. |
| 9969 | 16 | | | | | Why in Figure 16.2 the finance developed countries need are even greater than that of developing countries? | Noted. Need to check the scenario and confirm the data for each country group. |
| 9929 | 16 | | | | | Units for the data in the figure should be indicated. | Agreed. |
| 9937 | 16 | | | | | The caption of Figure 16.5 is not appropriate, which should be change into "Types of climate change mitigation activities in transportation sector ….". | Will be addressed if the figure is retained. |
| 15411 | 16 | | | | | The chapter describes second and third best policies and their deficiencies effectively, and appears to imply that there is a way to encourage financing of low carbon investments in the presence of such policies. The chapter should emphasize this point and start out by saying that without a carbon tax, cap and trade there will be no demand pull for low carbon investment other than state subsidies or other regulatory measures, and the efficiency of these instruments (discussed in ch 14) will determine the macro impact of investment. | Noted. Will be clarified in SOD. |
| 17791 | 16 | | | | | the title does not read well | Noted. Will be revised. |
| 8728 | 16 | | | | | Besides the many 2030 estimates, more estimates for 2020 and 2050 could be useful, as they are the years discussed in the negotiations. The section would also benefit form a clearer discussion of nthe difference between top-down and bottom-up modelling. | Noted. Depends on data availability. |
| 7376 | 16 | | | | | From the UNSG High Level Advisory Group on Climate Finance several "innovative sources" could also be included, such as international transaction taxes, taxes on bunkers, and Special Drawing Rights. It is also unclear if "south-south" is innovative, as it represents the model of direct Government contributions. | Agreed. Will be discussed in SOD. |
| 17789 | 16 | | | | | what is the total estimate range and how does it compare with what is needed? | Agreed. Will be discussed in SOD. |
| 8734 | 16 | | | | | Why is waste not addressed? | Chapter structure will be revised. Comment no longer relevant. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16462 | 16 | | | | | This section (1) is very heterogenic; some determinants are mentioned for some sectors, but not for others, without any reason given for this -> will mention some examples below (2) as it stands now, it is not clear whether the chapter adds additional understanding of the financing problem in each sector -> either you delete this part and refer to the specialized sector chapters of AR5 or you focus much more what the "financing challenges and instruments" are in each sector. (3) the waste sector is missing | Chapter structure will be revised. Comment no longer relevant. |
| 17788 | 16 | | | | | at the end provide some indication of the estimates of "total mitigation potential" | Outside the scope of the chapter |
| 10615 | 16 | | | | | Developed countries:This section makes some strange assertions and is difficult to follow. It claims for example that<br>'The fragmentation of the transport GHG reduction project results in transaction costs that are generally superior to the climate benefits.' (Presumably by superior they mean higher)<br>This is a very negative statement that grossly under-estimates the cost effectiveness of many GHG mitigation measures in the transport sector.<br>Chap 16 goes on to argue that to address this transaction cost issue 'policies for the transportation sector that are integrated to other sectors are crucial. However, the high cost of this "policy packaging" often receives little attention.' (No substantiation of this latter claim is given).<br>While it is often desirable to incorporate transport within more broadly-based carbon mitigation programmes, their importance seems to be exaggerated here. The statements are also highly generalised and need to be illustrated with specific examples and references. The impression is given that few 'free-standing' GHG-reducing initiatives in the transport sector are worth financing. This is too negative and lacks substantiation.<br>The remainder of this section makes vague comments about the role and types of public funding for carbon mitigation in the transport sector. It concludes with a rather cryptic comment that needs clarification and elaboration:<br>'In the absence of a strong evolution of the tax base, the increase in rates will be limited, both for political reasons and often because of the application of ceilings or legal limitations, which are set at the central level, to avoid potential local drifting.' | Taken into account. Will be improved in rewrite for SOD. |
| 10616 | 16 | | | | | Developing countries: This section relating to the developing world is brief but stronger and more consistent with Chap 8. It recognises that funding can support a range of carbon mitigation measures, most of which we discuss. It foresees an ' immense expected rise in transportation demand in developing countries' and argues that ' given that much of the infrastructure is yet to be built, this is a sector with great potential for mitigation finance opportunities.' An accompanying table, from a German government study, gives examples of the measures, though could have been more closely tailored to the situation in developing countries. Missing from the table is any reference to transport investment in developing countries favouring a modal shift to lower carbon modes.<br>The chapter could have made reference to the MAC analysis done in the transport sector and proposals to internalise the environmental costs of transport which, in addition to altering behaviour, would generate new revenue streams to fund GHG abatement schemes. | Taken into account. Will be considered in rewrite for SOD. |
| 8735 | 16 | | | | | One problem with creating credits from REDD+ is that there is a risk of flooding the market with dubious credits. | Outside the scoe of the chapter |
| 8736 | 16 | | | | | Unclear how the differnt kinds of means relate to investment, as they in my eyes would not drive investment. | Noted. Will be addressed in SOD. |
| 8737 | 16 | | | | | Why are susbidies not mentioned here? They can create barriers to effective implementation, e.g. by providing cheap alternatives to the low-carbon technologies. Why purchase EE technologies if energy is heavily subsidised? | Agreed. Will be discussed in SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18360 | 16 | | | | | Please link this discussion to the relevant sections in Chapter 3 (3.12.6) and 13 (13.9.3) to sharpen chapter specific focus and avoid redundancies. | Agreed |
| 3269 | 16 | | | | | This section called "Transfer" repeats information from earlier in the report and is not relevant to a chapter on finance. Would suggest rewriting to specifically discuss financing needs or mechanisms for climate-friendly technology transfer. | Accepted. |
| 3270 | 16 | | | | | This section on funding approaches dissucsses FDI and the CDM bu these are small in the range of various ways to fund technology transfer. A broader overview should be given. The section on trade also seems to not fit here, and the TRIPS agreement seems to not be relevant to funding TT. | Noted. Chapter will be restructured. |
| 3271 | 16 | | | | | This section only discusses TT in the context of the UNFCCC briefly the GEF, as opposed to the many other ways in which technology transfer occurs and should be broadened. | Noted. Chapter will be restructured. |
| 9060 | 16 | | | | | This section attempts to throw light on the obstacle that ineffective governance presents for "an efficient and effective system of finance for mitigation" but it is too polite to state what problems must be overcome in order to obtain effective governance. In fact, the rest of section, which is not too long, can be read as mirroring the nature of the problem, while avoiding stating directly what the issues are. Let me list some of the phrases which describe these obstacles: inadequate volume of finance, politically dependent access to finance, lack of country ownership, proliferation, fragmentation, conditionality, lack of alignment to development strategies. It would useful to state these problems especially in section 16.6.2.1, the international level, in which issues of duplication, complexity, inadequate scale because of project as opposed to program modality, inconsistency among fund mechanisms and objectives, and proliferation have been identified. There are numerous references where these problems have been identified including: United Nations (2009b). World Economic and Social Survey 2009: Promoting Development, Saving the Planet. Sales No. E.09.II.C.1.; United Nations (2010a). World Economic and Social Survey 2010: Retooling Global Development. Sales No. E.10.II.C.1.; World Bank (2010b). World Development Report 2010: Development and Climate Change. Washington DC: The World Bank. There are many others. The approach embodied in the Convention, based on the Westphalian system of states and consistent with the principles on aid effectiveness discovered in Paris in 2005, is that nation-states must be responsible for climate change actions, with differentiated responsibilities between Annex 1 and non Annex 1 countries. Under this framework, international mechanisms must be support and facilitate state actions. | Noted. Comments will be considered in the restructured chapter as appropriate. |
| 8740 | 16 | | | | | The Standing Committee under the UNFCCC should also be mentioned here. | Agreed. Will be discussed in SOD. |
| 17790 | 16 | | | | | conclusion is somewhat vague, is this intended as an conconclusion | Agreed. Will be addressed in the SOD |
| 4146 | 16 | | | | | You conclude that this "weakness leads to fragmentation, duplication of efforts, and more importantly to misdirected efforts and waste of resources". This is a bold statement which is not a problem as long as it can be grounded in the preceeding text and the literature assessed there. It be would useful if you could provide an assessment of the literature on climate finance effectiveness. | Will reshapte the conclusion to reflect new chapter content |
| 8742 | 16 | | | | | Brings up new issues which have not been discussed before, which is unhelpful in an conclusion. | Will reshapte the conclusion to reflect |
| 9946 | 16 | | | | | Still can't figure out the difference between financing approaches mentioned in this section and the ones mentioned in 16.2.2. | Chapter has be restrcutre to reflect this concern. |
| 7562 | 16 | | | | | Eco-point system for housing in Japan has to be mentioned:<br>http://www.env.go.jp/en/wpaper/2011/pdf/22_Chapter4-3.pdf<br>For example, insert the following sentences.<br>Global warming countermeasures in the private sector are an issue that the residential sector should work on, and the government can actively encourage energy-saving in terms of housing, which will create an environmental effect that contributes to the establishment of a low-carbon society, and an economic effect that will stimulate new demand in the domestic market. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7563 | 16 | | | | | Eco-point system for housing in Japan has to be mentioned:<br>http://www.env.go.jp/en/wpaper/2011/pdf/22_Chapter4-3.pdf<br>For example, insert the following sentences.<br>Global warming countermeasures in the private sector are an issue that the residential sector should work on, and the government can actively encourage energy-saving in the housing sector, which will create an environmental effect that contributes to the establishment of a low-carbon society, and an economic effect that will stimulate new demand in the domestic market. | duplicate of previous comment |
| 15413 | 16 | | | | | Planning does not work for development in the poorest countries (see Easterly - The White Man's Burden: Why the West's Efforts to Aid the Rest of the World Have Done So Much Ill and So Little Good, 2006.), and most democratic middle income have avoided reliance on central planning, so how can the conclusion that planning will be either necessary or successful to bring about mitigation investments be supported? | Accepted, will be reworded carefully. |
| 7377 | 16 | | | | | Perhaps this could be re-phrased to consider both a 2C and 1.5C goals, noting the uncertainty, but recognising there would probably be a substantial difference. The answer could also be reformatted to more clearly delineate between "what has been currently directed" and "what is needed." Further, under "what is needed" it would be consistent to quote the numbers from 16.2.1.2 - i.e. "Estimates 26 range from USD 380 to 1,215 billion per year in 2030, at a global level; in developing countries<br>27 incremental investments range between USD 177 and 695 billion per year" | Noted. Chapter will be restructured and comment addressed based on data availability. |
| 7432 | 16 | 0 | | | | In the 4th IPCC assessment spillover impacts of response measures was a cross-cutting issue, but in this version of the assessment there seems to be no mentioning of it, in spite of its vital importance for developing countries and the clear provisions in the UNFCCC for the minimization of its negative impacts through the appropriate design and implementation of policies as well as through funding and transfer of technologies. | Outside the scoe of the chapter |
| 9406 | 16 | 0 | | | | Related to cross cutting issue, the following paper can provide useful information on GHG emissions by region (e.g. Japan, China, India, All Asia, USA, EU27, Russia, Annex I , Non Annex I and world) and by technological mitigation cost (e.g. 0, 25, 50, 75, 100, 125, 150, 175, 200 US$/tCO2) in the year 2020 and 2030, based on bottom-up type analyses. Hanaoka, et al, 2012 also provides technological mitigation potentials by region, by cost and by sector in the year 2020 and 2030. These discussions may be fit into this chapter, but information on this paper is missing. Dr. Hanaoka can help provideing data for this chapter.<br><br>Hanaoka, T., Kainuma, M. (2012) Low-Carbon Transitions in the World Regions: Comparisons of Technological Mitigation Potentials and Costs in 2020 and 2030 by bottom-up analyses. Sustainability Science, 7(2):117-137, DOI:10.1007/s11625-012-0172-6 | Noted, but outside the scope of the chapter. More relevant for sector chapter. |
| 14258 | 16 | 0 | | | | I would expect it to be natural to here discuss the relationship between the negotiated abatement-commitments/quotas and the incentive to develop new/green technology: On the one hand, tough commitments (small emission quotas) makes it necessary for the member-country to invest in new technology. On the other hand, the anticipation of future bargaining rounds can create a fear to be held up then, since today's investments will then be "sunk", and this hold-up problem can reduce the incentive to invest in green technology (such as abatement technology or renewable energy sources). These relationships are analyzed in a recent working paper (Harstad, Bård, 2012, "The dynamics of climate agreements"). | Noted. Also relevant for chapter 13. |
| 16356 | 16 | 0 | | | | Please consider using the following paper in your assessment:<br>The world at a crossroads: Financial scenarios for sustainability<br>Jofre Carnicer and Josep Peñuelas<br>Energy Policy 48, 2012p 611-617 | Noted. |
| 13429 | 16 | 0 | | | | In a number of places, the language in the chapter is vague and inconsistent concerning the definitions of incremental costs | Taken into account: LAs and CLAs will ensure consistent application of |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18256 | 16 | 0 | | | | In a number of places, the language in the chapter is vague and inconsistent concerning the definitions of incremental costs | see comment 18256 |
| 18286 | 16 | 0 | | | | Although many useful references are cited in this chapter, on balance the chapter is weak and incomplete. The chapter as written is "not ready for prime time." Coverage of activities and institutions related to climate-finance in developing countries are especially poorly covered. In its current form, I do not believe that this chapter measures up to the previous standards of research excellence found in earlier IPCC Assessment Reports. | Taken into account: LAs and CLAs will do deeper research on developing country issues and broaden the range of literature. |
| 9047 | 16 | 0 | | | | The chapter can be clearly improved with greater self-reflection and integration of its substantive content. For example, the listing of the relationship of adaptation to mitigation in pages 38, lines 1 to 26, is simply a listing, without any attempt to relate each of the ideas to each other. There are many instances of incomplete writing, incomplete expressions. For example, in page 32, lines 27 to 28: "Even though the CDM bears weakness, it is one way to facilitate the technology transfer to Developing Countries." "EE" is never defined in the text. Etc. | Taken into account: will be considered in rewrite of chapter towards SOD. |
| 12821 | 16 | 0 | | | | General Remark: It is unclear what the basis for calculating the monetary values is. E.g. does billion dollar in 2050 include an inflation rate and is billion dollar in year X in study Y equal to billion dollar in year X in study Z with regard to the underlying basis for calculation. This is also relevant in the context of required subsidies. | Taken into account. Standard units in accordance with WGIII provisions will be used. |
| 8723 | 16 | 0 | | | | A good chapter but with room for improvement. Generally speaking, the different kinds of costs (incremental costs, incremental investments, total investments) clóuld have been explained better in the beginning, and subsequently used more consistently throughout the chapter. Also the concept of creating a global carbon price could be addressed more explicitly.Discussion of the importance of mainstreaming climate measures into ODA would also be useful. Finally, most of the discussions seem centred on the energy sector, whereas industrial emissions (especially non-CO2 emissions) are a bit overlooked. F | 1. see comment 12821 2. Noted: will be considered in rewrite. 3. Taken into account: Sector coverage and coverage of gases will be enhanced in rewrite for SOD. |
| 14351 | 16 | 0 | | | | In finance, issue on developed countries and those on developing countries are different. Developed countries can be financed with in their won country and/or international market. On the other hand, most of the developing country may be rely on financial assistance from developed countries and multilateral agencies. In this sense, nature of discussion on finance deems different between developed and developing countries. Therefore, this chapter should be devided into two: developed countries part and developing countries part. | We agree that te circumstances of developed and developing countries differ with respect to climate finance. They will be discussed in the chapter. But we do not believe that this is not the mostt effective way to organize the |
| 8075 | 16 | 0 | | | | the incremental cost estimates referred to lack the information from which stabilisation scenario (xx ppm, 2°C etc.) the estimates are derived | Accepted. Will be improved in rewrite. |
| 8083 | 16 | 0 | | | | it is not clear, why in so many cases reference is only made to mitigation finance and not also to adaptation finance, reference on page 13 line 23 does not make this sufficiently clear | Noted. The focus of this chapter is mitigation. The link to adaptation is |
| 3186 | 16 | 0 | | | | This chapter has very little data that helps readers ground the climate investment discussion into broader investment questions—such as total investment levels, flows, the role of MDBs vs private capital, etc. We need an iconic figure on this and serious discussion. (FAQ 16.1 is a notable exception—it does, albeit thinly, discuss such realities.)<br><br>The chapter has almost no discussion of the risk mitigation tools and other factors that have the largest impacts on baseline levels of private finance as well as possible increments in private finance for climate. □ | Taken into account. More emphasis will be given in rewrite for SOD. Risk mitigation will be further considered in SOD. |
| 9930 | 16 | 0 | | | | A section about the influence from financial crisis and the relationship between financial crisis and climate financing should be added, as a response to the chapter 1, in which financial crisis is mentioned as one of the issues learned after AR4. | Accepted. Based on the limited amount of available literature some text will be added to SOD. |
| 9933 | 16 | 0 | | | | When taking USD as the unit for economic numbers, please make sure whether it's in current USD or USD in specific year . Especially when data are from different model, it's important to make all numbers in an uniform unit. | see comment 12821 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 9935 | 16 | 0 | | | | As one of the innovative sources for climate financing, taxs from international aviation also need to be introduced. | Accepted. |
| 9936 | 16 | 0 | | | | Classification of 16.2.3 is not so reasonable. When talking about current sources and potential sources, I am afraid that there are some overlaps, for example, carbon tax. So maybe it should be reorganized. | Accepted. |
| 9942 | 16 | 0 | | | | In this chapter, if a section about quantitive researches on climate financing and trade-offs between mitigation and adaptation can be supplemented, it would be helpful. Otherwise, this issue should be fully discussed in chapter 6. | Noted. Availability of literature will be examined. |
| 9943 | 16 | 0 | | | | The relationship between this chapter and chapter 6 is unclear. Readers want to know the finace amount in each scenarios mentioned in chapter6. | Noted. A process to improve to consistency between chapters 6 and 16 |
| 9947 | 16 | 0 | | | | Financing approaches are stated repeatedly in this chapter, which even makes readers confused if there is a difference when the same approach is mentioned in different section. | see comment 18256 |
| 9967 | 16 | 0 | | | | Since there has been some financing projects, it would be interesting to assess the influence of climate change from such financial flows based on IAMs. | Noted. We will look for such literature. |
| 9968 | 16 | 0 | | | | Burdening sharing among developed countries is one of the key issues in international financing. And there are some literatures about this. I will submit two papers about the assessment on participations of the US and Australia in the 100 billion commitment pledged in Copenhagen(Houser and Selfe, 2011; Jotzo, et al., 2011). | Rejected. This is outside of the scope of our chapter but treated in other policy chapters. |
| 11054 | 16 | 1 | | 53 | | Chapter16 general comment: The description of the role of public finance (such a Export credit agency with conventional loan, government guarantee etc) is not insufficient. The public finance sector has its catalyze function to mobilize private finance with sensational loan through official dialogue with host country's MOE DOE MOF.These dialogue means capacity building for the host country. see | Accepted. |
