

Expert and Government Review Comments on the IPCC WGIII AR5 Second Order Draft – Chapter 1

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34080	1					I wondered why the overview on emissions comes that late in a report that is devoted to the mitigation of climate change.	Noted - because the conceptual issues are important to set the scene and because the section headings are dictated to us by plenary. No action needed.
27295	1					The first graphic in figure 1.4 represents change in global anthropogenic GHG emissions by major economic regions. Economic regions represented in the figure relate to G-20 membership, which is inadequate, since it does not correspond to a relevant grouping in the context of climate change, as it is based solely on economic factors. It is noted that the text following the table adequately presents trends based on groupings that are traditionally used in the international climate change context (Kyoto Protocol Annex B and non-Annex B Parties). Social development figures must also be used as basis for comparison in the consideration of trends by the IPCC.	Rejected - These categories are approved by TSU. No further action needed.
27296	1					Figure 1.5 represents change in global anthropogenic GHG emissions by major economic regions. Economic regions represented in the figure relate to G-20 membership, which is inadequate, since it does not correspond to a relevant grouping in the context of climate change, as it is based solely on economic factors. It is noted that the text following the table adequately presents trends based on groupings that are traditionally used in the international climate change context (Kyoto Protocol Annex B and non-Annex B Parties). Social development figures must also be used as basis for comparison in the consideration of trends by the IPCC.	Rejected - TSU approved these categories.
27290	1					Section 1.2 on "main messages and changes from previous assessment" presents analysis of changes in world macroeconomic situation, but does not include analysis related to social development and remaining social challenges.	Rejected - The macroeconomic changes have had a huge impact on social development. But given the need for conciseness in Chapter 1, no further action needed
32606	1					It would be really helpful if this section could clarify whether (and under what conditions) short-lived pollutants affect the case for action on CO2. It is very unclear to me (unless there is a scientific implication about CO2-radiative sensitivity). Surely the risks of long-term climate change associated with CO2 from infrastructure that lasts decades, emitting a pollutant with centurial residence times, is more or less independent of the severity of short-term pollutants? It would be great if this section could clarify.	Taken into account - team has discussed the balance on the topic of short-lived. Text has been revised.
23544	1					The title is confusing. These are not perspectives on mitigation, but perspectives on the background against which mitigation would be assessed as more or less effective.	Rejected - Title is fine. No further action needed.

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23545	1					This section is incomplete. Not only interNATIONAL collective action is needed or at least useful: also interCORPORATE action (where we have MNCs and TNCs interacting on multiple scales). And civic COSMOPOLITAN interaction is helpful (global civil society). And so on. Is this section too fixed on national governments? (Also, consider regional governmental interaction below the nation state level.)	Taken into account - added cite to Victor (2011) at line 14; Dubash and Florini (2011) and Aldy and Stavins (2007) at line 22; cross ref to ch 16 and cite to WEF 2011 at line 24; added text: One of the central challenges in international cooperation is that while national governments play central roles--for example, negotiating and implementing treaties--effective cooperation must also engage a large number of other actors, notably in the private sector. Moreover, governments and other actors cooperate not only at the global level through universal forums such as the United Nations but also in a wide array of regional forums. One result of these multiple processes that entrain public institutions as well as private actors is decentralized and overlapping systems for government (see chapter 13).
20839	1	0				We recognize this chapter is written under the condition that there is no agreement that 1.5 or 2 degree is the reduction target, and we stand for this condition. It should be kept through all this chapter.	Noted, no action required
25572	1	0				Well written.	Noted, no action required
25573	1	0				The following paper focuses on the possibility to achieve long term targets by using Kaya-identity and mitigation costs. If possible, please also refer this paper. K. Akimoto, F. Sano, T. Homma, K. Tokushige, M. Nagashima and T. Tomoda, Assessment of the emission reduction target of halving CO2 emissions by 2050: macro-factors analysis and model analysis under newly developed socio-economic scenarios, Energy Strategy Review (submitted; I can provide it according to your request.).	Accepted, citation to Akimoto et al added. Paper needs to be provided
20450	1	0				Overall the chapter has been markedly improved through the addressing of reviewers comments. I can see no further need for ammendments at at this stage. Bravo!	Noted, no action required
30725	1	0				The appropriateness and consistency of using of personal pronouns should be reviewed. In using "we" it is not clear if this is referring to the authors or IPCC.	Taken into account - we will review for consistency during the final round of review. No further action required.