| 17237 | 16 | 1 | | | | This chapter is a welcome addition to the work of WGIII – and could play a significant role in 'speaking finance to the climate community' and 'speaking climate to the finance community'. To do this, the chapter needs to have a stronger focus on how the low-carbon transition intersects with capital markets, the barriers to 'climate finance', how financial stakeholders can be incorporated into policy design and how climate risks can be better addressed by finance and investment. | Accepted. The spirit of this comment will be considered in rewrite of the chapter. |
| 17238 | 16 | 1 | | | | At its heart, effective climate finance ensures that the conventional risk:reward in all financial decision-making dynamic is transformed so that mitigation is assured. Historically, the risk:reward balance had weighed against low-carbon options; this has been remedied to some extent through policy intervention to internalize external costs. But high carbon options in nearly all economies are often seen to have a better risk:reward ration than low-carbon options. | Noted. |
| 17239 | 16 | 1 | | | | Global Capital MarketsIt is important to set out the size and structure of global capital markets in terms of key asset classes (equities, bonds, private equity, infrastructure, debt etc). The latest McKinsey Global Institute Report estimated that the total size was USD212trn: it is critical to incorporate this scope as it then places the challenge of 'climate finance' in context – and highlights that the scale of funding required is relatively small (eg 16.2) | Accepted. Quantitative information will be added in rewrite of chapter. |
| 17240 | 16 | 1 | | | | http://www.mckinsey.com/insights/mgi/research/financial_markets/mapping_global_capital_markets_2011 | part of comment 17239 |
| 17241 | 16 | 1 | | | | The relatively low amount is particularly striking if one considers that the share of investment in GDP has been historically low in recent year and will need to rise in coming decades: see Jorgen Randers, 2052 (2012) for some useful estimates. | part of comment 17239 |
| 17242 | 16 | 1 | | | | Key Financial Stakeholders: It is also important – perhaps diagrammatically – to set out the key actors in climate finance, and how they comprise the investment chain from: | part of comment 17239 |
| 17243 | 16 | 1 | | | | - asset owners (pension funds, insurance companies, sovereign wealth funds, foundations, states, private individuals) | part of comment 17239 |
| 17244 | 16 | 1 | | | | - actuaries and consultants which advise asset owners on strategic issues, including climate change See Mercer, Climate Change Scenarios – Implications for Asset Allocation, 2011 | part of comment 17239 |
| 17245 | 16 | 1 | | | | - asset managers, across equity, bonds, private equity etc | part of comment 17239 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17246 | 16 | 1 | | | | - banks, who provide investment analysis, raise capital for new assets in the form of equity and debt, provide leveraged finance drawn their own balance sheets and trade existing investment instruments | part of comment 17239 |
| 17247 | 16 | 1 | | | | - corporations, | part of comment 17239 |
| 17248 | 16 | 1 | | | | - ultimate assets and projects | part of comment 17239 |
| 17249 | 16 | 1 | | | | The OECD's Financing Climate Change Action programme also has some useful papers that frame the agenda | Noted. Will be checked for review. |
| 17250 | 16 | 1 | | | | http://www.oecd.org/env/climatechange/financingclimatechangeaction.htm#Papers___pubs | part of comment 17249 |
| 17251 | 16 | 1 | | | | One stakeholder that is omitted from the chapter at the moment is the individual consumer/housbehold as source of finance/investment. CF is not just an institutional issue; HSBC estimates that a third of the spending on low-carbon energy supply and consumption by 2020 will be by households (eg building retrofit; cleaner vehicles – HSBC, Sizing the climate economy, 2010 available at | Acccepted. Will be addressed. |
| 17252 | 16 | 1 | | | | http://www.longfinance.net/programmes/london-accord/392.html). | see 17251 |
| 17253 | 16 | 1 | | | | Climate Finance: It is important to re-examine the concept of 'climate finance'. The Executive Summary (l.33) admits 'there is no agreement on what qualifies as CF', but the chapter perhaps unconsciously assumes in many places that it is in effect public finance. At the heart of the problem lies uncertainty as to what climate finance includes in its orbit. I would suggest the following: ' Climate finance is the allocation of financial assets to activities that enable mitigation and adaptation' The important feature is that this leads to the possibility of measurement around defined investment themes (eg renewables, energy efficiency, public transport etc) and actors along the lines of the CPI report. A secondary issue is the stages of CF in terms of primary finance (eg funding a wind farm) and secondary finance (eg selling on this wind farm to a pension fund). | Taken into account. SOD will provide definition for climate finance. |
| 17254 | 16 | 1 | | | | It is critical to recognize that this definition does not include – and nor does the draft chapter – a discussion on 'climate finance risks', in other words the risks that the transition to a low-carbon, resilient economy pose for finance and investment: I will address this in my final section. I would also suggest that the chapter is more disciplined in defining the elements of CF, breaking it into the following categories. - Type 1: domestic private climate finance; - Type 2: domestic public climate finance; - Type 3: international private climate finance | Noted. Will be refelcetd in the revised draft. |
| 17255 | 16 | 1 | | | | - Type 4: international public climate finance | see comment 17254 |
| 17256 | 16 | 1 | | | | This categorization is perhaps implicit in parts of the chapter – but it would be valuable to have an iron-cast framework that applies throughout. | see comment 17254 |
| 17257 | 16 | 1 | | | | It is also important to clear up some confusion in the language: 'financial flows' refer only to cross-border Type 3 & 4 CF. In addition, in the discussion of innovative sources (16.2.3.2) this is effectively only about innovative sources of public CF. And finally, private finance often funds the public in large measure through public bond issuance, for example, either through sovereign bond issuance and/or issurance from public financial institutions. This is important to recognize as there is growing demand from asset owners for 'climate bonds' (see Climate Bonds Initiative/HSBC, Bonds and climate change - the state of the market in 2012). | see comment 18256 |
| 17258 | 16 | 1 | | | | The key point that needs to be highlighted in the next draft for 16.8 on Gaps in Knowledge is the absence of a common system used by public and private sectors alike for categorizing and monitoring | Taken into account. To be considered in rewrite. |
| 17259 | 16 | 1 | | | | Investment, Costs and Returns: The significant insight in the second paragraph of the Executive Summary of the difference between cost and investment (l.6>) is sadly lost in the rest of the chapter. One structural feature of the low-carbon, green economy is that it substitutes capital for resource use and carbon pollution: the low-carbon economy is thus generally a more capital-intensive economy, with one of the key strategic issues being how to raise this additional upfront capital, which will then deliver a flow of financial returns over the life of the investment. It is critical to communicate to policymakers and financiers/investors that CF investments envisaged yield a positive return, a point that has been emphasized in successive IEA World Energy Outlook's but appears to be omitted in the current section on scale 16.2. | see comment 18256 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 17260 | 16 | 1 | | | | Barriers to Climate Finance: The chapter lacks a clear analysis of what is preventing finance to flow at sufficient scale and speed to the right places for comprehensive mitigation. I would suggest the following | Taken into account. Will be accomodated in rewrite for SOD. |
| 17261 | 16 | 1 | | | | - structural market failures (eg the externalities identified in previous chapters of AR5, as well as the policy failures such as fossil fuel subsidies) | part of comment 17260 |
| 17262 | 16 | 1 | | | | - financial market failures: these would include short-termism, bounded rationality, regulatory blindness, perverse incentives, obsolete interpretations of fiduciary duty, institutional inflexibility, transparency and path dependency. These are the barriers that this chapter should focus on removing. | part of comment 17260 |
| 17263 | 16 | 1 | | | | To highlight some of these in more detail | part of comment 17260 |
| 17264 | 16 | 1 | | | | Short-termism: This has been highlighted as a structural flaw in financial markets for decades, making it hard for investors to effectively assess and act upon the durational challenge of climate change. Financial myopia was identified by J.M Keynes as a key reason for structural imbalances in Chapter 12 of The General Theory of Money and Employment published in 1936. “It is the long-term investor, he who most promotes the public interest, who will in practice come in for most criticism wherever investment funds are managed by committees or boards or banks. For it is in the essence of his behaviour that he should be eccentric, unconventional and rash in the eyes of public opinion.” This reality has been exacerbated in recent years, and quantitatively analysed by Andrew Haldane, Director of Financial Stability at the Bank of England: the market on its own will not act rationally in a temporal perspective http://www.bankofengland.co.uk/publications/Pages/news/2011/043.aspx | part of comment 17260 |
| 17265 | 16 | 1 | | | | This structural flaw could be addressed by incorporating in financial regulation a requirement on the investment chain for asset owners, managers, banks etc to assess and integrate the long-term challenge of climate change into their routine operations. | part of comment 17260 |
| 17266 | 16 | 1 | | | | Bounded rationality: It would be worth referencing the latest insights of behavioural finance and the explanations these give for inadequate attention to climate change, and the failure of conventional financial theory (such as the efficient markets hypothesis) to root its notions in empirical evidence. James Montier Behavioural Investing is a good reference, and could be cross-referenced with the useful section on behavioural economics in Chapter 3. | part of comment 17260 |
| 17267 | 16 | 1 | | | | Perverse incentives: These are both public and private. Currently, finance and investment receives considerable fiscal support to encourage saving, an important public policy objective: in the UK, this amounts to £30bn p.a.. However, unlike in other policy areas such as energy, there is still little or no integration of environmental or climate factors into how this fiscal support is allocated. One solution to this would be to ensure that to qualify for tax relief savings and investments would need to be managed by funds/institutions which demonstrated an ability to manage climate/sustainability issues and risks. | part of comment 17260 |
| 17268 | 16 | 1 | | | | Regulatory blindness: A similar theme – unlike the agriculture, energy and transport sectors, little or no attention has been given to integrating climate change into core financial regulation. This has led in the case of the banking sector to new rules under Basel III which are discouraging banks from holding long-term project finance debt – a key source of funding for climate mitigation. This is clearly not something that can be dealt with in formal climate negotiations at the UNFCCC and elsewhere – but as with the issue of perverse incentives highlights the need for climate change factors to be integrated into regular financial policy if mitigation and adaptation is to be successful. This insight could be usefully incorporated into 16.6 Institutional arrangements. | part of comment 17260 |
| 17269 | 16 | 1 | | | | Transparency: Without transparency on climate factors, financial markets cannot effectively integrate migitation into decision-making. Considerable progress has been made on a voluntary basis through initiatives such as the Carbon Disclosure Project, and some countries are introducing mandatory climate/sustainability requirements. These need to be universalized so that financial markets can make informed decisions: again worth highlighting in 16.6. | part of comment 17260 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 17270 | 16 | 1 | | | | Finally, the important point about highlighting financial market barriers is to make clear to policymakers that simply addressing the first order climate externalities will not be sufficient to achieve mitigation; there are many obstacles in financial markets which will obstruct this signal being received. | part of comment 17260 |
| 17271 | 16 | 1 | | | | Incremental Cost: The chapter explores the problematic nature of this term – but it needs to be made clearer the difference between incremental cost and incremental investment, the latter is a classic form of financial deployment from which net benefit is expected. And although carbon externalities are certainly deep and widespread, technological innovation is such that low-carbon mitigation options are increasingly without 'incremental cost' – although there may be incremental upfront investment (but lower operating costs and thus higher net returns). | part of comment 17260 |
| 17272 | 16 | 1 | | | | Institutional Arrangements: The chapter could benefit from recognizing the growing evidence of private finance sophistication and demand for policy in the area of climate change, particularly institutional investors. Hitherto, institutional investors have been the 'missing stakeholder' in climate policy formation and delivery, with policymakers not addressing the barriers that investors face to contribute to climate security. As owners of corporations, investors need to be regarded as a distinct stakeholder that has interests that are not necessarily the same as the interests of corporate management (principal-agent problem/corporate governance). The chapter could usefully highlight the growing investor demand for policy certainty in recent years including:- the 2011 Investor Statement, supported by USD20trn in assets: www.iigcc.org/iigcc-investor-statement and Investment grade climate policy: reports by IIGCC/UNEPFI as well as CMCI (decc.gov.uk) | part of comment 17260 |
| 17273 | 16 | 1 | | | | Climate Risks: The chapter as currently structured focuses on how to mobilize finance behind key thematic investments in the low-carbon landscape. It doesn't, however, examine the flip-side: the risks facing high-carbon finance. One important expression of this is the topic of stranded assets. The absence of credible long-term policy frameworks compounded by financial myopia means that financiers and investors discount the possibility of robust action to hold global warming below 2 degrees celsius. The long-lived nature of key pieces of energy infrastructure in particular means that this has potentially serious implications in terms of locking economies into high-carbon pathways, which makes support for the low-carbon efforts even more difficult. This was an issue addressed in the IEA's 2011 World Energy Outlook. A related issue are the risks for financial stability posed by continued investment in fossil fuel assets which cannot be burnt if the 2 degree threshold is respected. This issue has been usefully examined by the Carbon Tracker Initiative in its report, Unburnable Carbon (2011 http://www.carbontracker.org/carbonbubble). This suggests an important topic for further research and enquiry – to examine the dynamic between climate change and financial stability. | part of comment 17260 |
| 17784 | 16 | 10 | 13 | | | Chapter 1 talks about 2C by 2050 | Noted. We will check the study and make sure we summarize it correctly. |
| 9932 | 16 | 10 | 13 | | 14 | Since only MESSAGE and REMIND are mentioned on line 14, "three integrated assessment models" should be changed into "two…". | Editorial. |
| 13436 | 16 | 10 | 14 | | | The word "annual" is omitted between 'indicate' and 'incremental.' | Noted. |
| 18263 | 16 | 10 | 14 | | | The word "annual" is omitted between 'indicate' and 'incremental.' | See comment 13436. |
| 17785 | 16 | 10 | 17 | 18 | | how much effort needed to do get this done? | Comment not clear. |
| 16427 | 16 | 10 | 7 | 10 | 11 | Would be helpful to have an "overview" table showing the most important differences in assumption within the models | Noted. The SOD will provide greater detail on the cited studies. |
| 13437 | 16 | 11 | 24 | | | The word 'will' should be replaced by "may" or "can." | Comment not clear. Perhaps line 27. |
| 18264 | 16 | 11 | 24 | | | The word 'will' should be replaced by "may" or "can." | See comment 13437. |
| 16429 | 16 | 11 | 46 | 11 | 46 | Explain "t450" | Noted. The SOD will provide greater detail on the cited studies. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12827 | 16 | 12 | | | | Billion US D calculated with regard to which year? | Noted. All measurement units will be homogeneous (if possible) in the SOD. |
| 16430 | 16 | 12 | | | | Explain abbreviations of the different scenarios | Noted. Will be more precise in the SOD. |
| 13438 | 16 | 12 | 10 | | | The phrase "for power generation" should be inserted after 'consumption' and before 'is expected.' No one expects oil consumption to go to zero in the transport sector in a 2 degree scenario. | Noted. Will be more precise in the SOD. |
| 18265 | 16 | 12 | 10 | | | The phrase "for power generation" should be inserted after 'consumption' and before 'is expected.' No one expects oil consumption to go to zero in the transport sector in a 2 degree scenario. | See comment 13438. |
| 16431 | 16 | 12 | 10 | 12 | 10 | CCS can also be applied to oil but most oil is used in the transport sector where CCS would be too expensive | Noted. Will be more precise in the SOD. |
| 9053 | 16 | 12 | 12 | | | A reference to the empirical complementarity of energy, capital, and labor should be made for this claim. | Noted. Will add references to the empirical literature and to results from |
| 16432 | 16 | 12 | 15 | 12 | 15 | You may add (5) full information on technologies, no transaction costs | Noted. SOD will improve this section as the ful set of scenarios from other chapters will be available. Also the |
| 16433 | 16 | 12 | 29 | 12 | 36 | This paragraph only refers to the 4th assumption (absence of risk and uncertainty) -> explain why you only discuss this point and not the others | Agreed. The text will be revised in the SOD. |
| 13439 | 16 | 12 | 4 | 12 | 8 | It is unclear as written whether this para refers to savings due to higher efficiency or savings due to lower fuel cost resulting from decreased demand or both. | Noted. The paragraph will be rewritten. |
| 18266 | 16 | 12 | 4 | 12 | 8 | It is unclear as written whether this para refers to savings due to higher efficiency or savings due to lower fuel cost resulting from decreased demand or both. | See comment 13439. |
| 19007 | 16 | 13 | | 13 | | Unit is needed | Accepted. |
| 13440 | 16 | 13 | | | | Figure 16.4 claims to represent "current financial flows" of climate finance. However this figure and the accompanying discussion ignores South-North investment flows, e.g., Chinese investment in US advanced battery and electric vehicle companies. These investments in low-emissions technologies should be recognized as a part of the international flow of climate finance. | Noted. More data will be available for the SOD and will be reflected there. |
| 18267 | 16 | 13 | | | | Figure 16.4 claims to represent "current financial flows" of climate finance. However this figure and the accompanying discussion ignores South-North investment flows, e.g., Chinese investment in US advanced battery and electric vehicle companies. These investments in low-emissions technologies should be recognized as a part of the international flow of climate finance. | Noted. More data will be available for the SOD and will be reflected there. |
| 9061 | 16 | 13 | | | | The Chapter will make a distinct contribution if it will distinguish between financing often counted as "climate finance" and which financing flows can be counted as climate finance in the sense that it discharges the developed country obligations under the Convention. In page 13, it reproduces a financing flow diagram from Buchner et al. (2011) in which private financing flows are counted as climate finance. The draft should be commended about the fact that even counting these sources of financing it makes the judgement that the scale of financing so far is insufficient. | Agreed. The SOD will include a definition on climate finance that will clarifiy how it differs from climate finance under UNFCCC. |
| 8729 | 16 | 13 | 1 | 13 | 5 | How closely correlated are the risk premiums on a country's government bonds and on the projects taking place within that country? | Noted. Will be addressed in SOD. |
| 2798 | 16 | 13 | 20 | 13 | 20 | This diagram is very confused. It makes no sense to add tax revenues spent on funding clean energy investments with private capital which is looking for a return to invest against those cash flows. I would recommend that this diagram is removed as it makes no financial sense. | Noted. More data will be available for the SOD and will be reflected there. |
| 16435 | 16 | 13 | 21 | | | Some of these flows are not North-South, (1) a substantial part of the USD 55 billion of private finance will be South-South or domestic (see my comment 8), 20% of Bilateral development banks finance is provided by Southern institutions (Brazil, China, India); (3) some financial payments of MDBs are made possible by developing country shareholder equity (to mobilize debt on the capital market) -> NON-annex-1 countries have e.g. roughly a 35% share in IBRD capital subscriptions | Noted. More data will be available for the SOD and will be reflected there. |
| 13726 | 16 | 13 | 26 | 13 | 26 | Add after "… broad interpretation.": "(for a discussion of possible definitions see Stadelmann et al. 2011)". Reference: Stadelmann, M.; Roberts, T.; Michaelowa, A. (2011): New and additional to what? Assessing options for baselines to assess climate finance pledges, in: Climate and Development, 3, p. 175-192, | Noted. The reference will be checked and used as appropriate in the SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16434 | 16 | 13 | 3 | 13 | 3 | define "investment-grade" | Noted. Will add a definition |
| 2818 | 16 | 13 | | 19 | | For latest figures in current flows of climate finance, refer to Clapp et al (2011) "Tracking Climate Finance" OECD/IEA, http://www.oecd.org/env/climatechange/50293494.pdf -- see Section 2 pgs 10-12 of paper. This paper builds on previous OECD work by Corfee and Buchner, and offers more recent OECD data that Buchner et al Landscape of Finance. Clapp et al also includes ranges which are more accurate than one average figure for private sector flows. | Noted. Reference will be evaluated and included as appropriate. More data will be included. |
| 8730 | 16 | 14 | 13 | 14 | 14 | Reg the 28 out of 45 billion: does the term "domestic projects" in this context refer to projects within developed countries, or how? This is not clear. | Noted. Data will be checked and text will be clarified. |
| 8061 | 16 | 14 | 18 | 14 | 20 | It is not clear where the definition of international climate finance used here comes from; I do not think that it is undisputed that private finance flows are considered as "international climate finance"; but rather that it is understood as finance that has been mobilised explicitly for climate finance; there should be a discussion on available definitions; I also think this study (number) also includes domestic flows (Buchner et al, 2011, p.8),s o therefore one might need to indicate that the 97 billion are not fully international climate finance | Accepted. The SOD will include a definition on climate finance that will clarifiy how it differs from climate finance under UNFCCC. |
| 16437 | 16 | 14 | 21 | 14 | 22 | As noted before, give not only the point estimate but the range in the Buchner et al. 2011 figures; make clear that they also include some domestic private finance | Noted. SOD will include additional data and will include ranges. |
| 16438 | 16 | 14 | 31 | 14 | 31 | The Stadelmann et al. (2011) figure does not only include international private finance, but also domestic and South-South private finance that is mobilized by industrialized countries | Taken into account. We will check the reference. |
| 16439 | 16 | 14 | 37 | | | You may also refer to the sources that Buchner et al. Cite: OECD rio markers, Atteridge et al. (2009) for bilateral finance institutions | Noted. Will be included as appropriate. |
| 13729 | 16 | 14 | 39 | 14 | 39 | Revise footnote 4 as follows: "Michaelowa and Michaelowa (2011) find severe miscoding of projects and a correlation between overcoding and political variables." | Noted. |
| 16436 | 16 | 14 | 8 | | | The BNEF figure is not only domestic, it includes international investments | Agreed. BNEF includes both domestic |
| 11227 | 16 | 15 | 13 | | | CDM and JI projects have been under criticism for their negative impacts on the environment and on the human rights of affected communities. In 2001, the CDM board decided to launch an internal review into its public participation and consultation policies , following allegations human rights violations related to some CDM projects. | Noted, but chapter 6 deals only with financial aspects. Other aspects of CDM are dealt with in chapter 13. |
| 16440 | 16 | 15 | 13 | 15 | 13 | This figure depends very much on the year and the assumptions (e.g. on carbon credit prices, which are mostly confidential in the primary market; and the share of primary and secondary transactions), e.g. check the way Stadelmann et al. (2011) calculated the USD 1.6-1.8 billion for the CDM; using the same methodology, you would roughly receive USD 5 billion in 2011. | Noted. Data and assumptions will be checked. |
| 16441 | 16 | 15 | 38 | | | You may refer to the literature on stimulus packages, which included funding for clean energy; you may cite Höhne et al. (2009): Economic/climate recovery scorecards: How climate friendly are the economic recovery packages? | Thank you. Reference will be reviewed. |
| 2799 | 16 | 15 | 20 | 16 | 49 | Again this section confuses sources of public funding with private investmnent which are two totally different things. | Taken into account. Section on sources will be restructured in SOD. |
| 12484 | 16 | 15 | 21 | | | This section covers the additional risk currently inherent in low-emission technologies. What the section does not cover in much detail, is the increased financial risk associated with investing in fossil technologies in a scenario where carbon pricing (more fully) reflects the true costs of GHG emissions. The fact that proven hydrocarbon reserves contain much more carbon than we can burn if we want to limit climate change, is not reflected in today's share pricing/financing costs. This "market failure" / hidden financial risk should be pointed out in the financing chapter. It is particularly important that long term investors (e.g. pension funds) also develop tools to deal with this kind of "carbon risk". | Noted. |
| 9940 | 16 | 16 | | | | Since paragraphs on this page is supposed to describe the scale of financing, please pay attention to give some numbers about their potential financing capacity for each finance source. | Agreed. Will be revised in SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16442 | 16 | 16 | 1 | | | Among "international climate finance", you have - in my view - to A) specifically refer to funds/operational entities under the UNFCCC financial mechanism (GEF, SCCF, LDCF, GCF) and B) clearly distinguihs between climate-specific funds (e.g. CIFs, GEF trust fund, several bilateral initiatives, see Climate Funds Update for an overview), and ODA funds that have climate benefits (e.g. refer to Michaelowa & Michaelowa (2011) "Old Wine in New Bottles?"; where they show that ODA funding for renewables and energy efficiency has already existed in the 1980s and is mainly dependent on the oil price, but does not very much relate to climate change agreements, see http://www.zora.uzh.ch/57335/1/am_old_wine_in_new_bottles11.pdf) | Thank you. Reference will be checked. In the SOD there will be a section on operating entities. |
| 14352 | 16 | 16 | 1 | 16 | 9 | Discussion on international public finance focus on ODA. But, there are another source of international public finance called "other official flows, such as export credit. Therefore, this section should focus on other official flows as well as ODA. | Agreed. OOF are a source of climate finance. |
| 2180 | 16 | 16 | 10 | 16 | 25 | The section on private climate finance seems a bit weak in terms of identifying and analyzing emerging low carbon/sustainable energy investment funds as well as enterprises. Companies like DESI Power in India, for instance, is serving as a model for sustainable energy innovation/development in the developing world and little of this in documented here and/or places in thic chapter. | Noted. Section will be revised and expanded in the SOD. |
| 16444 | 16 | 16 | 10 | 16 | 25 | This paragraph should (a) more refer to specific types of private finance relevant for low-carbon technologies and (b) somewhere make clear that private finance may/will have to provide a substantial part of needed investments but it can not be expected to cover incremental costs of low-carbon technologies (unless it is incentivized via or compensated to do it). | Noted. Will be reflected in SOD. |
| 9934 | 16 | 16 | 10 | | 49 | The third to sixth parapgraphs are supplementary to the second paragraphy in this page. But the starting words in third to sixth paragraphs are all in bold, which seems to me that these paragraphs are parallel to the second paragraph. | Editorial. Will be clarified in SOD. |
| 16445 | 16 | 16 | 26 | 16 | 49 | Structuring unclear; everything form businesses to private philanthropy is potentially part of private climate finance; FDI and retail investors may be part of "business and corporations" (which itself is a relevant type of actor, but not type of funding) | Noted. Will be clarified in SOD. |
| 8062 | 16 | 16 | 26 | 16 | 35 | not clear why business/corporations finance and FDI is in a separate paragraph from private climate finance | Noted. Will be clarified in SOD. |
| 13728 | 16 | 16 | 5 | 16 | 5 | Add after "… action": "However, the share of development assistance channelled into mitigation activities has not been influenced in a statistically significant manner by the international climate policy regime, but essentially been correlated to the level of the oil price (Michaelowa and Michaelowa 2011)." Reference: Michaelowa, A.; Michaelowa, K. (2011): Old Wine in New Bottles? The Shift of Development Aid towards Renewable Energy and Energy Efficiency, in : Carbonier, Gilles (ed.): International Development Policy: Energy and Development, Palgrave Macmillan, London, p. 60-86 | Thank you. Reference will be checked. |
| 16443 | 16 | 16 | 5 | | | Make clear that MDBS/BDBs use both ODA and Other Official Flows (OOF) | Noted. |
| 10458 | 16 | 17 | 0 | | | The section on Carbon taxes on coal and others in India need to be expanded | Noted. |
| 16448 | 16 | 17 | 10 | | | Mention that Germany already uses part of EUA auctioning for international climate finance | Noted. |
| 12485 | 16 | 17 | 15 | 17 | 15 | Please consider to add a sentence about other emission trading systems that are being developed (e.g. Australia, China, California, South Korea). (See section 15.5.4 -New approaches to emission trading) | Noted. Will be considered for the SOD. |
| 8733 | 16 | 17 | 16 | 17 | 19 | The problem with selling AAUs is that it raises the emissions in the country buying them. | Noted. |
| 16449 | 16 | 17 | 17 | | | You may call this "allocation and selling of surplus emission allowances" (more neutral); then you may refer (apart from the eastern EU countries) to the idea of allocating headroom allowances to non-Annex-1 countries in order to give them financial assistance and include them in the global carbon market, see Wagner et al. (2009) Docking into a Global Carbon Budget, published in OUP book (http://www.edf.org/sites/default/files/9410_clean-investment-budget.pdf) | Source will be evaluated. |
| 12828 | 16 | 17 | 22 | 17 | 30 | Can you provide a reference? | We will cite source in SOD. |
| 16450 | 16 | 17 | 22 | | | You may give some numbers on how large these revenues are (e.g. in Europe, more than 50% of the petrol price is due to taxes…) | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16446 | 16 | 17 | 3 | | | Define "innovative sources", e.g. "not yet used" would not be appropriate… | Taken into account. "Innovative sources" will be defined in SOD. |
| 16447 | 16 | 17 | 3 | | | Somewhere quote Harmeling et al. 2008 "Funding Sources for International Climate Policy" who reviewed most of these 'innovative' sources | Thank you. Source will be reviewed. |
| 12829 | 16 | 17 | 33 | 17 | 38 | See comment 6 | Comment not clear. |
| 14353 | 16 | 17 | 35 | 17 | 38 | I cannot find how the author estimates the level of subsidy as USD 100 billion. Without reason, it may mislead the reader. | Noted. Amount will be verfied and source cited. |
| 14354 | 16 | 17 | 39 | | | Definition of "South-south cooperation" should be explained. | Accepted. |
| 13442 | 16 | 17 | 4 | 20 | 28 | The discussion of Innovative Sources of Finance and Innovative Instruments is overly simplistic and not credible. It completely ignores recent published work on potential use of a Tobin Tax type mechanism or a user fee on transport fuels used in the international aviation and marine freight sectors as possible sources of Tens of Billions of dollars for climate finance. This represents a glaring and profound weakness in this chapter. | Taken into account. "Innovative sources" will be defined in SOD. |
| 18269 | 16 | 17 | 4 | 20 | 28 | The discussion of Innovative Sources of Finance and Innovative Instruments is overly simplistic and not credible. It completely ignores recent published work on potential use of a Tobin Tax type mechanism or a user fee on transport fuels used in the international aviation and marine freight sectors as possible sources of Tens of Billions of dollars for climate finance. This represents a glaring and profound weakness in this chapter. | Taken into account. "Innovative sources" will be defined in SOD. |
| 8731 | 16 | 17 | 4 | 17 | 15 | It should be mentioned, that carbon taxes also have an impact on emissions in developed countries. | Noted. |
| 8732 | 16 | 17 | 5 | 17 | 6 | Are the mentioned carbon taxes explicit carbon taxes or both explicit and implicit ones. | Under consideration for clarification in |
| 8312 | 16 | 17 | 6 | 17 | 7 | Correction: change sentence to "In Canada, the provinces of Quebec and British Columbia have raised approximately USD 1 billion through carbon taxes". | Noted. |
| 16958 | 16 | 17 | | | | There is at least one potential international funding source not mentioned here, which is to incorporate importers into domestic carbon pricing schemes but make the money raised at the border available for international climate finance. See Michael Grubb (2011): International climate finance from border carbon cost levelling, Climate Policy, 11:3, 1050-1057. | Noted. Reference will be reviewed and considered for the SOD. |
| 12652 | 16 | 17 | 16 | 17 | 21 | Estonia, Czech Republic and Poland are involved in "Green investment scheme" as well.<br>This paragraph should refer to "Emission Trading " as written in Article 17 of Kyoto protocol. | Noted. Text will be clarified in SOD. |
| 7436 | 16 | 17 | 3 | 17 | 43 | Consider debating these questions to better inofrm this subsection: 1) are these sources really innovative? 2) To what extent does funding through the carbon market in developing countries be considered additional rather than a self-financed given the principle of common but differentiated responsiblities? 3) what are the impacts of funding mitigation through the carbon market in developing countries in relation to access and affordability of energy, economic development, and welfare? 4) To what extent does revenues generated through the carbon market in developed countries be used to replace the forgone revenues from fossil fuel taxation in their public budgets and how much will be avialable to finance climate change mitigation and adaptation in developing couuntries? | Noted. Section on sources will be revised to better address these issues in SOD. |
| 12651 | 16 | 17 | 3 | 17 | 43 | Other innovative sources such as Taxes based on globalized activities or Debt swaps have been discussed in Leading Group on Innovative Financing for Development(http://leadinggroup.org/IMG/pdf/Mapping_FIDENG-3.pdf) | Reference will be evaluated for inclusion in SOD. |
| 2800 | 16 | 17 | 3 | 17 | 43 | These are all sources of public funds which can be used to fund subsidies. They are not sources of investment, they are simply ways for governments to raise money. | Noted. Section on sources will be revised in SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 15673 | 16 | 17 | 4 | 17 | 15 | Discussion of innovative financing sources could include explicit reference to revenue generated from schemes to regulate emissions from international transport (bunker fuels), as these have been prominent in both the Report of the High-Level Advisory Group on Climate Change Financing (AGF) and broader policy debates. See also World Bank. 2011. Mobilizing Climate Finance: A Paper Prepared at the Request of G20 Finance Ministers. October 6, 2011. http://www.g20-g8.com/g8-g20/root/bank_objects/G20_Climate_Finance_report.pdf. | Noted. Section on sources will be revised in SOD. |
| 11047 | 16 | 18 | 16 | 18 | 37 | Pubulic export insurance system also contribute to technology transfer of infrastructural goods. For example, china, Korea, France(Coface) , Germany(Euler Hermes) , US(US-EXIM (Overseas Private Investment Corporation)and Japan(NEXI) etc have such a operation to mitigate political and credit risk. | Accepted. Will be reflected in SOD. |
| 7437 | 16 | 18 | 2 | 18 | 9 | It may be argued that concessional rather than competitive financing is needed to foster mitigation in developing countries. The question then whether the suggested sources and institutions of financing will be able to deliver this. | Taken into account in rewrite for SOD. |
| 16454 | 16 | 18 | 33 | 18 | 33 | If you mention FITs, which are essentially a policies, you also have to mention other finance-related policies, e.g. tenders, tax breaks, public investment in electricity infrastructure (important for grid access), check e.g. REN21 | Rejected. AMCs are on contract mechanism to respond to policy mandates; but will clarify in SOD. Other |
| 12830 | 16 | 18 | 34 | 18 | 35 | The abbreviations "EE" and "RE" are introduced without a definition which should be added. | Editorial. |
| 16455 | 16 | 18 | 39 | | | Not all power purchase agreements enable mitigation -> specify which ones (long-term, fixed-rate, rate high enough to cover costs) | Accepted. Will be reflected in SOD. |
| 16456 | 16 | 18 | 39 | | | (1) For the free-rider or additionality problem, you may cite Baumol & Oates (1988) as classic, or the newer literature of the CDM ; -> the free-rider problem actually occurs for any instrument with a subsidy element (so also FITs, concessiona loans, tax exemptions) -> this does not become clear in my view | Noted, but we don't understand the comment in relation to the referenced text. |
| 13441 | 16 | 18 | 53 | | | The acronym "PBI" is never defined. | Editorial. |
| 18268 | 16 | 18 | 53 | | | The acronym "PBI" is never defined. | Editorial. |
| 16453 | 16 | 18 | 7 | 18 | 9 | Write out EPC | Editorial. |
| 16451 | 16 | 18 | | | | The whole section is very much focused on instruments related to energy policy/management; the climate-specific instruments (carbon taxes, emission trading etc.) are MISSING | Accepted. Will be implemented for SOD. |
| 16452 | 16 | 18 | | | | This section mentions many interesting instruments, but also misses many (e.g. public-private equity funds, exchange rate risk-sharing pools, carbon price instruments, mezzanine financing, export risk credits….) -> either you provide a comprehensive overview or you select specific ones because they have advantages according to specific criteria -> mention your selection criteria or refer more to the literature | Accepted. Will be implemented for SOD. |
| 12960 | 16 | 18 | 2 | 18 | 9 | It is worth noting here that different types of investors will have different appetites for risk. Institutional investors may have requirements to conform to certain benchmarks defined by the designated asset class. | Accepted. Will be implemented for SOD. |
| 2801 | 16 | 18 | 38 | 18 | 46 | AMCs are a subsidy mechanism they are not a financial instrument | Rejected. AMCs are on contract mechanism to respond to policy |
| 12961 | 16 | 18 | 45 | 18 | 45 | INSERT AFTER 2009). "However, FITs still present some extrinsic risks to investments, for example the possibility of retroactive changes to FIT levels on existing projects, as was instituted by Spain in 2010, damaged investor confidence in renewable energy projects on a broader scale." CITATION: IIGCC (2010). Shifting Private Capital to Low-Carbon Investment. Available at: http://www.iigcc.org/__data/assets/pdf_file/0016/12247/IIGCC-Position-Paper-on-EU-Climate-and-Energy-Policy.pdf | Accepted. Will be implemented for SOD. |
| 16457 | 16 | 19 | 23 | 19 | 24 | Green bonds: discuss it broader, include Climate Bonds; if you want to focus on the residential sector, then include it the sub-section below | Taken into account. Will be included in SOD as appropriate. |
| 12486 | 16 | 19 | 3 | 19 | 3 | Please consider to add a paragraph about Certificates. "Green" certificates are used to increase the production of renewable energy in Sweden/Norway and "white" certificates are used to promote energy efficiency. For details, see section 15.5.3.7 | Taken into account. Will be included in SOD as appropriate. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11048 | 16 | 19 | 5 | 19 | 6 | Government involvement (DOE ( Department of Energy ) etc)and garantee is required, see thailand ESCO funds http://www.ecft.org/home/index.php?option=com_content&view=article&id=67%3Aesco-fund&lang=en | Under consideration / evaluating for inclusion in SOD. |
| 12962 | 16 | 19 | 2 | 19 | 2 | INSERT AFTER: ...public benefit funds. “Key features of the sustainability of Germany’s FIT scheme are a clearly stated tariff digression over time to match all reductions in technology costs and an end target of renewable energies achieving grid parity with fossil fuels.” CITATION: IIGCC, INCR, IGCC and UNEP-FI (2011). Investment-grade climate change policy: Financing the transition to the low-carbon economy. Available at: http://www.iigcc.org/__data/assets/pdf_file/0010/15310/2011-Investment-Grade-Policy-Report.pdf | Accepted. Will be reflected in SOD. |
| 2802 | 16 | 19 | 4 | 20 | 28 | The first six mechanims mentioned are ways of providing subsidy for clean energy / efficiency and the last two are forms of financing . Again, they should not be in the same catergory. | Rejected, but classification of instruments will be clarified in SOD. |
| 17781 | 16 | 2 | | | | There should not be a conclusion at section 16.6.3? | Agreed. Section will be revied in SOD. |
| 16459 | 16 | 20 | 17 | 20 | 28 | Pooling: cite the literature (becomes not clear from where you get the information) | Accepted. Will be reflected in SOD. |
| 17787 | 16 | 20 | 25 | | | give one sentence summary | We don't understand the comment in relation to the referenced text. |
| 17786 | 16 | 20 | 29 | | | give a preamble after the section heading | Noted. Section will be largely revised |
| 13443 | 16 | 20 | 31 | 21 | 10 | This discussion of the "Energy and Power Sector" is grievously simplistic and incomplete. There is no discussion at all of the very substantial financial requirements associated with the replacement of frail and aging power sector infrastructure, particularly in Industrialized Countries, as has been well-documented by the IEA. | Taken into account. Section will be largely revised |
| 18270 | 16 | 20 | 31 | 21 | 10 | This discussion of the "Energy and Power Sector" is grievously simplistic and incomplete. There is no discussion at all of the very substantial financial requirements associated with the replacement of frail and aging power sector infrastructure, particularly in Industrialized Countries, as has been well-documented by the IEA. | see comment 13443 |
| 15414 | 16 | 20 | 40 | | | barriers to renewable financing – nonsense, concern about profitability are the only difference from anything else. Need generality about calling something difficult to finance or facing barriers when the plain meaning is “too expensive” | Noted. Text will be calrified in restructred SOD. |
| 16460 | 16 | 20 | 43 | | | Competitive public auctions: add "tenders" (common wording) | Taken into account. Will be considered in restructured SOD as approproate. |
| 16461 | 16 | 20 | 44 | | | "specific percentage of renewable energy" -> this is normally called Renewable Portfolio Standard (RPS) | Agreed. This will be changed |
| 16458 | 16 | 20 | 8 | | | Green bonds: discuss it broader, include Climate Bonds | Noted, per above response to comment |
| 12963 | 16 | 20 | 39 | 20 | 39 | Therefore it is important to understand the asset allocation requirements for institutional investors on infrastructure investments, notably specific liquidity and ownership requirements and leverage ratios. SOURCE: NAPF News (2012) Issue 1 “Pension Funds and Infrastructure.” | Noted, per above response to comment 12960. |
| 12831 | 16 | 21 | 11 | 21 | 17 | You may like to mention policies which explicitly aim at correcting the effect of ENVIRONMENTAL market failures as a third category of policies that contribute to the development and dissemination of green technologies. The subsequently cited emissions trading system constitutes such a policy instrument that aims at environmental market failures (negative externality of THG emissions) and is meant to create incentives for the development (and in consequence also for the dissemination) of greener technologies. | Taken into account. Will be considered in rewrite for SOD. |