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29953	1	0				Alternatives to the current use of metrics and single basket approach would be relevant to mention here. There are several papers in the literature discussing other approaches that could function as alternatives to the approach. (See short paragraph on this in WG1, chapter 8.) RELEVANT REFERENCES: Daniel et al., 2012: Limitations of single-basket trading: lessons from the Montreal Protocol for climate policy. Climatic Change, 111(2): 241-248, Parallel Pursuit of Near-Term and Long-Term Climate Mitigation. Science, 326(5952): 526-527. Smith et al. 2012. Equivalence of greenhouse-gas emissions for peak temperature limits. Nature Clim. Change, 2(7): 535-538, Lauder et al. 2013. Offsetting methane emissions — An alternative to emission equivalence metrics. International Journal of Greenhouse Gas Control, 12(0): 419-429.	Accepted - added citation to Daniel et al. and Smith et al.
32604	1	0				As indicated, this Introduction is a refreshing overview of real world essentials that define the context for climate policy. The TSU's summary of the IPCC Expert Review Meeting (p.13) reports that I said the chapter was "almost perfect", is an exaggeration - nothing with this mandate can realistically achieve that! - and also would like to correct the record on my reference to "1.5 deg.C" - apologies I did not spot earlier. I did not at all say we should be aiming for 1.5 deg.C, but rather that 1.5 deg.C could have made sense as a goal back in 1990 but the fact that it is now clearly impossible could be used to illustrate the fact that inadequate progress in mitigation is constantly closing off options that might have been possible and rational had adequate action been taken.	Noted, no action required
33039	1	0				The discussion on short-lived pollutants in the chapter is very welcome and useful. However, it may be that this focus is not reflected in the broader report. Please liaise with chapters that you view as critical to incorporate similar discussions.	Taken into account - text revised; the team has discussed short-lived and long-lived pollutants and believe we have found a balance
25289	1	0				The chapter has 176 references, out of which 15 are from the chapter authors.	Noted, no action required
25290	1	0				Out of these 176 references, only 21 are on developing countries (around 13%). It is suggested that a more balanced approach could be adopted.	Rejected - The references in the text serve to underpin the science that is reviewed and not fulfill some national/regional quota system. The chapter already pays special attention to developing country issues; developing country issues arise in many citations beyond those cites that are specifically on developing countries; and we have a whole separate discussion on developing country issues. No action needed
25291	1	0				A quick check on the total universe of articles in peer-reviewed journals since AR4 (2007) indicates that there are almost 17000 in journals of Science Direct, 3500 in Francis and Taylor, 10000 in Springer Link, 300 in Sage, 8500 in Wiley and 2000 in JSTOR totaling to around 42000 articles in all on topic covered in this chapter. The chapter has captured almost 0.42% of existing literature.	Noted, no action needed. This chapter is an introduction and the fact that it already cites .42% of a massive literature is rather extraordinary.

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25292	1	0				Out of total 42000 articles mentioned as above, almost 16000 are on developing countries (around 40%) and issues related to them. It indicates that there is a large enough pool of articles to be picked up on developing countries to be cited in this chapter. The authors may like to take a look at it.	Rejected - The references in the text serve to underpin the science that is reviewed and not fulfill some national/regional quota system. The chapter already pays special attention to developing country issues; developing country issues arise in many citations beyond those cites that are specifically on developing countries; and we have a whole separate discussion on developing country issues.
35484	1	0				This is an interesting and informative chapter. The premise that mitigation challenges differ dramatically by region is certainly valid. Also valid is the observation that climate-specific regional cooperation has not to date played an important role. The one example offered--the EU--does not give one great optimism. The challenge, therefore, is to find alternative agreements, or common and mutually beneficial strategies that will result in climate change mitigation. This - the authors might consider - should be the theme throughout the chapter.	Rejected - The chapter has many pressures on it for "focus" so we can't adopt the search for alternative agreements as a focus, but we do mention this (and cite to the literature on diffused governance and similar discussions in chapter 13). No further action needed

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35485	1	0				<p>The document does not seem to adequately cover the liability issue with respect to mitigation technologies associated with large scale carbon capture and sequestration (CCS). In many cases, large scale CCS may require very large areas of land (hundreds of square miles) to effectively store greenhouse gas emissions. One only has to read the recent stories on perceived or real environmental effects of shale gas fracturing wells, deep well disposal of shale gas fracturing water in Ohio or nuclear waste disposal to realize the public perception of these technologies represents what could take place with large scale CCS if a liability and financial responsibility framework is not established globally. A 2010 US workshop is an example. The reader might expect to see more discussion concerning the liability, legal and financial responsibility frameworks.</p> <p>The reviewer did find minimal treatment of the subject on page 10 of the introduction chapter (lines 42-45), page 41 (lines 16 -19) in the TS, and page 43 (lines 1-10) in chapter 10. A search through chapters 16 (financial chapter), Summary for Policy Makers and several others chapters on the key words "legal" and "liability" revealed little discussion concerning the liability and legal framework issues associated with large scale CCS. As with the nuclear waste issues, these could be show stoppers in portions of the US where EOR is not conducted routinely. "Numerous barriers impede the demonstration of large"scale CCS projects (those that capture and sequester at least 1.5 million tons of carbon dioxide annually). First and foremost is the absence of any national price on or restriction of CO2 emissions in the United States. Other key barriers include uncertainty about liability; the dearth of pipelines to transport captured CO2, requiring significant investment in infrastructure; and the transaction costs and impracticality associated with acquisition of huge swaths of pore space, making access to sequestration sites difficult in many parts of the U.S. Many argue that the prospect of unknown liabilities far in the future impedes the financing of CCS projects. Lack of experience sequestering CO2 at large volumes creates uncertainty with respect to the timing and magnitude of potential liability.</p> <p>The absence of a national framework for delineating liability and financial responsibility for owners and operators of CCS projects, and for landowners who consent to having CO2 sequestered in the pore space under their land compounds this uncertainty. The U.S. also does not yet have rules in place regarding the oversight and stewardship of sites requiring management far into the future, decades after active sequestration operations have ceased. Nor is there any national legal framework in place for the financing of such long"term site stewardship or payment of potential future liabilities decades after a site has been closed."</p> <p>Jacobs, W. B. Summary Report of Expert Workshop Addressing CCS Liability, Oversight, and Trust Fund Issues. October 29, 2010, http://belfercenter.hks.harvard.edu/publication/21068/summary_report_of_...</p>	<p>Rejected - Beyond the scope of the chapter. This comment pertains more to other chapters, including the chapter on power generation and the chapters on policies. Chapter 1 already prominently mentions CCS as a particular technology option and then indicates the large numbers of barriers to scaling that option at present. Liability is one of those barriers but far from the only.</p>
35486	1	0				<p>The reader might like to see in the first chapter some discussion of technology investments by industry and governments in developing and developed countries, government subsidies to make clean energy technologies cost competitive with traditional oil and coal, the need to de-politicize the subject of climate change, and the need to educate the public about the long-term implications of climate change. What have been the trends in recent years and what is necessary in the future?</p>	<p>Rejected - Beyond the scope of the chapter. These are important points, but we have been asked to address dozens of other points as well. Thus we have only a thin disucssion of R&D and various policy instruments and have no space for more.</p>

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35487	1	0				This chapter presents a number of framings for how you can look at emissions - on a regional, historic, cumulative basis, etc. What is lacking, however, is a presentation of how much embedded carbon exists in existing capital stock, so-called "infrastructure lock-in". One could argue that emissions prior to ~1990 (when the UNFCCC was established) should be weighted less because the world did not know that GHG emissions were harmful. How, the world knows and those who continue to invest heavily in C-intensive infrastructure do so with the full knowledge of the ramifications. An excellent article to cite in this respect would be Davis, Caldeira and Matthews, Science, 329, 10 Sep 2010, p. 1330-1333. The figures in this paper are really valuable and easily digestible to the layperson - something that cannot be said for many of the figures in Chapter 1 (e.g., Fig 1.4a, b; Fig. 1.7a, c, d)	Accepted - There isn't enough literature on lock-in to make a whole figure and section on this point. But we should add this point to the general discussion. Text and cite to Davis et al paper added: "Emissions from these systems depend on infrastructures such as power grids and roads and thus there are also large inertia as those infrastructures are slow to change."