| 16464 | 16 | 21 | 12 | 21 | 17 | When discussing technology & innovation, it looks strange that you just cite one World Bank study, while there is a whole strand of literature on these questions, called "science & technology studies" (check for books and papers of Malerba, Lundvall, Dosi, Winter); much of this literature actually looks at mitigation technologies, e.g. Johansson & Bergek, Hekkert, Geels, Unruh... | Taken into account. Will be considered in rewrite for SOD. |
| 16463 | 16 | 21 | 13 | | | "new technologies" -> needed in all sectors | Noted. |
| 16465 | 16 | 21 | 18 | 21 | 18 | The mentioned policy instruments also apply to other sectors | Noted. |
| 11049 | 16 | 21 | 20 | 21 | 20 | The legislation of energy saving is dropped, the low of energy efficiency improvement,energy saving is required to insert in text, please see APEC energy overview http://eneken.ieej.or.jp/data/4431.pdf | Noted. Will be taken into account in rewrite of this section |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12832 | 16 | 21 | 23 | 21 | 23 | The sections 16.3.2 and 16.3.3 refer to sector specificities in developed and developing countries, respectively. Which criteria are used to differentiate between theses two groups of countries? It would make clear why India, which serves as example in section 16.3.2, is classified as a "developed country", here. | Noted. We will ensure consistency with the glossary (discussed in X-cut meeting) |
| 4529 | 16 | 21 | 25 | 21 | 37 | This paragraph highlights the role of venture capital. However, venture capital is responsible for a tiny fraction of investment, and for the industry sector (e.g. steel, cement and chemicals) the investments that would reduce GHGs largely have to do with improving efficiency of their operations and are not an area for venture capital finance. This paragraph seems more relevant to renewables where it would be interesting to compare VC investment with the pace of investment of for example solar manufacturing in China (and place this in the energy sector section). | Noted. Will be considred in rewrite for SOD |
| 13444 | 16 | 21 | 25 | 21 | 37 | This discussion is outdated and fails to reflect recent developments. The discussion of a contraction in venture capital flows to clean technologies in 2009 is misleading in that it ignores the substantial growth of ventue funding for these technologies in 2010 and 2011. | Noted. Message and data will be updated |
| 18271 | 16 | 21 | 25 | 21 | 37 | This discussion is outdated and fails to reflect recent developments. The discussion of a contraction in venture capital flows to clean technologies in 2009 is misleading in that it ignores the substantial growth of ventue funding for these technologies in 2010 and 2011. | Noted. Message and data will be updated |
| 13445 | 16 | 21 | 40 | 21 | 41 | This sentence is totally incomprehensible. | Agreed. Will be rewriten. |
| 18272 | 16 | 21 | 40 | 21 | 41 | This sentence is totally incomprehensible. | see comment 18272 |
| 9056 | 16 | 21 | 40 | 21 | 43 | This is sentence is incomprehensible to me: "The fragmentation of the transport GHG reduction project results in transaction costs that are generally superior to the climate benefits." Superior? Greater than? | Agreed. Will be rewriten. |
| 16467 | 16 | 21 | 44 | 21 | 44 | The difference between investment and operation costs is relevant for most sectors (e.g. energy, industry, buildings…) | Noted. |
| 9055 | 16 | 21 | 23 | | | The section 16.3.2 is on sector specificities in developed countries but in this line the example is from India, a developing country. | Agreed. This will be corrected |
| 16466 | 16 | 21 | | | | The whole section very much focuses on the public sector; the private sector can play an important role, e.g. in the operation of buses or railway lines, but also owners of air and road transport fleets | Agreed. The section will be largely revised |
| 13446 | 16 | 22 | 1 | 22 | 3 | This section is totally incomprehensible. | Agreed. Will be rewriten. |
| 18273 | 16 | 22 | 1 | 22 | 3 | This section is totally incomprehensible. | see comment 13446 |
| 13447 | 16 | 22 | 10 | 22 | 18 | This discussion incorporates a fundamental misconception in setting the boundaries of an economic problem and assumes a system that privatizes all benefits and socializes all investment losses. | Noted |
| 18274 | 16 | 22 | 10 | 22 | 18 | This discussion incorporates a fundamental misconception in setting the boundaries of an economic problem and assumes a system that privatizes all benefits and socializes all investment losses. | see comment 18447 |
| 9057 | 16 | 22 | 11 | 22 | 11 | The section 16.3.2 is on sector specificities in developed countries but the example cited is from Asia in which only Japan and possibly the Republic of Korea are developed countries. | Agreed. Will be changed in rewrite. |
| 15460 | 16 | 22 | 19 | | | The principal-agent problem is a major stumbling block to building efficiency in China. See http://eec.ucdavis.edu/publications/2010analyzingretrofitinbeijinggov.pdf | Agreed. Will be considered in rewrite of the section. |
| 13448 | 16 | 22 | 39 | 22 | 42 | This statement is incorrect. In many countries (including in the US and the EU), the reason that the emissions-reducing potential of the Ag, Land Use, and Forestry sectors remains untapped is not due to technical problems but rather due to policies that provide incentives for expanding emissions-intensive activities rather than their low-emissions alternatives. | Noted. Will be considered in the rewrite of this section. |
| 18275 | 16 | 22 | 39 | 22 | 42 | This statement is incorrect. In many countries (including in the US and the EU), the reason that the emissions-reducing potential of the Ag, Land Use, and Forestry sectors remains untapped is not due to technical problems but rather due to policies that provide incentives for expanding emissions-intensive activities rather than their low-emissions alternatives. | see comment 13448 |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12965 | 16 | 22 | 12 | 22 | 18 | According to Ürge-Vorsatz et al, in an appraisal of 20 regulatory instruments, a diverse portfolio of policy instruments is the most effective way to drive CO2 reductions in buildings, with the most cost-effective being appliance standards, demand-side management programmes and mandatory labelling. See, Ürge-Vorsatz, Koeppel and Mirasgedis (2007). Appraisal of policy instruments for reducing buildings' CO2 emissions, in Building Research & Information, 35:4, 458-477. | Noted. Will be considered in the rewrite of this section. |
| 12966 | 16 | 22 | 19 | 22 | 27 | To complete the bullet points in this section, allow me to suggest a recent paper compiled by IIGCC's Property Working Group: IIGCC (2012). Enhancing the real estate sustainability policy framework. Available at: http://www.iigcc.org/__data/assets/pdf_file/0005/15377/IIGCC-enhancing-the-real-estate-sustainability-policy-framework.pdf This paper outlines 7 barriers to scaling up finance in energy efficiency as identified by institutional investors: Policies that inadequately target the relevant practitioner making key management decisions, failure to target opportune stages in a building's lifecycle, tendency to focus on design over operational performance, market signals do not currently value sustainability, lack of strong compliance regimes – to enforce existing regulations, lack of information and skills in green building and failure to consider unintended consequences of policy – for example premature forced obsolescence of buildings. | Noted. Will be consider in rewrite the section.SOD will focus more on investment barriers. |
| 12964 | 16 | 22 | 9 | 22 | 9 | There is also a need to differentiate ownership agreement because renters and owners operate under different incentives in terms of investing in energy improvements, and trends in property ownership vary drastically across markets. | Agreed . Will be taken into account in rewrite of the section. |
| 16468 | 16 | 22 | | | | The whole section is very much written in a "abatement cost" language; a stronger focus on "finance" is needed | Taken into account. The section will be largely rewriten. |
| 11228 | 16 | 23 | 2 | | | As regards tropical forest countries, the land rights of indigenous peoples and local communities are seldom fully recognized in national legal frameworks (RRI, 2012) | Check reference. |
| 11050 | 16 | 23 | 27 | 23 | 40 | There are "immense" opportunities for financing mitigation is not appropriate, a lot of countries face on financial barrier, even in emerging country. According to our study and steel company, India has no any special financial assistance such a tax break, subsidy etc. | Linked to the discussion on complementariness and trade-offs. |
| 16471 | 16 | 23 | 43 | 23 | 43 | write "non-CO2 GHGs" for clarity and mention which ones (HFC?) | The text will be reviewed to be clearer. |
| 16469 | 16 | 23 | | | | Becomes not clear why you discuss all sectors for developing countries again -> many of the mentioned points (e.g. relevance of policies, CCS, digital technologies) also apply for industrialized countries -> would suggest to just focus on the main differences between North and South (e.g. currency risks, political risks, economic risks, many sectors are still dominated by the public sector in many developing countries...) | Accepted. SOD will be largely restructured. |
| 14355 | 16 | 23 | 12 | 23 | 25 | CCS is available at very limited developing countries. I don't think it is appropriate as example of new technology in developing countries. Rather, smark grid must be appropriate. In general, developing countries need to increase their energy supply since many of poor people still have no access to the energy. This means that most of developing countries will be green field of renewable or low carbon energy which could help poor countries to supply energu to poor people. Such potential of low carbon energy supply in developing countries should be focused. | Discussion with the group and with the x-cutting group on adaptation. |
| 9058 | 16 | 23 | | | | Authors might want to consider citing and learning from an important study India on incremental cost on six sectors: Centre for Science and Environment (CSE) (2010). Challenge of the New Balance. New Delhi. | Try to re-structrure the sub-sections. |
| 16470 | 16 | 23 | | | | You may mention that some energy-intensive industries are shifted from developed to developing countries, which leads to additional emissions in developing countries (see e.g. Peters/Hertwich & Edenhofer)and to many investment decisions where low-carbon tech could be applied | Check references. Re-structure the title of sub-section to accommodate a broader perspective. |
| 16472 | 16 | 23 | | | | The whole section only refers to technologies, not to finance | Check with WGII. |
| 16474 | 16 | 24 | | | | Mention in caption that this is about "transport" | Additional data and literature will be |
| 16473 | 16 | 24 | 15 | 24 | 22 | Sections needs rewording: 1) "but there are many…" does not make sense as intro; 2) whole section only refers to technologies, not finance; 3) "with great potential" -> not clear what this means, sounds very unscientific, add details (e.g. % of potential below 20 $/tCO2) | Taken into account. It has already been mentioned that these are only few examples. It can be reinforced in the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 13449 | 16 | 24 | 4 | 24 | 9 | This discussion is overly simplistic and not correct. In many Industrialized countries, growth in buildings sector demand for energy is strongly driven by increases in "plug load"-related demand for electricity, not just by HVAC demand driven by increased floor space. | It will be re-structured. |
| 18276 | 16 | 24 | 4 | 24 | 9 | This discussion is overly simplistic and not correct. In many Industrialized countries, growth in buildings sector demand for energy is strongly driven by increases in "plug load"-related demand for electricity, not just by HVAC demand driven by increased floor space. | Linked to the discussion on complementariness and trade-offs. |
| 14356 | 16 | 24 | 26 | 25 | 15 | Major source of GHG in agriculture sentor in developing countries include Methan Gas from rice paddy. Many of developing countries rely their economy and employment on agriculture sector. So, agriculture and land use is critical for them in terms of economy and employment, in turn, GHG mitigation. | The text will be reviewed to be clearer. |
| 18277 | 16 | 24 | 27 | 25 | 16 | This section is unacceptably weak, with major gaps in coverage and repeated use of overly simplistic concepts. For example, the section does not address the potential for emissions mitigation in the ag sector of Industrializd Countries or the issue of financing measures to achieve this potential. The section does not address the impact of existing tax and subsidy policies on emissions-intensive activities or the financial potential of reducing or redirecting these subsidies, particularly in the cases of industrial agriculture and factory-like facilities for livestock production. | It is just an introduction to the sub-section. However, a reference can be sought. |
| 11229 | 16 | 25 | 11 | | | Significant challenges still exist as regards full compliance with relevant international human rights and environmental obligations and standards. | Noted. Comments will be reflected in the restructred SOD as appropriate. |
| 16475 | 16 | 25 | 3 | 25 | 5 | Cite literature why public and not private sector is important (in many cases the public sector is responsible for forestry policy but the private sector is the one investing or not…) | Taken into account. The differentiation will be highlighted in the SOD (maybe in |
| 8063 | 16 | 25 | 4 | 25 | 4 | as written here it seems as if international public finance could only be ODA | Comment doesn't make sense in line 4. We assume it refers to line 2. International public finance is not all ODA but "Other official flows" are very |
| 8064 | 16 | 26 | 10 | 26 | 10 | is it really "to enable mitigation finance" and not rather "mitigation action"? And would this not also be applicable to adaptation? | Noted. |
| 16476 | 16 | 26 | 2 | 26 | 2 | Sentence needs re-wording | Rejected. |
| 11231 | 16 | 26 | 21 | | | In addition to facilitating the political, fiscal and educational frameworks, government should also provides modalities for full and effective participation of stakeholders and rightsholders. | Under consideration / evaluating for inclusion in SOD. |
| 16477 | 16 | 26 | 21 | 26 | 27 | Some policies may not be at the right place, e.g. quotas are rather mandating, financial incentives can be seen as facilitating. Difference between facilitating and resourcing does not become clear | Noted. Will clarify in SOD. |
| 11232 | 16 | 26 | 23 | | | Information should be made publicly available to stakeholders and rightsholders as well, not only to the market. | Noted. |
| 18279 | 16 | 26 | 29 | 26 | 10 | This is just a mental error. Line 29 announces that the section will treat "five broad categories" but it covers only FOUR categories. | Editorial. |
| 11230 | 16 | 26 | 4 | | | Proper consideration should also be paid to the, legal and regulatory frameworks and social actors... as key requirements to ensure social and environmental sustainability as well as the attractiveness of financing. Governments should ensure legal reforms aimed at ensuring that climate finance and related activities will do no harm to local communities and indigenous peoples, be participatory and directly accessible - for financing activities based on traditional knowledge and traditional sustainable resource conservation. | Noted. Covered by other sections of WGIII report. |
| 18278 | 16 | 26 | | | | This section is also weak. This where the chapter should treat the topics of removing perverse incentives and subsidies for emissions-increasing activities. Unfortunately, it ignores both important topics. | Under consideration / evaluating for inclusion in SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12967 | 16 | 26 | 10 | 26 | 14 | To enable mitigation finance, government needs to a) evolve TRANSPARENT policy, fiscal, legal and educational frameworks THAT ARE ALIGNED WITH WIDER POLICY GOALS INCLUDING ECONOMIC, ENERGY, RESOURCES AND TRANSPORT POLICY OBJECTIVES b) build institutional capacity across sectors and at various levels; c) proactively respond to the needs and preferences of ACTORS BY PROVIDING INCENTIVES TO INVEST WHICH RECOGNIZE AND COMPENSATE FOR ANY ADDITIONAL RISK INVOLVED IN THE INVESTMENT d) establish and maintain a range of oversight, accountability , and feedback mechanisms; and e)mobilize and allocate public resources and investments. | Noted. Edits will be included as appropriate in restructured section. |
| 13064 | 16 | 26 | 2 | 26 | 27 | I think it should be appropriate to mention in this section a synthesis work undertaken by WBCSD and published in April 2010 called "Enabling Frameworks for technology diffusion". This work was undertaken at the request of EGTT (Expert Group on Transfer of Technologies) of UNFCCC when consultation of business was framed by this body. This publication, which refernces are below could be accompanied by the following text which summarises the findings : "Business has experienced that five elements are necessary to enhance investments and sales of low carbon technologies : strong signals from governments towards low carbon growth, adequate institutionla frameworks, appropriate absorptive capacity in institutions , business and society, economic and financila incentives, energy efficiency drivers, and business engagement with governements. Specific enablers were indentified in the following sectors :power,cement, road transport, buildings and forests (WBCSD, 2010).". The publication can be quoted as : WBCSD (2010). Enabling Frameworks for technology diffusion. WBCSD, Geneva, 13 Switzerland, 32 pp., (ISBN: 978-3-940388-61-2). Available at: http://www.wbcsd.org/Pages/EDocument/EDocumentDetails.aspx?ID=149&NoSearchContextKey=true | Noted. Reference will be evaulated and included in SOD as approproiate. |
| 12968 | 16 | 26 | 31 | 26 | 31 | ...performance, and facilitating markets." | Editorial. |
| 11051 | 16 | 27 | 35 | 27 | 35 | MEPS for appliance is very populler policy in developing countries as well,thus, several counties should be listed in the text. More comprehensive study is needed. | Noted. Will cite sources that provide more info. |
| 16479 | 16 | 27 | 38 | 27 | 42 | Mention instruments here, e.g. capacity building, information campaigns, labels, knowledge platforms… (the IEA policy database has a good overview) | Rejected, but how facilitation occurs will be included in the SOD. |
| 16480 | 16 | 27 | 43 | 27 | 43 | here you can refer to section 16.3.1. , where a whole range of instruments are discussed to improve access to finance | Noted. |
| 16478 | 16 | 27 | 9 | 27 | 25 | mention carbon price and quantity driven instruments (e.g. ETS or RPS) -> both of them also affect price of consumption -> your distinction btw "affecting price" and "affecting "performance" is not very useful, as both of them can be linke -> a beter distinction may be btw price-based and quantity-based instruments. Among quantity-based instruments, you may distinguish btw. flexible quantity-based instrument (e.g. ETS or RPS) that affect the prices in the market an non-flexible quantity-based instruments (e.g. standards) | Accepted. But will probably not be discussed in this section, but in other section of SOD. |
| 12969 | 16 | 27 | 48 | 27 | 48 | Additionally, private investors may have a difficult time financing energy projects in developing countries because of less developed local banking sectors. | Under consideration / evaluating for inclusion in SOD. |
| 16481 | 16 | 28 | 1 | 28 | 1 | Why are you discussing barriers for policy-makin g and implementation here? Isn't this the finance chapter? | Noted. Will clarify in SOD. |
| 8313 | 16 | 28 | 27 | 28 | 33 | Given that well-designed regulations, which are stringent and flexible, can spur innovation and enhance competitiveness, please add "if poorly designed" before "they can become impediments to innovation and competition". | Will revise in SOD. |
| 8065 | 16 | 28 | 4 | 28 | 7 | it would be interesting to mention shortly the other barriers here | Noted. |
| 18280 | 16 | 28 | 9 | 28 | 25 | The discussion of the fiscal dimension of climate financing omits any discussion of the impacts of fossil fuel subsidies on climate finance. This section needs to compare the impacts of fossil fuel subsidies on future emissions to the impacts of proposed incentives for climate finance and emissions-reducing activities. | Noted. Addressed in other section(s). |
| 16482 | 16 | 28 | | | | Mention import taxes for low-carbon technologies | Noted. |
| 16483 | 16 | 28 | | | | Difference btw regulations and statues does not become clear according to the description; what is the relevance of the distinction for the low-carbon finance context? | Noted. Will consider revision for SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 4530 | 16 | 29 | | | | This figure is at odds with the facts regarding funding of R&D and exaggerates the governmental role. This figure/depiction should be contrasted with the reality who is actually making R&D investments today. Examination of the R&D statistics (reference OECD report on R&D Statistics) shows that for the OECD roughly two thirds (and rising) of R&D is carried out or funded by the private sector, and a third by government. | Noted. Comments will be considered in the restructured chapter as appropriate. |
| 3268 | 16 | 29 | 7 | 29 | 9 | This paragraph states that "A variety of different theoretical and analytical perspectives has been applied to study and understand technology transfer, but no comprehensive theories yet exist." This seems misleading and would be better replaced with a reference to the other sections of AR5 that actually discuss some of these perspectives and definitions. | Accepted. Section will be disolved in SOD. |
| 16484 | 16 | 29 | | | | (1) whole section needs re-writing (english language native should check it), (2) more academic literature needed, does not help too much when just citing UNFCCC; (3) in general, it is not obvious why this section is needed as a) this is the finance and not the technology chapter and (b) almost everything (policies, R&D, financing) is discussed in other sub-chapters of chapter 16; (4) to better integrate this into the whole chapter, this section could focus on the link of finance and technology transfer, e.g. financing tools that promote tech transfer (e.g. CDM) or transfer of "financing technology or know-how" ) tools and knowledge needed for financing low-carbon technology) | Noted. Chapter will be restructured. |
| 6951 | 16 | 29 | 14 | 29 | 15 | Please provide a more specific reference to WGI AR5. | Noted. Reference will be provided if paragraph will be retained. |
| 18281 | 16 | 30 | 13 | 30 | 30 | This para needs a citation for the quoted statistic on the declining share of government research and a footnote on how nuclear R&D is included in the cited calculation (e.g., as energy R&D or as defense spending). | Noted. Appropriate referencing will be used if paragraph will be retained in SOD. |