35488	1	0				The Chapter overlooks two key behavioral drivers of climate change: population growth and per-capita consumption of global resources. This problem may arise from the fact that the climate mitigation literature also tends to overlook the behavioral aspects of climate change - biasing it towards technology and macroeconomic governance/policy solutions. Regardless, these drivers should be addressed in this chapter (and in Chapter 5) to the extent that the literature allows. Several points to incorporate: From one perspective, climate change can be viewed as having three core drivers, (1) population growth, (2) increasing per capita consumption of natural resources, and (3) poor knowledge on how to support an advanced society without burning fossil fuels. Whether here and/or in Sec 4.3.3 (Population & Demography), there is extensive literature that can be assessed demonstrating that nations who educate ALL their citizens to a 6th - 9th grade level tend to naturally stabilize their birthrate at <= 2.1 children per family. This improved education and productivity also has a profoundly positive impact on human development and per capita health and wealth. The net gain is typically >\$5 per \$1 invested in education. The world has limited natural resources, and it can be argued that we cannot solve environmental problems such as climate change so long as (1) population is growing, and (2) people consume more resources each year. The Club of Rome made this point over 20 years ago, and a recent comparison of observed trends against these projections has shown them to be largely accurate. The Chapter should address this, and clearly note that "improved technology alone cannot solve all human ills". If the rate of technological change does not increase dramatically, then modern societies may need to greatly reduce per-capita energy consumption in order to mitigate climate change.	Taken into account - the team has discussed behavioral drivers and revised the text to expand the discussion related to the Kaya identity.
35489	1	0				In general, where authors are offering new figures, they ought to use most recently defined categories of countries	Accepted - figure being revised
35490	1	0				Add narrative and empirical foundations for greater ambition. Chapter 1 notes that "Existing models suggest it is very unlikely that the goal of stabilizing warming at 2 degrees at least cost is practically feasible unless international cooperation that involves all countries were to begin almost immediately and a wide array of cost-effective low emission technologies were available." Explicit discussion of the the roles of various sectors (industry, agriculture, energy, etc.) in using and producing these "cost-effective low emissions technologies" can help to introduce and support a more ambitious agenda.	Rejected - This is an important point, but we can't say much about it in this chapter except to highlight the broad levels of additional effort that would be needed. We cite to specific industry chapters for discussion of technologies.

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35491	1	0				Chapter 1 focused primarily on CO2. Is this appropriate? Should there be efforts to mitigate methane, fluorocarbons, and the other atmospheric pollutants listed in Table 1.1?	Rejected - We don't think so, but we also have comments telling us that the discussion of SLCPs is too much in our chapter because there isn't so much discussion of that in the rest of the report. Thus pending different instructions from the WG3 co-chairs we are already at the outer limit of what we have space to do on SLCPs. The comment is correct, though, and points to a big bias in the existing IAM and policy literature, which is its obsession with CO2. No further action needed.