| 9059 | 16 | 30 | 43 | | 46 | There is a direct quote in this paragraph from a UNEP publication which refers to an "inflection point." But the preceding paragraphs do not describe what the previous situation was to justify characterizing 2008-2009 as a inflection point. The observation of the UNEP study of an inflection point just when the financial crisis erupted can be interpreted as an instance that the private sector will tend to over-finance environmental projects during periods of high financial liquidity in search of high returns through risky projects. This means that the levels of private financing during period of abundant global liquidity in 2000-2008 cannot be directly interpreted as evidence that the private sector can provide climate financing at the scale required except in periods characterized by speculation in search of potentially but unsustainably high returns. This is the same point as my comment no. 20 . Long-term and steady public sector climate policy, not abundant liquidity arising from other flaws in the international financial system, is indispensable to mobilize sutainable private investment and risk-taking in climate change. | Noted. Comments will be considered in the restructured chapter as appropriate. |
| 16485 | 16 | 30 | 7 | 30 | 7 | purchase/trade of CDM credits as "technology transfer" sounds strange, but CDM projects involve tech transfer, cite the extensive literature (e.g. Seres et al., Schneider et al. -> cite them also on page 31, line 40) | Noted. Reference will be reviewed and included in the restructured chapter as |
| 13058 | 16 | 30 | 20 | 30 | 32 | A reference could be attached to this sesction on Research and Development, to the following publication of WBCSD that was done at the request of EGTT in the private sector consultation handled by this body : WBCSD (2010). Innovating for Green Growth, 40pp, ISBN: 978-3-940388-68-1 and can be found at the site : http://www.wbcsd.org/Pages/EDocument/EDocumentDetails.aspx?ID=151&NoSearchContextKey=true | Noted. Reference will be reviewed and included in the restructured chapter as appropriate. |
| 16486 | 16 | 30 | | | | Substantial part of this section is referring to R&D (which is chapter 16.5.1.1) | Noted. Chapter will be restructured. |
| 18253 | 16 | 30 | 33 | 30 | 36 | Similar terms are used referring to “processes of research, development, demonstration, and deployment (RDD&D) is reducing the private spending on climate-smart technology, delaying its diffusion,” | Noted. Chapter will be restructured. |
| 16487 | 16 | 30 | | | | What is difference between "tech diffusion" and "tech transfer" (according to your definition of tech transfer, there should not be any) | Noted. Text will clarified if retained in SOD. |
| 9938 | 16 | 31 | 16 | 20 | | If you can list the detailed technology transfer in energy sector in a table, which can demostrates which technology has been tranfered from which country to which coutry. | Noted. Outside the scope of the chapter. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 18282 | 16 | 31 | 22 | 32 | 17 | This section again ignores the potential use of large-scale mechanisms such as a Tobin Tax or a fee on emissions from international air and marine freight travel as a mechanism for funding climate-related technology transfer. | Accepted. |
| 9939 | 16 | 31 | 22 | 32 | 17 | The funding approaches for technology transfer is almost the same to climate financing in 16.2, so actually funding for tranfer is one part of climate financing. Maybe this chapter should be recomposed, according to the lifecycle of climate financing, which includs the finance sources, instruments, usages, etc. | Noted. Chapter will be restructured. |
| 8066 | 16 | 31 | 31 | 31 | 31 | which sector is being referred to? | Take into account. Text will be revised in restructured chapter. |
| 12003 | 16 | 31 | 36 | 31 | 42 | see my comment above in cell K11: one third is wrong, it is more, difficult to say how much, but definitely more. | Noted. Reference is provided. |
| 11233 | 16 | 31 | 39 | | | In some cases CDM projects have resulted in adverse social and environmental impacts. | Noted. Outside the scope of the chapter. |
| 13724 | 16 | 31 | 39 | 31 | 43 | Replace by cross-reference to Ch. 13.13.1.2 | Noted. Will be incorporated if retained in |
| 16488 | 16 | 31 | | | | You miss two key funding challenges for tech transfer: domestic finance and financial instruments of multilateral development banks | Noted. Comment will be considered in the restructured chapter as appropriate. |
| 14996 | 16 | 31 | 22 | | | The chapter should discuss offsets in cap-and-trade systems as a means of financing developing country mitigation efforts. Beyond the CDM, some programs (e.g., California, Australia) are considering inclusion of international offsets in their trading regimes. Such provisions could drive significant flows of investment from private entities with compliance obligations to mitigation efforts in developing countries. | Noted. Comment will be considered in the restructured chapter as appropriate. |
| 3305 | 16 | 31 | 43 | 32 | 17 | Delete these paragraphs because they overlap with chapter 13, International Cooperation, and they are not strong paragraphs and are understandably not fully developed. | Noted. Chapter will be restructured. |
| 11106 | 16 | 32 | 1 | 32 | 11 | Both Chapter 13 and Chapter 15 deal with issues on IPRs in details. Compared to these chapters, the description of this paragraph is partial, probally because of the limit of space. Thefore, it may be better to refer to these chapters and avoid duplicating similar descriptions in this chapter. My suggestion is "Another sector relevant for technology transfer flows is the international market. There is evidence that those links go through trade on intermediate goods and capital goods. In this regard, IPRs play an important role, and Chapter 13 and 15 deals with IPR-related issues." | Accepted. |
| 11052 | 16 | 32 | 12 | 32 | 17 | The following description is quite misleading. “Over the last years, data show that a .. official export credits flows have “gone to transport and industry sectors, followed by energy projects”. The role of trade financing technology transfer for mitigation “may” not conclusive, however, these mentioned financial share is not directly explain its effect. The citation is not appropriate.<br>Through my working experience at Bilateral Financial Institution, without these export credit, environment efficient technology in industry and transport sector is not realized in developing country. These country face financial and technology barrier to introduce expensive but environmental sound efficient infrastructure with concessional loan □ | Noted. Comment will be considered in the restructured chapter as appropriate. |
| 13725 | 16 | 32 | 25 | 32 | 31 | Replace by cross-reference to Ch. 13.13.1.2 | Noted. Will be incorporated if retained in |
| 12004 | 16 | 32 | 28 | 32 | 31 | you need to explain more the issue with the transaction costs. The transaction costs have been greatly reduced during the last two years. | Noted. Outside the scope of the chapter. CDM will be discussed in more depth in |
| 8738 | 16 | 32 | 28 | 32 | 31 | Why does a price have to be high to generate demand? | Noted. Text will be revised. |
| 7129 | 16 | 32 | 32 | 32 | 37 | Information can be updated on the basis of UNFCCC COP, decision 1/CP.16, establishing a Technology Mechanism, under the guidance and accountable to the COP, which consist of a Technology Executive Committee, and a Climate Technology Centre and Network (CTCN), being one of the priorities areas "Increased public and private investment in technology development, deployment, diffusion and transfer". | Agreed. |
| 16489 | 16 | 32 | | | | This sounds like industrialized countries, CDM and GEF are responsible for tech transfer but you miss some of the key players: companies in Annex-1 countries, governments and companies in non-Annex-1, non-UNFCCC institutions such as MDBs and UN organizations | Noted. Comment will be considered in the restructured chapter as appropriate. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16491 | 16 | 33 | 10 | | | Define "institutions" for this chapter-> only organizations and funds, or more general: set of rules that shape scocial interaction (if second, refer to North (1990) or other social scientists) | Accepted. Definition will be included. Text refers to a broader defintion of institutions but that include organizations |
| 16492 | 16 | 33 | 21 | 33 | 28 | Many statements, no references, cite literature | Accepted. More references will be cited. |
| 11234 | 16 | 33 | 32 | | | Direct access to financing for adaptation and mitigation actions designed and implemented by local communities and indigenous peoples should also be allowed. (Martone, Rubis, 2012) | Noted. Will make reference to this new modality when referring to GCF and |
| 8739 | 16 | 33 | 42 | 33 | 44 | Two things: Firstly, finance ministries are generally invovled with all public expenditure, i.e. all projects involving public co-financing. Secondly, ministries of energy, planning, etc are also increasingly involved in implementing such activities. | Accepted. Will add a reference to this. |
| 18283 | 16 | 33 | 45 | 34 | 6 | This section needs to expand the reference to national finance channelling entities such as the Indonesia Climate Change Trust Fund as a vehicle for integrated planning and targeting of national, international, and FDI-related investments. This section also needs to cover the role of entities such as the BNDES in Brasil as a national arrangement for managing climate-related investments. | Accepted. A table will be added listing those that have been creating recently. |
| 16490 | 16 | 33 | | | | Wholesub- chapter could be part of the policy sub-chapter; try to focus more on institutions relevant for finance (not for climate policy in general) | Accepted. Text will be revised to focus only on institutions relevant to finance in |
| 14994 | 16 | 33 | 1 | | | This section should be expanded significantly. In particular, the discussion on bilateral finance should be expanded to identify the level and nature of investments that the major donor countries are making. Also, some discussion of the various institutional arrangements and their relative merits or challenges would be appropriate here. | Noted. Section will be revised. |
| 16493 | 16 | 34 | 2 | 34 | 3 | "national implementing entities" -> they are now established as part of the "direct access" window of the Adaptation Fund; as "direct access" is an important development, also for the GCF/GEF, discuss it somewhere (you may cite Horstmann 2011/2 in "Climate Policy" or others) | Accepted. A table listing these and their main characteristics will be added |
| 16495 | 16 | 34 | 25 | 34 | 25 | Replace "Multilateral" with "Global" (else the distinction between multilateral and regional and trilatereal does not make too much sense) | Rejected. Here we refer to multilateral arrengements. |
| 16496 | 16 | 34 | 32 | 34 | 33 | Only Kyoto but not UNFCCC includes "binding emission reductions"; both call for "new and additional finance" | Accepted. Text will be revised. |
| 15675 | 16 | 34 | 33 | | | Financing commitments under the UNFCCC and KP only apply to Annex II, not Annex I countries. | Accepted. Text will be revised. |
| 16497 | 16 | 34 | 35 | 34 | 35 | The voluntary market has not been generated by the UNFCCC/Kyoto | Rejected. Although not directly generated, voluntary markets have been triggered by ETS under the UNFCCC. |
| 16498 | 16 | 34 | 40 | 34 | 40 | Write out SCCF and LDCF | Accepted. Will do. |
| 8067 | 16 | 34 | 44 | 34 | 45 | unclear what is being referred to with this transitional process; where is the 2013 coming from? | Accpeted. Will update the text to reflect new agreements and decisions. |
| 11235 | 16 | 34 | 45 | | | The first meeting of the Board of the Green Climate Fund took place in August 2012. Among te key challenges it will have to face are the need to ensure full and effective participation of stakeholders, ensuring a robust safeguards system and related compliance and accountability mechanisms | Noted. Will make reference to role of stakeolders when speaking of GCF. |
| 16494 | 16 | 34 | | | | Interesting chapters but does not refer to finance | Accepted. Text being revised to focus only on issues of finance in coordination |
| 9421 | 16 | 34 | 36 | | | When discussing institutional arrangements in the international level, do authors only focus on the basket of six GHGs in the Kyoto Protocol? Isn't it also important to take into account non-CO2 GHG emissions, not only six Kyoto gases but also transboundaryair pollutants and Montreal gases that also have a large impacts on climate change? For example, as for Montreal gases such as CFCs and HCFCs, these are long-lived gases with very high global warming potentials that the policy makers were aware of. These gases were excluded from the UNFCCC to avoid any overlap with the Montreal Protocol, however, there will be still large amount of emissions in CO2 equivalent in the next 10 -20 years which are difficult to be reduced even regulated under the Montreal Protocol, because the Montreal Protocol only regulate the phase out schedule of consumption and production of CFCs and HCFCs and still allow production of HCFCs especially in developing countries. | Noted. Reference will be made in SOD where appropriate. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15674 | 16 | 34 | | | | Either here or in section 13.11 it would be useful to elaborate further on the range of ways in which financing can support international cooperation on climate change. See generally Rübbelke, D.T.G. 2011. International Support of Climate Change Policies in Developing Countries: Strategic, Moral and Fairness Aspects. Ecological Economics 70 (8):1470-80. Either way, it would be useful to cross-reference between these two sections. | Rejected. This belongs more in chapter 13. |
| 14995 | 16 | 34 | 25 | | | The chapter should discuss the World Bank's Forest Carbon Partnership Facility as a key example of multilateral financing that can play a role in capacity building and mitigation. This section could be an appropriate place for that discussion. | There is already a reference to the CIFs administered by WB - will list each separately in SOD. |
| 8068 | 16 | 35 | 23 | 35 | 23 | should be "bilateral climate finance" instead of "bilateral ODA" | Rejected. Some ODA is dedicated to climate finance as defined in the chapter - but will make sure to clarify this in the |
| 8741 | 16 | 35 | 31 | 35 | 35 | Given that it is very much up to the countries to report whether financing deserves the Rio marker or not, it is not certian how precise an instrument the Rio marker is. | Accpeted. Will clarify the shortcomings of this tool, nevertheless as an important but imperfect tool to provide some |
| 16501 | 16 | 35 | 35 | 35 | 35 | Apart from Corfee-Morlot, also cite Michaelowa&Michaelowa(2011) for a more critical view on the markers | Accpeted. More references will be added in the re-write of the chapter. |
| 8069 | 16 | 35 | 35 | 35 | 35 | there is now also an adaptation marker | Accpeted. Will make a reference to this. |
| 17792 | 16 | 35 | 36 | | | plurilateral or multilateral to keep it clear for more non-specialised audience? | Rejected. The two terms refer to different things but accept that a |
| 16499 | 16 | 35 | | | | (1) The EU is an important regional arrangement, also for finance; (2) you may cite the Climate Funds Update webpage for the funds you mention here (also before) | 1) Rejected. The EU is not a financing mechanism though it is true that it manages funds under its purvue and will |
| 16500 | 16 | 35 | | | | This section should be more about the bilateral institutions and not the data collection | Rejected. We include the Rio Markers as an important tool to help track climate finance but agree that the text needs to |
| 16502 | 16 | 35 | | | | (1) Not clear if this section is needed -> are these arrangements relevant? give examples for the case of climate change; (2) instead, you may discuss multi-bi institutions, like the CIFs, this is an important development… | 1) Accepted. Text being revised to focus only on those relevant to finance to climate change 2) CIFs are covered |
| 8070 | 16 | 36 | 1 | 36 | 7 | are there also such plurilateral or triangular arrangements for renewable energies or energy efficiency? | Yes there are and will make reference to this as appropriate in redrafted section. |
| 18284 | 16 | 36 | 12 | 36 | 20 | This concluding section refers to the importance of mitigation activities that are integrated into overall national plans. However, the preceding sections of this Chapter make no mention of any of the most successful of these efforts, including the efforts of the NDRC and the provisions of China's 12th Five Year Plan or the efforts of BAPPENAS in Indonesia that have led to the creation of Indonesia's Sectoral Roadmap for Climate Change and Development or Ethiopia's program of Green Economic Development. The omission of any reference to these and similar activities in other developing countries reinforces the unacceptable "tilt" of this section toward the activities and interests of Annex 1 (i.e., Industrialized) countries. | Accepted. There will be a new table added to these national entities and the important role that they are playing or that will potentially play. |
| 11053 | 16 | 36 | 13 | 36 | 20 | "The overall state of institutions in developing countries is weak." change to "need further capacity building" | Accepted. Will revise text to place focus on need for building the capacities of |
| 16503 | 16 | 36 | 13 | 36 | 14 | This is a very strong statement, and certainly not an obvious "conclusion" of what you discussed before. -> You may cite the work of Winkler on SD PAMs but I am not sure if this is enough to make such a strong statement | Accpeted. Will cite references and efforts of countries to do this and the reasons for doing it. |
| 8071 | 16 | 36 | 18 | 36 | 20 | national implementing entities and national funds have also great potential. If followed by the sentence currently in the text, it sounds like they could also lead to the mentioned weaknesses | Accepted. Will add. |
| 16504 | 16 | 36 | | | | Why are these conclusions only about domestic instutions? Why do you refer to important things in the conclusions like fragmentation and duplication that were, however, not discussed before? | Accepted. Conclusion will be rewritten to cover all the issues of the section. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 12835 | 16 | 37 | 12 | 37 | 13 | This sentence is contradictory. If mitigation and adaptation were complementary, the investment in mitigation would increase the need to invest in adaptation (and not, as mentioned, reduce it). If more mitigation reduces the investment in adaptation, the two strategies are substitutes, and not complements. | Noted. Wording will be clarified. |
| 15415 | 16 | 37 | 23 | | | I know Tol and cant figure out what they are talking about – eg private vs public good aspects of adaptation | Noted. Reference will be double-checked and SOD text clarified. |
| 12836 | 16 | 37 | 24 | 37 | 29 | The message is unclear to me. | The text will be reviewed to be clearer. |
| 12834 | 16 | 37 | 1 | | | In this subsection the notions of complementariness/complement/complementary should be defined to avoid confusion. The economic term "complement" in its strict sense implies that more mitigation leads to an increase in the effectiveness of adaptation and vice versa. According to that, the general relationship of mitigation and adaptation is the following: An increase in mitigation lowers the expected damages of climate change, and so adaptation becomes less effective. In the literature we also find that mitigation and adaptation are economic substitutes, and not complements (see e.g., Ingham, A., J Ma and AM Ulph (2005), Can adaptation and mitigation be complements? Tyndall Centre Working Paper No. 79. Barrett, S (2008) Dikes v. Windmills: Climate Treaties and Adaptation, Discussion Paper, Johns Hopkins University, and Tol, RSJ (2005) Adaptation and mitigation: trade-offs in substance and methods, Environmental Science & Policy 8, pp. 572–578). Also note the short summary concerning this issue in chapter 13.3.1, p.18 ll. 27 to 36. If the notion "complements" is just used to illustrate the fact that it is optimal to apply a mix of both strategies, mitigation and adaptation, (instead of one strategy), then it would be helpful to use another term or to define this notion at the beginning. Nevertheless, in some special sectoral cases there might exist synergies between mitigation and adaptation which could be discussed in detail in section 16.7.2.1 (see Yohe and Strzepek (2007) Adaptation and mitigation as complementary tools for reducing the risk of climate impacts, in Mitigation and Adaptation Strategies for Global Change, Vol 12, 5.). | Noted. Term will be clarified in SOD and discussed with the x-cutting group on adaptation. |
| 16505 | 16 | 37 | | | | Whole section is not very easy to read, consider better structuring: question, elaboration, conclusion (particularly sections 16.7.2.1 to 16.7.2.3 are not very well structured) | Noted. Section will be re-structrur as appropriate. |
| 12833 | 16 | 37 | 9 | | | While the "macro-level perspective" of investments in mitigation and adaptation is described in section 16.7.1, the (expected) "micro-level perspective" is missing as an explicit section in this chapter. Due to the global-public-good character of mitigation in contrast to the private-good property of adaptation, this would lead in a micro-level perspective (without a global agreement to mitigate GHGs) to an underinvestment of mitigation due to free riding (see, e.g. Zehaie, F (2009) The Timing and Strategic Role of Self-Protection, Environmental and Resource Economics 44:337-350, Heuson, C et al. (2012) Which mode of funding developing counrtries' climate policies under the post-Kyoto framework?, RECAP15 Discussion Paper Series 4). | Noted. Reference will be evaluated and included as appropriate. Titel will be reformulated to accommodate a broader perspective. |
| 16506 | 16 | 37 | | | | Check if this is not discussed elsewhere in AR5 | Check with WGII. |
| 12837 | 16 | 37 | 37 | | | Besides the integrated assesment models, there are also theoretical contributions to the issue of timing. You may like to mention that by timing adaptation before mitigation the non-cooperative contributions to mitigation decrease because of strategic actions (see Zehaie, F (2009) The Timing and Strategic Role of Self-Protection, Environmental and Resource Economics 44:337-350). | Check reference. |
| 9941 | 16 | 38 | 1 | | 26 | Literatures in these paragraphs should not just be listed one by one, but the implications and contributions to time dimension should be recomposed. | It will be re-structured. |
| 12838 | 16 | 38 | 20 | 38 | 26 | You may like to check whether your interpretation of the term "complememts" is in line with the authors'. They may refer to their result that "an integrated adaptation and mitigation strategy is more effective" (Wang and McCarl (2011) Inter-Temporal Investment in Climate Change Adaptation and Mitigation. Department of Agricultural Economics, Texas A&M University, Pittsburgh, Pennsylvania, p. 12) which is a different meaning. | Noted. Reference will be double-checked. |
| 9944 | 16 | 38 | 32 | | 35 | You may have to highlight that the followings are just several examples for sectoral financing approaches, which are far more than those mentioned followed. | It has already been mentioned that these are only few examples. It can be |
| 16507 | 16 | 38 | | | | Add a reference to your statement | It is just an introduction to the sub-section. However, a reference can be |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11236 | 16 | 39 | 19 | | | Social and environmental aspects must also be considered | Comments will be reflected in the text, although I cannot change the message |
| 8743 | 16 | 39 | 22 | 39 | 26 | See commont number 13 above. | Which comment 13? I believe that the number corresponds to the list of comments by Prof. Skovgaard. I do not |
| 11238 | 16 | 39 | 23 | | | REDD+ has generated a significant debate around its potential social and environmental costs and benefits, the positive contribution of and to indigenous peoples and local communities as well as the need to ensure that any REDD+ action, in order to be effective, will have to respect and recognize the rights of indigenous peoples and local communities (Nussbaum and Moss, 2011) | Check reference. |
| 11239 | 16 | 39 | 23 | 39 | 27 | No agreement has been made yet at the UNFCCC on sources of financing for REDD+ , whether public, private or a combination of the two. It is worth noting however, that the last COP in Durban acknowledged that non-carbon benefits of REDD+ (social, livelihoods, and biodiversity among others) should be taken into account for REDD+ related results-based payments). | Noted. Reference to COP acknowledgment will be included as appropriate in restructured text. |
| 16508 | 16 | 39 | 42 | 39 | 43 | What does this section address: adaptation funding or synergies/trade-offs? Would suggest the 2nd, which is more in line with 16.7 overall | Linked to the discussion on complementariness and trade-offs. |
| 11237 | 16 | 39 | 53 | | | Significant challenges still exist as regards legal and governance reforms aimed at ensuring the full and effective participation of stakeholders and compliance with human rights and environmental obligations and standards. (IUCN, 2010) | Check reference. Linked to comment 463. |
| 7316 | 16 | 39 | 6 | 39 | 10 | The text discusses the presumed benefits of diverting waste from a landfill to composting, stating the following: "Waste management projects, especially those who have the dual benefits of producing compost and reducing methane emissions by diverting organic waste from dumping at a landfill to dumping at a composing plant (e.g. CDM project “Composting of Organic Waste in Dhaka”), which is highly suitable to LDCs, can be successful in achieving investment and delivering on sustainable development benefits (Ayers and Huq, 2008)." Waste industry experience indicates that this is an overly simplistic view. Typically, only open windrow composting operations are sustainable and cost-effective for the LDCs. If optimally managed, composting of waste is a highly desirable strategy. However, during rainy seasons or in wetter climates the windrows are seasonally characterized by high water contents, resulting in loss of aeration, the development of anaerobic conditions, and the generation of N2O and CH4, as well as highly objectionable odors from intermediate decomposition products under less than optimum aeration (esp. carboxylic acid generation). I don't know the particulars of the Dhaka project but would just note that, to date, since registration, the Dhaka project has achieved 7131 verified CERs out of an annual projected average of about 89,000 CERs. This plant is semi-enclosed with cells and a "maturing" windrow area according to publically-available information on the CDM website. | Another example and additional literature on the trade-offs with waste sector can be sought. |
| 9945 | 16 | 39 | | | | It's good to introduce the regional financing approaches, but this section seems to be too simple to learn about the issue. Maybe some data or case on this issue can be supplemented to make this section interesting. | Additional data and literature will be sought. |
| 12653 | 16 | 39 | 41 | 40 | 17 | It might be better to describe diference between GEF and CIF (GEF is additional grant,CIF is loan, equity or other instruments) | Taken into account. The differentiation will be highlighted (maybe in a footnote). |
| 17783 | 16 | 4 | | 5 | | The executive summary states "investment and finance inadequate" - how much is needed and how much is the shortfall estimate? | Taken into account. We will provide more information in SOD. |
| 14417 | 16 | 4 | 19 | | | need to translate to percent of (2030) GDP | Unfortunately, it is not possible to translate into a share of 2030 GDP because these estimates are from |
| 2272 | 16 | 4 | 2 | 4 | 2 | The idea that the climate can be "stabilized" merely by controlling greenhouse gas emissions is absolute rubbish and is without a scrap of evidence. It is not only a question as to whether such a "stabilization" is desiteable , there has also to be a realisation that such an objective is completely absurd, as we do not have that degree of control of the many factors influencing the climate and may never have it. | There is ample scientific evidence that shows how growing GHG emissions are altering global climate. It is true that we cannot fully control global climate. However, it is possible to reduce the |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16400 | 16 | 4 | 20 | 4 | 21 | Incremental investment can already be considered a 'net' figure, so reduced investment in other parts of the economy should already be deducted. | Agree, we cut the sentence |
| 4525 | 16 | 4 | 23 | 4 | 31 | This paragraph gives the impression that incremental cost is a comprehensive metric for viewing investment. However, the cost might not be borne by the investor or a set of investors. In many (most?) cases, different pathways imply investments by different investors with costs borne by those implied by the policy assumed. The idea promoted in this paragraph of using incremental cost as a metric for investment policy is confounded by the fact that the investor is not necessarily the impacted by the macroeconomic cost, and these costs often are not estimated to include transaction and other cost contributors. | Agreed.We will clarify it in the SOD. |
| 16401 | 16 | 4 | 23 | 4 | 31 | Your definition of incremental costs is quite narrow; incremental costs may also include transaction costs (e.g. contracting, enforcement, overcoming information barriers via capacity building, costs of setting up policies etc.), see how the GEF and the Multilateral Fund under the Montreal Protocol use it. | Noted. We will provide a clear definition. |
| 13431 | 16 | 4 | 28 | 4 | 30 | Language used is unclear whether the author is referring to a cost of $100billion per country, $100Billion per technology, or $100Billion in aggregate globally. | This is an aggregate global figure. We rephrased the sentence. |
| 18258 | 16 | 4 | 28 | 4 | 30 | Language used is unclear whether the author is referring to a cost of $100billion per country, $100Billion per technology, or $100Billion in aggregate globally. | see comment 13431 |
| 8076 | 16 | 4 | 28 | 4 | 31 | the incremental cost estimates referred to lack the information from which stabilisation scenario (xx ppm, 2°C etc.) the estimates are derived | see comment 8075 |
| 2399 | 16 | 4 | 3 | 4 | 3 | from activities to technologies. This sentence needs a rewrite. | Agreed. Will be rewritten. |
| 4526 | 16 | 4 | 32 | 4 | 38 | This paragraph is not able to define climate finance, but nevertheless the chapter repeatedly uses the term and tends to limit itself to climate finance rather than investment and finance more generally. Suggest that the chapter clearly define the boundaries it will cover in clearly defined terms. Otherwise, this chapter may give a biased view of what is important for climate change in the areas of investment and finance. | Agreed. We will provide a definition of climate finance in the SOD. |
| 16402 | 16 | 4 | 32 | 4 | 33 | Some authors (e.g. Buchner et al. 2011) include total investments of mitigation technologies (not just the incremental part compared to fossil fuels) in climate finance. | Agreed. Several authors have suggested different definitions of climate finance but there is not a commonly accepted |
| 16403 | 16 | 4 | 32 | 4 | 36 | National climate finance is not only provided by development banks but also by the private sector | Noted. Text will be clarified in SOD. |
| 2794 | 16 | 4 | 32 | 4 | 45 | I think that this is confusing fiannce with aid flows | Noted. We will provide a definition of climate finance in the SOD. |
| 9054 | 16 | 4 | 33 | 4 | 34 | The Convention does not define what "climate finance" is. However, it defines WHAT kind of finance CANNOT be counted as climate finance for purposes of fulfilling developed country obligations in the Convention. In order to claim a comprehensive treatment of the topic, this chapter must recognize the categories of finance that are not countable under the Convention as climate finance. Under Article 4 paragraph 3, climate finance provision for mitigation is a mandatory for developed country signatories. These obligations cannot be met be through ODA which is voluntary, subject to domestic political decisions of aid givers, and bearing of conditionality. Climate finance must be "new" and "additional" and cannot involve redeployment of current aid flows towards climate change purposes. Climate finance under the Convention cannot be provided through loans which must be paid back because under the convention developed countries are responsible for the incremental costs of developing countries' fulfilling their obligations toward mitigation and adaptation. The grant element of loans or the subsidy element in the interest on loans could be climate finance, but not the loan itself. Private foreign investment cannot be counted as climate finance under the Convention because the obligation is that of Annex 2 parties, including the United States. Annex 2 parties can collect funds from the private sector to discharge their climate finance obligations, but voluntary private financing and investment does not qualify as climate finance under the Convention. | Noted. We will provide a definition of climate finance in the SOD and note how it differs from climate finance under the Convention |
| 16404 | 16 | 4 | 39 | 4 | 39 | Most of the flows are not really "meant" to support mitigation/adaptation (particularly private finance but also some ODA/OOF); so to avoid the doubtful interpretation that their is some intention behind it, you may simply write that they "support" mitigation and adaptation | Agreed. Text will be revised. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 16405 | 16 | 4 | 40 | 4 | 40 | "international" means by definition that it comes from "foreign" countries | Agreed. |
| 12822 | 16 | 4 | 41 | 5 | 45 | Executive summary: The results in section 16.7.1.2 are more concise than it is written in the summary ("investments in mitigation should anticipate investments in adaptation" section 16.7.1.2, p. 37, l. 42) ) | Agreed. |
| 18259 | 16 | 4 | 42 | 4 | 45 | Para cites "the only overview available" - but includes no citation. Citation is required. | Agreed. There are now at least 2 estimates that will be summarized. |
| 5242 | 16 | 4 | 42 | 44 | | It is unclear wheather USD 97 billion is an annual amout of money for 2009 or 2010, or wheather it is a cumulative amount of money over several years until 2010? | It is for 1 year, but not for a specific calender year |
| 16406 | 16 | 4 | 43 | 4 | 43 | The estimates of Buchner et al. Are rather "best estimates", so you should give ranges (can be found in their report). | Agreed. We will include ranges. |
| 8059 | 16 | 4 | 43 | 4 | 43 | I think this study also includes domestic flows (Buchner et al, 2011, p.8), therefore one might need to indicate that the 97 billion are not fully international climate finance | Noted. The 2012 report has explicitly included domestic finance and we will |
| 16407 | 16 | 4 | 44 | 4 | 44 | The private finance figure of Buchner includes domestic sources; their figure is the average of USD 37 billion, an estimate of Green FDI flowing into developing countries by UNCTAD (so only international finance here) and USD 72 billion, the BNEF estimate for renewable energy investment in developing countries (of which a substantial part will be domestic); the lower bound seems to be a better proxy for "international private climate finance" in my view, even when the UNCTAD figure does not include all climate-friendly transactions is not based on official corporate reporting but on a dataset from the Financial Times that uses only publicly available data (many FDI transactions may be confidential) | Noted. We will used updated CPI data in the SOD. |
| 7433 | 16 | 4 | 6 | 4 | 10 | Note that 1- The distributional consequences across sectors may have negative macroeconomic impacts if they negatively affect international competitiveness, 2- distributional impacts across sector that has no international competitiveness implications can be dealt with through the domestic polcies but when the distributinal impacts are across regions the fix is difficult. This prevent the movement in allocation to be Pareto optimal and the issue of who gains and who loses can not be ignored. | Agreed, but outside the scope of chapter 16. Should be addressed by chapter 6 and 14. |
| 2400 | 16 | 4 | 6 | 4 | 7 | That is one weird definition of macroeconomic costs. Suggest a rethink. Investments can go into people, institutions or concrete. Not just one. | The sentence is not intended to define macro economic costs |
| 16509 | 16 | 40 | 1 | 40 | 1 | 1) GEF is not a fund, but it manages several funds, e.g. the GEF Trust Funds, LDCF, SCCF; 2) the GEF Trust Fund had a adaptation window even before LDCF/SCCF were created; 3) GEF funds for biodiversity should have had adaptive benefits | Comments will be reflected in the text, probably in a footnote. |
| 15676 | 16 | 40 | 18 | | | The text could refer to the problematic nature of the CDM levy in that it represents a tax on mitigation in order to finance adaptation: see Eisenack, K. 2012. Adaptation Financing in a Global Agreement: Is the Adaptation Levy Appropriate? Climate Policy 12 (4):491-504. | Check reference. |
| 16511 | 16 | 40 | 18 | 40 | 24 | Better separate synergies (CDM as institution initates adaptation funding, AF funding may have mitigation co-benefits) from trade-offs (adaptation levy in CDM reduces finance for mitigation) | Linked to the discussion on complementariness and trade-offs. The |
| 8072 | 16 | 40 | 22 | 40 | 22 | the AF is also financed through pledges of developed countries, hence not only CDM revenues | Comments will be reflected in the text, |
| 18285 | 16 | 40 | 25 | 40 | 29 | This para offers the only passing reference in the entire chapter to some important and innovative approaches to climate finance. It is good that these passing references appear somewhere in this chapter. It would be better if the reference included additional citations and provided some of the associated analysis available in these publications, including some measure of the scale of the possible contribution from each such source of funding. | Coordination with the part on innovative means of finance. Measure of scale will be sought in additional literature. |
| 16512 | 16 | 40 | 26 | 40 | 29 | This rather belongs to 16.2.3 (sources) where it is actually missing | Coordination with the part on innovative means of finance: 16.2.3.2. |
| 8073 | 16 | 40 | 27 | 40 | 27 | a levy on international transport is not only proposed for adaptation, but for both, mitigation and adaptation activities (although of course this specific author might only propose it for adaptation) | Coordination with the part on innovative means of finance: 16.2.3.2. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 16513 | 16 | 40 | 30 | 40 | 36 | Does not belong here -> burden sharing also applies to mitigation, and should rather be discussed in chapter 16.2.3 (sources) | Coordination with the part on innovative means of finance: 16.2.3.2. I believe it belongs here, because this sub-section deals with the synergies and trade-offs between adaptation and mitigation. This |
| 16510 | 16 | 40 | 4 | 40 | 4 | You may have to mention that the SCCF addresses both mitigation and adaptation, while LDCF is for adaptation only | Comments will be reflected in the text, probably in a footnote. |
| 11240 | 16 | 40 | 7 | | | There is already literature on the Green Climate Fund, see lost below FPP and JOAS have produced a report titled “Indigenous Peoples and the Green Climate Fund” that contains a series of recommendations on how to ensure that the GCF activities respect international human rights obligations and standards such as the UN Declaration on the Rights of Indigenous Peoples, ensure full and effective participation of indigenous peoples as active observers and direct access to financing. (Martone and Rubis, 2012) | Noted. Reference will be evaluated and inclueded in restructured SOD as appropriate. Linked to comment 459. |
| 15677 | 16 | 40 | 30 | 40 | 32 | The problem is primarily about who should fund adaptation in poorer countries, given that they don't have sufficient resources - as is, the text implies that the answer is to look to the rich (i.e. capacity to pay), whereas later in the paragraph it rightly suggests that responsibilities to provide adaptation finance should be based on a mix of responsibility and capacity. | This can be reflected in the text, although I cannot change the message of the literature quoted. A reflection on the point raised can be added and |
| 16517 | 16 | 41 | | | | After reading the whole chapter, I am surprised to find no sub-chapter on effectiveness and efficiency of climate finance, given that this is a topic that is both important and more and more discussed! | Noted. The second order headings have been decided by the IPCC plenary in 2009. However, the restructured SOD |
| 16514 | 16 | 41 | 11 | 41 | 13 | Again, better give a range than a point figure for the Buchner et al. estimates | Taken into account. Answers will be |
| 8074 | 16 | 41 | 12 | 41 | 12 | I think this study also includes domestic flows (Buchner et al, 2011, p.8), therefore one might need to indicate that the 97 billion are not fully international climate finance | see comment 8059 |
| 16516 | 16 | 41 | 22 | 41 | 37 | This section does not make clear that substantial governmental policies (ETS, taxes, FITs…) will be needed to reach the needed level of financing; risk-mitigation tools may be an important complement but they will never generate the level of investments needed; generating a high level of public funding will both be very difficult and will also be less inefficient than mobilizing the investment via policies. | Accepted. Role of policies will be clarified. |
| 16515 | 16 | 41 | 6 | 41 | 20 | This section does not clearly distinguish btw. Incremental costs and investment needs. The Buchner etal figure is somehow a mix between the two; -> would be helpful to distinguish the two | Accepted. The SOD will include a definition of incremental cost and |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11241 | 16 | 5 | | 40 | | Full references for the comments on chapter 16 :<br><br>Johl Alyssa and Lador Yves: “A human rights-based approach to climate finance” Friedrich Ebert Stiftung, Geneva, February 2012<br><br>Global Witness, “Safeguarding REDD+ finance” February 2012<br><br>Nancy Dubosse and Richard Calland “Beyond the Jargon: the governance of climate finance” Climate Finance Governance Initiative /IDASA November 2011<br><br>Liane Schalatek and Nancy Bird “The principles and criteria of public climate finance” Heinrich Boell Foundation and Overseas Development Institute, November 2011<br><br>Richard Doornbosch and Eric Knight, “What role fo public finance in International Cimate mitigation? OECD, 2008<br><br>Sean Stephenson, “Does ODA grow on trees? A legal analysis of REDD-ODA finance, European journal of Legal Studies, vol 4, issue 1 summer 2011<br><br>Francesco Martone and Jen Rubis : “Indigenous Peoples and the Green Climate Fund technical briefing for indigenous peoples, policy makers and support groups”, Forest Peoples Programme (FPP) and JOAS, August 2012<br><br>Smita Nakhooda and Alice Caravani “REDD-plus finance”; Climate Finance Fundamentals, Overseas Development Institute, Heinric Boell Foundation , November 2011<br><br>Rights and Resources Institute (RRI): “What rights? A comparative analysis of developing countries' national legislation on community and indigenous peoples' forest tentur rights” Washington DC, 2012<br><br>K.W.Abbott and D. Gartner : “The Green Climate Fund and the future of environmental governance” earth System Institute, working paper 16, 2011<br><br>Fukuda, K., Wakiyama, T. and Shimizu, N. 2011. Financial support to the implementation of adaptation measures – comparative analysis of the Adaptation Find and the Climate Investment Funds, and implications for the design of the Green Climate Fund. Working Paper CC-2011-03. IGES, November.<br><br>UNFCCC Secretariat,” Financing options for the full implementation of results-based actions relating to the activities referred to in decision 1/CP16 paragraph 70” technical paper, July 2012<br><br>N. Moss and R. Nussbaum, “A review of three REDD+ safeguard initiatives” UNREDD ECPF, June 2011 | Noted. We will review the comments and inclued as appropriate. |
| 12483 | 16 | 5 | 10 | 5 | 10 | The section referred to (16.2.3.1) covers the additional risk currently inherent in low-emission technologies. What this section does not cover in much detail, is the increased financial risk associated with investing in fossil technologies in a scenario where carbon pricing (more fully) reflects the true costs of GHG emissions. The fact that proven hydrocarbon reserves contain much more carbon than we can burn if we want to limit climate change, is not reflected in today's share pricing/financing costs. This "market failure" / hidden financial risk should be pointed out in the financing chapter. It is particularly important that long term investors (e.g. pension funds) also develop tools to deal with this kind of "carbon risk". | Noted, but outside the scope of chapter 16. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 11044 | 16 | 5 | 11 | 5 | 14 | The role of Public Finance sector should be shed the right on in executive summary, for example "Public finance has significant role to promote technology transfer and leverage new and additional private fund with catalyze function" see OECD. 2008. Richard Doorn Bosch and Eric Knight, Round Table on Sustainable Development, What Role For Public Finance In International Climate Change Mitigation | Noted. The catalytic role of public finance is necessary when there are externalities, as mentioned in the text. This reference will be reviewed. |
| 11222 | 16 | 5 | 14 | | | Proper governance reforms should also be ensured , including – among others - respect of human rights and environmental obligations and instruments, in particular as regards indigenous peoples and local communities. (Johl and Lador 2012) | Noted. But topic is outside the scope of the chapter. |
| 8079 | 16 | 5 | 15 | 5 | 15 | add "inter alia by instruments such as" after revenues; since the following list is not comprehensive and there are no reasons given why the mentioned instruments are preferred | Accepted. Text will be redrafted. |