40538	1	0				Chapter 1 should be reviewed entirely to check for its consistency with the outcomes of Chapter 6.	Taken into account - team will review chapter for consistency
27396	1	0				Chapter 1 in general lacks references. There are a lot of statements, even full paragraphs with just prose. This must be changed, as IPCC is an assessment of the existing scientific knowledge and sources must be provided in a transparent manner.	Rejected - chapter 1 is an introduction that is 29 pages long with about 150 citations. We had adopted this style for FOD with no comments on the issue and AR4 did the same. No further action needed.
27397	1	0				In some instances in this chapter, the term "pollutants that affect the climate" is used. This term is unclear. Pollutants need to have a media/pool/reservoir to contaminate like air/atmosphere, water, soil which affect human health and ecosystems directly. GHGs are not regarded as pollutants. It seems however, that they are meant by the term pollutant here. The term does not exist in the Glossary, in the chapters the term GHG is used and pollutant as well in sense of causing harm to humans and ecosystems directly. Also, the WGI text uses GHGs. the new meaning added to the term "pollutant" causes confusion and inconsistencies. Therefore insert before "pollutants" " GHGs and".	Accepted - term replaced with "GHG and other pollutants"
27398	1	0				It would be nice to have all FAQ's in one block or index somewhere.	Editorial - copyedit to be completed prior to publication. All FAQs will appear in a separate document for distribution
23758	1	1				General comments. 1 Due to the urgency it would be good to emphasize also the policy measures to be taken at local, regional and national levels to mitigate incumbent industry and practice resistance as well as accelerate transformative practices towards full renewable energy supply as well as towards enhancement of wetlands, halt of moorland drainage, soil composition enhancement, agricultural reform, afforestation, carbon sink boosting, nitrogen fixation and phosphorus recycling. Terra Preta or composting is not mentioned in soils management, the biosequestration dimension is underdeveloped.	Rejected - Outside the scope of the chapter. There is an extensive discussion of AFOLU (which covers some of these issues/technologies) and also an introduction to a wide range of policy issues addressed in other chapters.

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23200	1	1		48		A good introduction to set the scene, but at times it veers into more of a summary and I don't think this is the objective. For example, Section 1.3.3 should be reviewed in that regard and maybe some sections deleted which summarise findings (eg from Ch 6), and not scene-set. It could use more cross referencing to other chapters - for example page 10 lines 19-33 could reference Chapter 7. Need to check is not too much duplication too.	Rejected - This is an important point and we will continue to examine balance in the chapter. However, it is very hard to introduce the scale of the challenge (and to the factors that will affect whether/how countries will cooperate to cut emissions to meet goals like 2 degrees) without some basic overviews of the type discussed in section 1.3.3. No further action needed.
23201	1	1		48		I cannot see the reason or logic to grouping several figures under one caption as is done here - eg Figs 1.3, 1.4, 1.7 and 1.8 then discussing the "panels" separately. It is a confusing approach and the captions and notes become difficult to follow. For example, why not have Panel A of Fig 1.7 as one figure; Panel B as another; Panels C, D into another and Panel E as a fourth. There may be some links between the figures but much easier to present clearly in the text if they are separated.	Taken into account - all figures have been revised for clarity
23202	1	1		48		In my view personal pronouns should be avoided - such as "we". Who are "we"? The chapter LAs, all the LAs? Since we are charged with assessing the literature, then what "we" think is not really relevant.	Taken into account - pronoun use will be neutral. We will review chapter for consistency in final round.
27399	1	1	1	49	49	Chapter 1 of WGI AR5 contains an overview about the terms to describe evidence, agreement and confidence. This overview should be repeated here to ensure consistent wording and clarity.	Taken into account - text added pointing to the annex in chapter 2 that does just what the reviewer suggested.
34493	1	10	1	10	8	"Peak production" is a debatable term. It has been controversial in the scientific and non scientific circles. It is suggested to avoid the term or replace it with a more scientifically accepted term.	Rejected - We recognize that the term is debatable and that is the reason the term is used in "quotes". The sentence that introduces the term also begins with "Some analysts interpret", and the entire following paragraph discusses new supplies that radically undercut the "peak" idea. This term is commonly known and used, and therefore we think it is entirely appropriate here. No further action needed.