| 12823 | 16 | 5 | 16 | | | You may like to consider that selling of AAUs leads to emissions elsewhere (the incentive to buy AAUs is not to take mitigation measures). So the money raised by selling AAUs can not fully be attributed as additional money for mitigation, especially not if the money is used for other investment purposes. | Noted. We are simply considering possible financial revenues for governments. We are not making any assumption on how revenues from |
| 9050 | 16 | 5 | 20 | 5 | 23 | The discussion on fossil fuel subsidies applies well to developed countries but must be qualified in the case of developing countries where the contraction of fuel subsidies is circumscribed by the equity impact and objectives of providing access to modern energy to poor populations. See: United Nations (2009). World Economic and Social Survey 2009: Promoting Development, Saving the Planet. Sales No. E.09.II.C.1. | Accepted. Fossil fuel subsidies should be replaced by some form of income support in low-income countries. Therefore the net effect of phasing-out |
| 8080 | 16 | 5 | 20 | 5 | 20 | what is not compatible: the contraction of fossil fuel subsidies, or the fossil fuel subsidies themselves? confusing | Taken into account. We rephrased the sentence. |
| 13433 | 16 | 5 | 22 | 5 | 23 | Para asserts that fossil fuel subsidies will "vanish" in a low-emissions world. This is not necessarily true. No citation is given for this assertion. | Noted. We will check text and amend if necessary. |
| 18260 | 16 | 5 | 22 | 5 | 23 | Para asserts that fossil fuel subsidies will "vanish" in a low-emissions world. This is not necessarily true. No citation is given for this assertion. | see comment 13433 |
| 12824 | 16 | 5 | 23 | | | If the goal is reached there is no problem if sources of funding "vanish in a low-emission world". | Disagree. In several countries, taxation of fossil fuels provide public funds used to finance government activities (i.e. beyond their pigouvian scope). If funds vanish, taxes on income or on other |
| 2795 | 16 | 5 | 24 | 5 | 30 | Some of the tools mentioned are public and some are private. The paragraph implies that there are some which are common which is not the case. | Noted. We separated public and private tools |
| 4799 | 16 | 5 | 26 | 5 | 27 | I think that tradable green certificates (TGC) should also be mentioned, not only FIT has proven its success in the development of renewable energy sources. | Agreed. We will mention TGC. |
| 2402 | 16 | 5 | 31 | 5 | 35 | that para needs a rewrite. Do we need international governance to have good national finance for mitigation? And the second sentence is a run-on. | Agreed. Paragraph will be redrafted. |
| 8060 | 16 | 5 | 32 | 5 | 32 | Why not also for adaptation? | Adaptation will be addressed in Working Group II. We will discuss adaptation |
| 11223 | 16 | 5 | 35 | | | Full and effective participation of stakeholders and right-sholders both in governance and in the design and implementation of projects should also be guaranteed. Experience in various global funds show that direct engagement of communities is a key prerequisite for ownership and effectiveness. (Abbott and Gartner, 2011) | Agreed. Text will be revised. |
| 17782 | 16 | 5 | 36 | | | in certain sectors, for example in PV area - where Australian and US inventions have been commercialised in China | Comment not clear. |
| 16408 | 16 | 5 | 36 | 5 | 40 | The domestic enabling environment is key for tech transfer, see the discussion under the TEC and the IPCC special report on "Methodological and Technological Issues in Technology Transfer" | Agreed. We will review the report. |
| 8081 | 16 | 5 | 44 | 5 | 44 | also the link could be mentioned that lack of funding for mitigation will likely increase the costs for adaptation (and the required finance) and loss and damage | Noted. The chapter incluedes a section on synergies and trade-offs between |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 7434 | 16 | 5 | 6 | 5 | 10 | Taking into account the inhert risks in developing countries together the public good nature of the environmental provision, the type and extent of private funding to climate change may be quite limited. | Noted. We agree with the reviewer. In fact we explicitly say that private finance will play a role only if "the right |
| 2401 | 16 | 5 | 6 | 5 | 6 | that is a poor definition of the private sector. | It is not intended to be a definition, it is a list of major actors in private finance. |
| 9049 | 16 | 5 | 6 | 5 | 8 | "The private sector – e.g. pension funds, insurance companies, banks, mutual funds, and private foundations – has developed tools to finance large and risky projects when there is a clear return on the investment." This statement has to be qualified in light of 2007-2008 financial crisis and the too-big-to-fail phenomena. States have proven to be the ultimate guarantors of the "clear return on the investment" even where there was no explicit guarantee. | Noted. Topic is outside the scope of the chapter. |
| 13727 | 16 | 5 | 9 | 5 | 9 | Add after ".. established.": "However, the target of leveraging a maximum of private funds is unlikely to lead to an effective outcome, as high leverage ratios are likely to mask lack of additionality of the underlying project (Stadelmann et al. 2011)." Reference: Stadelmann, M. Castro, P.; Michaelowa, A. (2011): Is there a leverage paradox in climate finance? Efficiency of the CDM and the GEF in leveraging funds and reducing CO2, Working Paper, Climate Strategies, Cambridge | Noted. |
| 8078 | 16 | 5 | 9 | 5 | 9 | the word "right" incentives in my understanding is quite normative, something like appropriate would be more adequate | Accepted. Text will be redrafted. |
| 16410 | 16 | 6 | 11 | 6 | 14 | This part needs references in the literature, check e.g. Painuly (2001) or refer to other parts of AR5 | Agreed. We will check the reference and change if necessary |
| 2403 | 16 | 6 | 2 | 6 | 16 | careful here. This sounds like a repaet, and a biased one, of the climate negotiations. | Comment is not clear. |
| 16411 | 16 | 6 | 24 | 6 | 26 | Why are innovative sources "crucial"? In theory, you may just use public budgets and regulations (taxes, standards/cap&trade) to mobilize the needed investments. | Noted. Text will be revised. |
| 11224 | 16 | 6 | 26 | | | Any financing from public and private sources will have to be subject to social and environmental safeguards and related compliance and performance evaluation. Respect for safeguards will be key to create an enabling environment for genuine and effective long term mitigation and adaptation action, while recognizing the possible role and contribution of indigenous peoples' and local communities' traditional knowledge and livelihoods. (Johl and Lador, 2012; Global Witness, 2012, Martone and Rubis, 2012) | Noted. Topic is outside the scope of the chapter. |
| 7435 | 16 | 6 | 27 | 6 | 33 | The climate finance in this reference is meant to be additional and predictable. This may impose a constraint on the possible sources. | Noted. This applies to climate finance under the UNFCCC but not to climate |
| 9051 | 16 | 6 | 27 | 6 | 33 | The text claims that: At the Conference of the Parties in Copenhagen 28 2009 (COP 15) and Cancún 2010 (COP 16), developed countries made a concrete commitment, in the context of meaningful mitigation actions and transparency on implementation, to a goal of jointly mobilizing USD 100 billion per year by 2020 to address the needs of developing countries." First of all, the commitment was made in COP 16; the statement from COP 15 is not an actual commitment since the statement was only noted by the Parties. Second,This commitment does not "meaningfully"discharge the obligations of developed countries under the Convention because the Convention does not recognize voluntary financial flows, such as ODA, as fulfilling developed country obligations. To avoid confusion and error, this qualification must be stated in the paragraph. | Noted. The SOD will discuss the USD 100 billion p.a. commitment. |
| 7126 | 16 | 6 | 27 | 6 | 33 | Information can be update to reflect Decision 2/CP 17 (Durban), in particular par.127 which decides to undertake a work programme on long-term finance in 2012... to progress on long-term finance in the context of decision 1/CP.16, paragraphs 97-101. The LTF programme, according to Par.130, is to ""... analyze options for the mobilization of resources from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources and relevant analytical work on the climate-related financing needs of developing countries". | Agreed. SOD will be updated regarding the new developments. |
| 16412 | 16 | 6 | 27 | 6 | 27 | Art 4.3. of the FCCC only refers to "financial resources" provided by Annex-2 countries (Annex-1 w/o former Eastern Bloc) for non-Annex-1 countries; it does not include the full world of climate finance as defined on the same page (domestic, South-South) | SOD will include a definition of climate finance that is broader than climate finance under UNFCCC |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 15672 | 16 | 6 | 31 | | | Text should clarify that the $100 billion is for both mitigation and adaptation. | Agreed. |
| 5226 | 16 | 6 | 39 | | | Please better specify 'green tourism'. In most scientific literature 'sustainable tourism' is translated into eco-tourism and pro-poor tourism, both basically long haul air transport based rich to poor countries tourism, with a very high cabon footprint (and often many associated socio-economic and political issues as well). So this is very much unhelpful within this IPCC report. My suggestion to replace 'green tourism' with 'sustainable transport based, short haul and/or domestic green tourism'. I know, not a nice term, but the general term is not helpful (skip the whole term is another option, may be better; too many problems with tourism to label it a green solution). See further discussions in chapters 8 and 10. | Sustainable tourism will not be covered in the SOD. |
| 16413 | 16 | 6 | 46 | 6 | 47 | for the credible and long-term strucuturing of incentives you may cite Hamiltion (2009) "Unlocking Finance for Clean Energy" and Brunner et al. (2012) "Credible commitment in carbon policy" in Climate Policy | Thanks. We will check these references and cite as appropriate. |
| 16409 | 16 | 6 | 9 | 6 | 9 | Would add "as understood/defined here" after "climate finance", as there is no agreed definition of climate finance | Noted. SOD will include a definition of climate finance. |
| 11225 | 16 | 7 | 15 | | | Public sector should also play a crucial role in setting the REGULATORY framework | Agreed. We also meant the overall |
| 16416 | 16 | 7 | 15 | 7 | 22 | Whole paragraph needs references (can also refer to past IPCC reports or other chapter in this IPCC report) | Agreed. We will look for appropriate |
| 16415 | 16 | 7 | 16 | 7 | 17 | What is difference between "leveraging" and "mobilizing"? (be careful, as particularly the word "leveraging" is understood very differently, see Brown et al. (2011) "[...] a survey of leveraging methodologies". Rather write "mobilizing new and redirecting existing private investment flows" | Agreed. Text will be revised. |
| 11226 | 16 | 7 | 22 | | | Furthermore the public sector has an obligation to ensure that any climate related action complies with international obligations and standards on the environment and human rights. | Noted. Should be addressed in chapter 3. |
| 7127 | 16 | 7 | 23 | 7 | 24 | This affirmation is controversial. Under UNFCCC the main request of developing countries is that finance should come from public sources, as an obligation of developed countries, as reflected in Article 4.7 of the UNFCCC. In addition to the political compromise, public finance is relevant , to support mitigation measures not well addressed by carbon market because they face non-price barriers or more financial support is required than the provided by the market price. That also depends of the country, because carbon market does not operate with the same effectiveness everywhere. Public is also important to finance R&D when private sector not willing to invest due to high risk, long development times or 'public good' character. So public finance is crucial to correct market failures and for leverage private financing. | Agreed. Text will be revised. |
| 16414 | 16 | 7 | 7 | 7 | 7 | "legitimate development needs" is a normative statement, not backed-up by research. Delete or write "development needs, as perceived by stakeholders X, Y and Z " | Noted. Text will be revised. |
| 13430 | 16 | 8 | | | | Language used is vague in separating the concepts of annual vs. aggregate incremental costs | SOD will include a more precise |
| 18257 | 16 | 8 | | | | Language used is vague in separating the concepts of annual vs. aggregate incremental costs | See comment 13430 |
| 4527 | 16 | 8 | 12 | 8 | 27 | Finance largely comes from the private sector and not from governments. Investment flows do not flow only from developed countries to developing countries. Currently, investment is often flowing from countries with strong trade surplus to other counties, regardless of whether the country is developing or not developing. This paragraph is not presenting a description of current investment flows, but rather is stating how many think the flows should work. As such it is expressing a value judgment and should be balanced by a description of the current flows of investment which are being driven largely by economic forces. | Agreed. Text will be revised. |
| 2796 | 16 | 8 | 12 | 8 | 17 | This again confuses aid flows with financing. | Noted. SOD will include a definition of |
| 9052 | 16 | 8 | 15 | 8 | 16 | Text says: "however, countries at the opposite end of the wealth spectrum will be unable to self-finance and 15 will require assistance from the funds committed at COP16." This presumes that the the funds committed in COP16 are the only funds that will be available from now until the future. To be correct, the "16" should be deleted. | True, need to change. |
| 4528 | 16 | 8 | 18 | 8 | 23 | This paragraph seem to advocate greater financing of risky projects, whereas, the added real cost of risk and the principle of minimizing cost would argue for the opposite. Suggest that both sides of such an argument be given here, and since this is only introductory the paragraph should refer forward to sections where both sides are explained with evidence. | Noted. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 13435 | 16 | 8 | 18 | 8 | 23 | Implies that investment risk is lower in Industrialized Countries than in Developing Countries. This not universally true. Investment risks in Spain, Italy, Portugal, Greece and Ireland are likely to be higher, for example than the parallel risks in India, Brasil, Indonesia, and China. | Noted. |
| 18262 | 16 | 8 | 18 | 8 | 23 | Implies that investment risk is lower in Industrialized Countries than in Developing Countries. This not universally true. Investment risks in Spain, Italy, Portugal, Greece and Ireland are likely to be higher, for example than the parallel risks in India, Brasil, Indonesia, and China. | See comment 13435. |
| 16418 | 16 | 8 | 19 | 8 | 19 | rather "risks", not "risk" | Noted. |
| 8726 | 16 | 8 | 20 | 8 | 23 | Prejudice or limited knowledge leading to an inflation of the perceived risks is a similar problem: often investors want a higher risk premium than what can be empirically justified simply because they do not know enough about the country in which the investment is taking place. | Noted. Behavior depends on perceived risk, even if the perception is not accurate. |
| 16419 | 16 | 8 | 20 | 8 | 20 | replace "must flow to" with "must be invested in" -> most investments will be domestic | Noted. |
| 16420 | 16 | 8 | 30 | 8 | 30 | Check for definitions of "incremental costs" under the GEF and Multilateral Fund; the wording "incremental cost" has first been used in the ozone regime, where it was meant to clarify that benefits have to be deducted from costs (see e.g. Benedick 1991) | Taken into account. SOD will include a definition of incremental cost. |
| 9048 | 16 | 8 | 34 | 8 | 41 | The paragraph proposes a definition of incremental cost as lost welfare measured via GDP and derives the implication that incremental cost can only be measured through modeling. Lost welfare through a counterfactual GDP calculation is probably the most direct way to measure incremental cost at the nation-state level. But lost welfare can also be measured at the local, firm, regional, household level and thus incremental cost can also be measured at these levels without the need for economic modeling. So, economic modeling is not the only way. See, for example, Centre for Science and Environment (CSE) (2010). Challenge of the New Balance. New Delhi in the case of 6 high emission sectors in the case of India.<br>Of course, for the purpose of deriving a national estimate it would be necessary to aggregate these estimates but methodologically this alternative method can generate a national incremental cost estimate. | Taken into account. SOD will include a new and broader definition of incremental cost. |
| 8727 | 16 | 8 | 34 | 8 | 41 | If we operate on the national scale, one could argue that the benefits of avoided climate change, or at least co-benefits such as avoided air pollution, also should be included. | Noted. SOD will state more clearly that the analysis deals only with costs and |
| 15285 | 16 | 8 | 34 | 8 | 34 | remove "and" after "from" | Noted. |
| 8724 | 16 | 8 | 6 | 8 | 7 | And vice versa: viable institutions influence how much finace can be raised. | Noted. Text will be revised. |
| 13434 | 16 | 8 | 8 | 8 | 11 | Assumes that Industrialized Countries will necessarily have first priority in allocation of global resources for climate mitigation. This is not necessarily true. Investments in energy efficiency and low emissions technology in China, Brasil, and India are already greater than parallel investments in many Industrialized Countries, including Belgium, Spain, Portugal, Austria, New Zealand, Netherlands, Czech Republic, etc. | Noted. |
| 18261 | 16 | 8 | 8 | 8 | 11 | Assumes that Industrialized Countries will necessarily have first priority in allocation of global resources for climate mitigation. This is not necessarily true. Investments in energy efficiency and low emissions technology in China, Brasil, and India are already greater than parallel investments in many Industrialized Countries, including Belgium, Spain, Portugal, Austria, New Zealand, Netherlands, Czech Republic, etc. | see comment 13434 |
| 8725 | 16 | 8 | 8 | 8 | 11 | I do not think it is a question of not having enough headroom, the global capital markets have plenty of money to meet those needs, the question is how to create incentives to invest in order to meet those needs. | Agreed. Text will revised. |
| 16417 | 16 | 8 | 8 | 8 | 12 | Strange wording in my view: the paragraph gives the impression that capital markets may not be able provide the right amount of capital for CC mitigation, even the right incentives are in place. Can you back up this "risk" or "fear" with any study? If yes, cite them? | Noted. Text will be revised with citations. |
| 16421 | 16 | 9 | 11 | 9 | 12 | "the adequacy of the USD (-> replace 'US$') 100 billion commitment to meet the developing country mitigation and adaptation" needs ->this does not only depend on the level of incremental costs - which is analyzed in this chapter - but also on the own contribution of developing countries you assume; while the UNFCCC 1992 may be interpreted in a way that Annex-2 countries have to pay for all incremental coss in Non-Annex-1 (see e.g. Biermann 1997), this is much less clear under the Copenhagen Accord where the USD 100 billion are provided "in the context of meaningful mitigation actions". | Noted. The SOD will provide context for the 100 $bn commitment. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
|---|---|---|---|---|---|---|---|
| 12825 | 16 | 9 | 21 | 9 | 29 | Investment may be made due to non "climate motives", e.g. due to biodiversity protection. So you may like to add some words on the underlying assumptions of the models considered, here. | Noted. The SOD will provide a definition of climate finance. |
| 16422 | 16 | 9 | 21 | 9 | 21 | Olbrisch et al could not include a recent estimate from Landis & Bernauer (2012) in Nature Climate Change -> the latter provides an estimate for "financial transfers" needed under a 2 degrees path -> they take into account that Annex-2 may not have to pay all incremental costs of non-Annex (see my comment 22) | Thanks, will include the reference. |
| 16424 | 16 | 9 | 21 | 9 | 42 | You use different terminologies, like incremental investment, additonal invemstmen, incremental costs, abatement costs -> for the reader, it would helpful if you define them somewhere and show where relevant differences exist or where terms mean actually the same (e.g. incremental costs and abatement costs?) | Taken into account. SOD will provide definitions for incremental cost and investment. |
| 2797 | 16 | 9 | 21 | 9 | 42 | These paragraphs mix the funding of the cost gap between clean and dirty and actual financing investment throughout | Noted. The SOD will use a new set of definitions. |
| 16423 | 16 | 9 | 30 | 9 | 42 | make clear whether the cited studies; (1) include GHGs other than CO2; (2) included biogenic CO2; (3) have a macro or micro view on costs -> as far as I understand, the IEA is a macro-study, while McKinsey is micro (but check) | Noted. The SOD will provide greater detail on the cited studies. |
| 9931 | 16 | 9 | 31 | | 32 | When "New Policies Scenario" is mentioned, it's better to introduce the NPS in footnote in case readers have no idea about the NPS. | Noted. The SOD will provide greater detail on the cited studies. |
| 16426 | 16 | 9 | 34 | 9 | 34 | It may useful to note that MAC studies like the one of McKinsey do not include transaction costs, so the acutal costs may be higher (see e.g. Kesicki 2012 in "Climate Policy") | Noted. |
| 12826 | 16 | 9 | 41 | | | You may like to add some words on the height of subsidies in a different context, e.g. with regard to coal or nuclear power, in order to get an impression on the relative height of the subsidies mentioned here. | Noted. The sentence will be rephrased in the SOD. |
| 16425 | 16 | 9 | 41 | 9 | 41 | the USD 200 billion do not have to be provided via subsidies, the incremental costs can also be overcome by taxes, emission trading and other means. | Agreed. The sentence will be rephrased in the SOD. |
| 15412 | 16 | 9 | 43 | | | Outstanding | Agreed. |