35532	1	10	1	10	50	The authors should consider adding a new figure to help strengthen this discussion. A plot is needed to compare growth in energy demand versus growth in energy discoveries, on a per-unit energy basis. This should be done for oil, gas, and coal. The long-term issue is not whether or not we have enough to last "for today" (e.g. ~10 - 30 yrs out), but whether our rate of consumption is outpacing our rate of discovery (e.g., are we depleting our energy "bank account"). This aspect of the peak energy discussion should be incorporated into the text. When "peak fossil" might occur is less important than whether or not we are on a long-term path to "peak fossil". Comparison of rates of demand growth versus new resource discovery will provide useful insight.	Rejected - beyond the scope and mandate of this chapter. But some of the pieces we cite do exactly what the commentator suggested. No further action needed.

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35535	1	10	10	10	11	Why is fertilizer application in forests not covered? It seems like this is relevant to the chapter and should not be excluded.	Rejected - comment is not relevant to the text. No action needed
23215	1	10	13			IIASA 2012 is same reference as GEA, 2012 - suggest use latter throughout text eg page 11 line 4 etc	Accepted - reference corrected. All cites to IIASA 2012 have been updated to GEA 2012
35536	1	10	15	10	16	Why are these other sources of emissions relevant to this chapter not included? Again, this seems like they should be included	Noted - comment does not refer to any text in our chapter.
24546	1	10	22	10	25	Suggest removing examples already listed in previous paragraph (i.e. 'not only from shale gas but also coal-bed methane, deep gas, and other sources')	Rejected - text is ok as is. We re-added the illustration to clarify the logic flow. no further action needed.
24545	1	10	22	19	24	This discussion would benefit from more balance in terms of the feasibility of reducing emissions from fuel switching within fossil fuels. Recent IEA analysis that suggests we cannot afford to burn more than a third of our fossil fuel reserves without exceeding the dangerous concentration of GHGs in the atmosphere. This places a more severe constraint on our use of fossil fuels and creates many interesting policy and economic challenges. These emerging gas sources could also drive emissions and temperatures higher than alternative policies. For example, IEA (WEO 2012) has pointed out that we cannot use more than about 30% of known fossil fuel resources without exceeding 450 ppm. Citation: International Energy Agency (IEA) (2012). World Energy Outlook 2012- Executive Summary. OECD/IEA 2012 (http://www.iea.org/publications/freepublications/publication/English.pdf)	Rejected - the text is balanced. A further discussion of fuel substitution within fossil fuels is neither needed nor adds scientific substance. Updated two references to IEA. The text is balanced
35537	1	10	26	10	28	The generation share numbers could be updated in two ways: 1) Note that gas generation reached parity with coal generation for the first time in April 2012 (32% coal, 32% gas). 2) The 2012 value for coal generation was closer to 37% (should update the 2011 43% figure). May also be worth noting that while coal's share of generation is expected to continue downwards in the longer term, that total coal generation will largely hold steady due to increasing electricity demand. Most recent statistics can be found on EIA's web site (e.g., http://www.eia.gov/totalenergy/data/annual/index.cfm)	Taken into account - Text revised, will check precise values in Aug 2013
24544	1	10	3	10	18	Suggest also include discussion of Peak Minerals. This does not refer to availability limits necessarily but to the suitability of exploiting mineral resources in a carbon-constrained world, particularly relative to the energy and other costs of exploiting waste and existing 'above-ground' stocks of materials such as gold. Suggested citation: Giurco D, Prior T, Mudd G, Mason L, Behrisch J. 2009. Peak minerals in Australia: a review of changing impacts and benefits. Prepared for CSIRO Minerals Down Under Flagship, by the Institute for Sustainable Futures (University of Technology, Sydney. 110 pp.	Rejected - this is outside our scope. No further action needed.
24547	1	10	30	10	33	This sentence would benefit from more balance in terms of expected demand for coal. IEA suggests that global coal demand will decline by 30% relative to today's level under a 450ppm scenario by 2035. Citation: International Energy Agency (IEA) (2011). World Energy Outlook 2011 Factsheet: What role for coal in an emissions-constrained world? OECD/IEA 2011 (http://www.worldenergyoutlook.org/media/weowebbsite/factsheets/factsheets.pdf)	Taken into account - text revised to say "baseline projections"
31200	1	10	32	10	32	There's no IEA 2011c in the bibliography	Accepted - reference corrected.
21570	1	10	33	10	33	Please rephrase or specify what is meant by "clean coal technology".	Taken into account - text revised to say "the diffusion of technologies that allow coal combustion with lower emissions."

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24548	1	10	34	11	13	Renewable energy and energy efficiency should be emphasised as relatively advanced, quicker and cost-effective mitigation options compared to CCS. Suggest that 1) The paragraph on CCS (currently p10 line 34-46) is moved down after the paragraph on energy efficiency (currently after p.11 line 23); and 2) The first sentence of the paragraph on CCS (currently p10 lines 34-35) is amended to "Another option of particular interest..." to ensure the paragraphs still flow.	Rejected - this is a good idea, but moving the CCS paragraph then breaks flow with previous paragraph (which ends line 33 on p.10) which is all about coal and relative emissions--pointing to the huge likely buildout of coal. That's why we have this paragraph here. no further edits needed.
33021	1	10	34	10	46	It would be useful to refer the reader to the Chapter 7 discussions of CCS here.	Accepted - cross reference to chapter 7 added
35538	1	10	36	10	36	Q - is coal worse than tar-sands oil?	Noted - yes. No further action needed.
35539	1	10	41	10	42	This number should be put in context with global emissions that are ~50,000 Mt CO2e/yr	Taken into account - text revised to say "which is less than 0.1% of total expected world emissions that year."
20434	1	10	46	10	46	Recently, a conception of a solar energy based Carbon Capture and Cycling (CCC) technology was presented to obtain a man-made global zero-carbon (not a zero-emission) budget analogously to the natural assimilation-respiration cycle (Möller 2012). This conception includes a carbon dioxide economy using CO2 extracted from natural sources as a chemical raw material (see also Aresta 2010).	Noted - no further action needed.
35540	1	10	47	10	47	Consider revising the introductory text so it is more clear. For example: "Since AR4, innovation...."	Accepted - text revised as suggested
35533	1	10	5	10	8	This is a surprising statement and really ought to be backed up with facts from BP Energy Statistics or BNEF or IEA or some relevant source like those. Is it really comprehensively accurate - and applicable to the global situation?	Rejected - the sentence is accurate and succinct to state our point.
23216	1	10	50	11	1	Suggest delete this sentence. Why pick on wind - also solar, bioenergy CHP etc. If you want to comment on RE growth just reference the annual REN 21 Global Status Report - in line 4	Taken into account - We merely provide a concrete illustration to make the text more comprehensible to non-experts. Our intention is not to pick on wind. To clarify, the text is revised to say "...generating capacity has, for example, experienced..."
35534	1	10	9	10	9	"After the AR4..." it does not matter when it got published by CUP, but rather when the work was done and the info/data fixed.	Rejected - our text is ok. Our intention is to try to make the text readable and understandable in larger context. No further action needed.
20050	1	10	25		26	Add some phrases from chapter 7 (p.4 line 28-30) so that the sentence in parenthesis can be read "Recent life cycle assessments indicate a modern NGCC power plant emits about half the CO2 per unit of electricity than current world-average coal fired power plant when fuelled from a low GHG natural gas source" to be consistent with chapter 7 .	Taken into account - cross reference to chapter 7 added. The suggested change makes the same point as our current text, but our text uses few words. No text revision made.