| 7128 | 16 | 9 | 8 | 9 | 14 | The 100 billion is definitely a political commitment, and do not reflect the developing countries needs, that is why when adopting the long term finance programme in Durban, part of the mandate of the LTF programme is relate to develop "...relevant analytical work on the climate-related financing needs of developing countries. The analysis will draw upon relevant reports including that of the High-level Advisory Group on Climate Financing and the report on mobilizing climate finance for the Group of Twenty and the assessment criteria in the reports, and will also take into account lessons learned from fast-start finance.<br><br>A recent presentation (South Centre) in the Long Term Finance Workshop (July 2012), mencioned as sources of information and estimated of finance requirements form mitigation:<br><br>• IEA (2010) “Blue Map” scenario, up to 2030 $750 billion a year, 2030-2050 $ 1,600 billion a year<br>• Global Energy Assessment (2011), 2010-2050 $ 1,700-2,100 billion a year<br>• Edenhofer et al. (2009) “RECIPE” up to 2030 $480 – 600 billion a year, in 2050 $1,200 billion a year<br>• Mckinsey (2009) Pathways to a Low-Carbon Economy, in 2020 $ 660 billion a year, in 2030 $1,000 billion a year<br>• UNFCCC (2009) expert group on technology, Global additional financing required, $300 to 1,000 billion a year until 2030 . Developing country share in costs of technology deployment and diffusion (excl. research and development) $182 to 505 billion a year.<br>• World Bank Development Report 2010. •Incremental mitigation costs in development countries<br>• $140 to 175 billion a year . “Associated financing needs”, $265 to 565 billion a year .<br>• UNDESA (WESS 2011), Global investments for energy transformation, $1,800 billion a year. Developing country requirements: Energy transformation - $1,080 billion a year, Agric. investment 20 billion a year, Total $1,100 billion a year | Noted. The section will be substantially revised in the SOD. |

| Comment No | Chapter | From Page | From Line | To Page | To Line | Comment | Consideration |
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| 8082 | 16 | 9 | 8 | 9 | 14 | it is implied that the 100 bn commitment would refer to incremental costs, however, this is not clear; politically it is more likely that developed countries will try to count more flexible, which may increase the actual gap between the financing needs and the funding delivered | Noted. The SOD will provide context for the 100 $bn commitment. |
| 12650 | 16 | all | all | | | ETP2012 describes clean energy financing. "Risk analysis for investments in low-carbon energy technologies" and "Mechanisms and financing vehicles to leverage private-sector investment" in ETP2012 should be suggestive. | Taken into account. ETP 2012 will be considered as appropriate in SOD. |
| 13432 | 16 | icle | 42 | 4 | 45 | Para cites "the only overview available" - but includes no citation. Citation is required. | Accepted. |
| 9919 | AnnexII | 0 | | | | There is no conversion between ppm and GtC. Sometimes people are confused about the relationship between them. | The reason for this comment could not be located as there is no conversion |
| 9920 | AnnexII | 0 | | | | Distinguish the difference between CO2 and CO2equivalent. For example, how much Co2 equivalent is corresponding to 450ppm CO2. | The discussion between different GHG metrics will be taken care of in chapters 3 and 6 of the report. Currently it is not |
| 7649 | AnnexII | 10 | 24 | 10 | 26 | There was a recent Special Issue in ESR on "CF and IO", see Wiedmann, T. (2009) Carbon Footprint and Input-Output Analysis - An Introduction. Economic Systems Research, 21(3), 175-186. http://dx.doi.org/10.1080/09535310903541256.<br>This article provides a good overview of examples for applications: Minx, J. C., Wiedmann, T., Wood, R., Peters, G. P., Lenzen, M., Owen, A., Scott, K., Barrett, J., Hubacek, K., Baiocchi, G., Paul, A., Dawkins, E., Briggs, J., Guan, D., Suh, S. and Ackerman, F. (2009) Input-output analysis and carbon footprinting: An overview of applications. Economic Systems Research, 21(3), 187-216. http://dx.doi.org/10.1080/09535310903541298. | A reference to Minx et al. was included. We prefer to focus on peer reviewed publications. |
| 10939 | AnnexII | 10 | 31 | | | A relevant reference over several scales is Peters, G.P., 2010. Carbon footprints and embodied carbon at multiple scales. Current Opinion on Environmental Sustainability 2, 245-250. | included |
| 10940 | AnnexII | 10 | 36 | | | Footnote 3: There is no methodological reason not to include LUC, it is lack of our ability as analysts. In principle, LUC should be included. I think you should state something to that effect. | The footnote has been modified to say "more data work is needed to address GHG emissions related to land-use |
| 7650 | AnnexII | 10 | 37 | 10 | 37 | The current state of the art in MRIO modelling is summarised in: Wiedmann, T., Wilting, H. C., Lenzen, M., Lutter, S. and Palm, V. (2011) Quo Vadis MRIO? Methodological, data and institutional requirements for multi-region input-output analysis. Ecological Economics, 70(11), 1937-1945. http://dx.doi.org/10.1016/j.ecolecon.2011.06.014. | included |
| 6381 | AnnexII | 10 | 7 | | 8 | The comparator "broader" requires indicating what these traditions are broader than. | Revised |
| 10943 | AnnexII | 11 | 14 | | | Perhaps a reference on these points, e.g., Lenzen M, Kanemoto K, Moran D and Geschke A, Mapping the structure of the world economy, Environmental Science & Technology | included |
| 10944 | AnnexII | 11 | 34 | 11 | 40 | LCA global warming impact category only considers long lived GHG and uses a GWP100. Both of these have been citritiqued in the climate literature. This article discusses some alternatives, and it is worth pointing to somehitng like this Peters, G.P., Aamaas, B., T. Lund, M., Solli, C., Fuglestvedt, J.S., 2011. Alternative “Global Warming” Metrics in Life Cycle Assessment: A Case Study with Existing Transportation Data. Environ Sci Technol 45, 8633-8641. | Following sentence has been added: "LCA traditionally focuses only on GHG emissions, often evaluated over a 100 year time horizon. Radiation-based climate metrics (Peters, Aamaas, et al. 2011) and geophysical effects such as |
| 6382 | AnnexII | 11 | 37 | | 38 | LCAs do not "provide an estimate of the technical emissions reductions offered by these technologies", though (attributional) LCA results are certainly used this way. Attributional LCA merely counts emissions in a production-use-disposal chain and assigns these to the end product, relying on a range of methods and data that can produce substantially different results. Any reduction results from displacement effects outside the supply chain, about which attributional LCA is ignorant: displacement is simply assumed to occur on a 1:1 functional unit basis. | The sentence has been modified and now reads: "LCA is thus used to provide an estimate for the technical emissions reductions offered by these technologies. " |

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| 6390 | AnnexII | 11 | 44 | | | Given the substantial parametric and epistemic uncertainty in many LCAs, how is can a reliable 'upper bound' be produced? The subsequent sentence acknowledges the possibly large cutoff error, which (in conjunction with the many other limitations of LCA) suggests that no value produced by an LCA can reliably define an upper bound for anything. | The reviewer here seems to misinterpret the sentence. The "upper bound" refers to the maximum potential reduciton of emissions due to the introduction of the technology. It is thereby acknowledged that emission reduction may actually be lower given the part of the life cycle omitted due to system boundary issues. Uncertainties in LCA are acknowledged |
| 10941 | AnnexII | 11 | 6 | 11 | 7 | Are some refereences missing from here? | A reference has been added |
| 10942 | AnnexII | 11 | 9 | | | I have not read the article, but this seems to be an exception to the rule http://onlinelibrary.wiley.com/doi/10.1111/j.1530-9290.2012.00518.x/abstract | Yes, this is a proposal for a marginal rate. Not yet well-established. We have included a sentence here with reference |
| 7651 | AnnexII | 11 | | | | Some developments in LCA are also summarised in: Finnveden, G., Hauschild, M. Z., Ekvall, T., Guinée, J., Heijungs, R., Hellweg, S., Koehler, A., Pennington, D. and Suh, S. (2009) Recent developments in Life Cycle Assessment. Journal of Environmental Management, 91(1), 1-21. http://dx.doi.org/10.1016/j.jenvman.2009.06.018. | included |
| 6383 | AnnexII | 12 | 1 | | 2 | The improved "accuracy" of hybrid LCAs is assumed, but cannot be demonstrated. First of all, accurate for what? Estimating an inventory or estimating GHG reductions? For the prior, perhaps, but not for the latter, since neither method addresses marginal effects. A better wording would be "hybrid LCA can be used to generate a more complete inventory" -- but accuracy is another matter. | The statement has been modified to: "Through their better coverage of the entire product system, hybrid LCAs tend to more accurately represent all inputs to |
| 6384 | AnnexII | 12 | 15 | | 21 | This section is quite dismissive of consequential LCA (CLCA) and implies more accuracy and utility than attributional LCA (ALCA) can deliver. ALCA cannot answer the primary question the Mitigation chapter must ask, which is "Does strategy X mitigate unwanted climate change, and if so, by how much?" This question requires comparison to a baseline and consideration of marginal change, which consequential LCA attempts to do. The difficulty of implementing CLCA does not suggest using instead a method we know does not answer the question! Where ALCA offers false precision with a Type III error (measuring the wrong thing), CLCA offers uncertainty around the correct conceptual answer, which is an appropriate representation of our limited understanding of the actual benefits of some proposed mitigation strategies. Moreover, the "established methods" of ALCA include a variety of approaches to handle co-products that are mostly not representative of environmentally outcomes -- because this cannot be determined in a static analysis -- and which can produce very different results. "Established" doesn't mean correct or accurate. CLCA is presented here as a mere "proposal", yet the US EPA relied on this approach to implement the US Renewable Fuel Standard, and there is a rapidly increasing number of consequential LCAs in the literature. | The section has been amended. A reference has been inserted to a recently published review paper on consequential LCA by some of the method developers, which confirms the statement that CLCA is not yet mature. Note that not all consequential LCAs are about marginal changes and that the role of scenarios in CLCA is increasingly acknowledged by developers of that method, also in the cited review paper. Scenarios are taken up in the subsequent paragraph. |
| 10945 | AnnexII | 12 | 2 | | | "real emissions"? What are they? How do you know? Do you have a reference for this? | See response to review comment 6383 |
| 10946 | AnnexII | 12 | 2 | | | A reference for the cut off issues would be good. Lenzen, JIE? | Several references have been added, including the ones suggested. |
| 6385 | AnnexII | 12 | 27 | | 28 | ALCA does not "show how much impacts per unit are likely to change as part of the scenario" unless marginal effects are approximated by average effects throughout the product system, and there are no price effects. This section oversells LCA and attributional LCA in particular. Offering policy makers false precision is not helpful. | Scenario-based assessments are precisely attempting to do this. Whether they are called attributional or consequential is a question of preference |
| 6392 | AnnexII | 12 | 27 | | 28 | This paragraph seems to imply that examining scenarios makes attributional LCA useful for estimating mitigation capacity. In my view, this is probably incorrect, though what exactly is meant by "scenarios" here is left unsaid. The fundamental issue is that ALCA isn't designed to estimate change. | Please note that references have been added to relevant work. |

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| 6391 | AnnexII | 12 | 3 | | 14 | This section soft-pedals the limitations of LCA, making is sound as though the method is fundamentally accurate, but "some" LCAs are less useful. The example presented about biofuels and animal feed seems incorrect in several ways: (i) it is indeed possible in principle for the implementation of a bioenergy system to result in negative emissions relative to a baseline, (ii) systems that show negative emissions tend NOT to be the ones that produce fodder, but cellulosic ethanol systems that assume high soil C sequestration and displacement of fossil-based electricity by excess electricity co-produced by burning lignin, plus 1:1 replacement of gasoline. (Mind you, all of these assumptions are arguable), (iii) the statement about being more appropriate for a corporate context than for assessment of large-scale transitions is generally true for all attributional LCAs because these assume no scale effects or market effects, nor do they descibe change from a baseline. | The paragraph has been deleted and replaced. It is made clear that most LCAs assess products, not decisions. Market effects are hence less relevant. To what degree market effects should be addressed in LCA is controversial. |
| 6386 | AnnexII | 12 | 37 | | 41 | This section should also address the macro-economic effects of changing supply and demand. If a bioenergy policy reduces global demand for petroleum, price will decline and more petroleum will be used than in the baseline. Put another way, the biofuel doesn't displace its energy equivalent in petroleum, although this is usually assumed in attributional LCA (and the interpretation thereof). This is critically important, as the purpose of this section is to provide information to policymakers about the efficacy of alternative mitigation strategies. Should we really promote so vigorously a method that ignores economics and almost certainly overestimates GHG reduction benefits, including getting the sign wrong in some cases? We need to be more up-front about these limitations and not describe them so glancingly as is done generally in this section. How about saying clearly that ALCA can get the sign wrong (relative to the question noted above), owing to many exclusions and simplifications, and methodological ambiguity? | This section is not specifically about biofuels. Please note that LCA as a research method is not useful to investigate the question of what happens if petroleum is not used for one purpose; if it will be used for another purpose or stay in the ground. In most mitigation scenarios examined in Ch.6, all conventional oil will be produced and burned independent of the amount of energy efficiency or low-C fuels introduced. So this would be an argument that no mitigation measure reduces oil demand. The question examined by LCA is whether a specific |
| 10947 | AnnexII | 12 | 6 | | | A reference to your example is needed. This critique should be mentioned in the appropriate place in the WGIII report. | The section has been replaced so the comment no longer applies. |
| 7652 | AnnexII | 12 | | | | The most recent review on MFA is: Fischer-Kowalski, M., Krausmann, F., Giljum, S., Lutter, S., Mayer, A., Bringezu, S., Moriguchi, Y., Schütz, H., Schandl, H. and Weisz, H. (2011) Methodology and Indicators of Economy-wide Material Flow Accounting. Journal of Industrial Ecology, 15(6), 855-876. http://dx.doi.org/10.1111/j.1530-9290.2011.00366.x. | include |
| 8529 | AnnexII | 25 | 15 | 25 | 16 | Any activity to enhance the sinks of GHGs from the atmosphere should be considered as geo-engineering of CDR-type | Could not be located - this document only has 21 pages. |
| 8530 | AnnexII | 27 | 10 | 27 | 10 | The unit must be not “nanometers” but “micrometers” | Could not be located - this document |
| 18461 | AnnexII | 3 | 13 | | | Though a minor detail - in section A.II.1.3 (Monetary Unit Conversion), the USD2010 is presented with the 2010 in subscript. Will that be the standard, or rather the USD2010 in full size presented in this table? | For consistency with the IPCC SRREN, the variant with subscript will be used in |
| 7503 | AnnexII | 5 | 30 | 5 | 30 | Bioethanol. Also need a definition for Biomethanol, gengas, and producer gas. | This comment relates to the glossary |
| 7504 | AnnexII | 5 | 39 | 5 | 42 | Second-generation biofuel. Second-generation biofuel uses non-traditional biochemical and thermochemical conversion processes and feedstock mostly derived from the lignocellulosic fractions of, for example, agricultural and forestry residues, municipal solid waste, etc. The production of methanol (wood alcohol) has been undertaken for centuries. It was the first building block for the organic chemical industry. So it is not a new process. Nor is the production of producer gas/water gas (gengas) a new process. | This comment relates to the glossary (Annex I). |

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| 18462 | AnnexII | 5 | | | | Recognizing that there is an ongoing disucssion on how to compare costs across sector chapters, it is clear that the discussion in this section focuses on energy thus far. Once an agreement has been made, will methodologies for the different sectors also appear here? If so, it would be very useful to clarify which methods are applied in which chapters, and also perhaps to include a brief discussion of the challenges of comparability in this section. | In the process of preparing the SOD, additional cost metrics including levelized costs of conserved energy (LCCE) and macro-economic mitigation costs have been added. The plan is as a next step to also include a discussion of levelized costs of conserved carbon (LCCC) or unit mitigaiton as it is often called if this metric turns out to be useful for comapring costs across several |
| 7505 | AnnexII | 6 | 11 | 6 | 14 | "The International Energy Agency (World Energy Outlook 2010) defines traditional biomass as biomass consumption in the residential sector in developing countries that refers to the use of wood, charcoal, agricultural residues and animal dung for cooking and heating. All other biomass use is defined as modern biomass". This definition is very restrictive and does not make sense. Biomass is used for cooking by the service sector in developing countries and for district heating as well. In developed counties, it is used for household heating and water heating. Industry especially in developing countries, including cottage industries use biomass for heat and stem generation. In my opinion, no distinction should be made between different end uses of biomass. It should all be treated as biomass energy. | This comment relates to the glossary (Annex I). |
| 7506 | AnnexII | 6 | 40 | 6 | 42 | CO2. A naturally occurring gas, also a by-product of burning fossil fuels from fossil carbon deposits, such as oil, gas and coal, of burning biomass, of land use changes and of industrial processes. If the biomass is not burnt, it will rot etc. and revert back to CO2! So the way in is turned back to CO2 (the carbon cycle) is irrelevant. | This comment relates to the glossary (Annex I). |
| 8847 | AnnexII | 7 | 1 | 7 | 17 | While the FOD does state that "there seems to be a clear understanding that LCOE are not intended to be a definitive guide to actual electricity generation investment decisions", Branker et. al (2011) argue that the method "is deceptively straightforward and there is lack of clarity of reporting assumptions, justifications showing understanding of the assumptions and degree of completeness, which produces widely varying results". Branker et al. cite a wide range of LCOEs fo solar from REN21 (2010), Doty et al (2010), Yang (2010), Black and Veatch Corportation (2010), Velosa (2010), REN21 (2008), Bandyopadhyay et al. (2008), Grana(2010), NEB (2006), Walden (2006), and Wiser et al. 2009. [P. Bandyopadhyay, A. Groo, M. Hartley, J. LeBrun, A. Moazed, Renewable Energy for BHP Billiton, University of Michigan, Master's Thesis (2008).] [Black and Veatch Corporation, Renewable Energy Transmission Initiative Phase 2B: Draft Report. Sacramento, CA: RETI Stakeholder Steering Committee, 2010, pp 1-109.] [K . Branker, M. J.M. Pathak, J. M. Pearce, "A Review of Solar Photovoltaic Levelized Cost of Electricity",Renewable & Sustainable Energy Reviews 15, pp.4470-4482 (2011). http://dx.doi.org/10.1016/j.rser.2011.07.104] [G. N. Doty, D. L. McCree, J. M. Doty, F. D. Doty, Deployment Prospects for Proposed Sustainable Energy Alternatives in 2020, ASME Conf. Proc. 2010, 171 (2010), 171-182.] [P. Grana, Demystifying LCOE, RenewableEnergyWorld.com, August 18, 2010,http://www.renewableenergyworld.com/rea/blog/post/2010/08/demystifying-lcoe] [National Energy Board (NEB), Emerging Technologies in Electricity Generation, A Market Assessment Report, March 2006, pp.1-113.] [Renewable Energy Policy network for the 21st century (REN21), Renewables 2007 Global Status Report, Paris, 2008, pp. 1-54] [Renewable Energy Policy Network for the 21st century (REN21), Renewables 2010 Global Status Report, Paris, 2010, pp. 1-80.] [A. Velosa III, What is Inside your LCOE assumptions? SEMI PV Group – The Grid, April 2010, http://www.pvgroup.org/NewsArchive/ctr_036226] [T. Walden, Relative Costs of Electricity Generation Technologies, Canadian Energy Research Institute, for Canadian Nuclear Association, September 2006, pp. 1-8.] [R.Wiser R, G. Barbose, C. Peterman, N. Darghouth, Tracking the Sun – II: Installed costs of PV in the US from 1998–2008, US Department of Energy, Lawrence Livermore Berkley Laboratory, 2009, pp.1-50.] [C. Yang, Reconsidering solar grid parity, Energy Policy 38 (2010) 3270-3273.] | Branker et al. 2011 now is included in the paragraph on the range of LCOE. |

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| 8848 | AnnexII | 7 | 1 | 7 | 17 | Darling et al. (2011) suggest that transparency could be improved calculating LCOE as a distribytion, constructed using input pararmeter distributions, rather than a single number. [Darling, S.B., You, F., Veselka, T., Velosa, A., 2011. Assumptions and the levelized cost of energy for photovoltaics. Energy Environ. Sci. 4, 3133–3139.] | Taken into account - citation added. |
| 8849 | AnnexII | 7 | 1 | 7 | 17 | While noting that system and installation costs vary widely, Branker et al (2011) document significant variations in the underlying assumptions that go into calculating LCOE for PV, with many analysts not taking into account recent cost reductions or the technological advancements that means modern panels have a much smaller drop in productivity (now 0.1 to 0.2% annually compared to the 1% used in many cost analyses). [K. Branker, M.J.M Pathak , J.M. Pearce, "A review of photovoltaic levelized cost of electricity", Renenwbale and Sustainable Energy Reviews, Volume 15, Issue 9, December 2011, pp 4470-4482.] | Taken into account - text added. |
| 10938 | AnnexII | 9 | | | | This section is quite useful and relevant. I think it should perhaps appear in Chapter 1? | Chapter 1 does not discuss LCA, carbon footprinting and material flow analysis at present. In any case, the discussion provided in this annex will be far too |
| 18463 | AnnexII | 9 | | | | This section is a very clear deliniation of methods, but the reader is left wondering how exactly these three methods are applied in the AR5, e.g. to which chapters? Which of these methods can and can not be applied to the different sectors? Is there an integrating element across sectors? Recognizing that this process is still ongoing, it may be too early to include this in the FOD, but it could be a useful direction for the next draft. | We now list the chapters but not sections. We do not give an explanation of what appears where. This sentence can be expanded to a paragraph making this identifications, but for that we would need access to the SOD, as most |