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24497	1	10	34	10	46	As the case of In-Salah Gas Field in Algeria, pilot CCS is implementing and this means basic technology is ready even though further improvement is needed. A serious barrier is economic CCS. By accumulating projects, technology is going to be developed and cost would be decreased. So a crucial message to policy makers is to set investment climate to improve its economics, like Feed-n-Tariff. Fossil fuel with CCS may be lower cost option when it is compared to renewable incentives. Please see "Look at the potential of coal fired power with CCS" at Nikkei-Sangyo News on 20 July 2012 by Takashi Hongo.	Rejected - Our text is accurate, and we cite the most authoritative source for info on projects that are under way. In-Salah is a bad example to cite because it does not capture CO2 from coal combustion--it is gas separation off a CH4 stream. Also, the Hongo piece is not peer reviewed and therefore we are not able to cite it.
19621	1	10	9	10	18	It should mentioned as well, among the new supplies from unconventional: tight gas and tight oil	Rejected - We mention 7 examples already (and with an "eg" which means this is an illustrative list, not exhaustive). Our examples are sufficient to make our point. No action needed.
23219	1	11	10			Chapter 11 in IPCC? Needs rewriting - but note biofuels were discussed in Ch 2 of the SRREN.	Taken into account - cross reference to chapter 2 corrected; reference corrected
19812	1	11	12			"Many analysts" needs a reference.	Taken into account - text revised to say "leading investors and analysts alike to wonder whether and how"
33022	1	11	14	11	23	It would be useful to refer the reader to the Chapter 7 discussions of integration challenges and solutions here.	Accepted - cross reference to ch 7 added.
35542	1	11	14	11	23	This paragraph seems to be introducing the demand-side options of energy efficiency and demand response initiatives. It would be good to flesh out the difference between the two for the unfamiliar reader (e.g., EE is a reduction in overall energy consumption, DR is a reduction in peak generation). For demand response, could also mention recent progress in grid operators pricing demand response initiatives into forward capacity markets - giving them more traction.	Taken into account - cross ref to chapter 7 added at end of this paragraph. Those differences are explored in more detail there.
34494	1	11	16	11	19	This entire sentence starting with "Energy.." is too difficult to understand/technical and should be replaced	Taken into account - sentence revised to say "Integrating information and communication technology (ICT) into energy networks offers the potential to deliver and use energy more efficiently and flexibly, which could make it much easier to integrate variable and intermittent renewable power sources into existing electric grids."
32853	1	11	16	11	23	wording is again biased in favour of a perception of beneficial outcomes - suggest re-wording "Innovations of this type may also interact with behavioural changes that can have large effects on emissions as well." to "Innovations of this type may also interact with behavioural changes that can have large effects (BOTH BENEFICIAL AND ADVERSE) on emissions as well." see for example forthcoming issue http://www.iemss.org/docs/cfp/EMS_TI_Modelling_Sustainability_of_Smart_Solutions.pdf	Taken into account - combined with comment 273

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21571	1	11	22	11	23	Please expand on how behavioural change can interact with innovations. Is this a positive or negative interaction and what are the points of influence with policy?	Taken into account - text added to say "greater flexibility and efficiency could encourage consumers to use more energy, partially offsetting the benefits of these investments in smarter energy supply networks. Or, close attention to energy supplies could encourage shifts in behavior that are much more frugal with energy."
26386	1	11	24	11	25	SPECIFIC COMMENT. "A central challenge in shifting to clean energy supplies and to creating much more efficient end-use of energy is that many energy technologies require large capital costs with long time horizons". Comment: this challenge is not true for H2FC Powertrain technology that will require small capital cost and short time horizons.	Rejected - We use the word "many". And calling out H2FC is getting into too much detail for here. No further action needed.
35543	1	11	24	11	32	An overly-narrow perspective here is leading to an inaccurate statement. Shifting to clean-energy has this problem, if you think from the perspective of "supplying unlimited energy on demand". The infrastructure problem is much more tractable if the problem is redefined as "providing essential energy on demand, and incremental energy as available - for a price". This is a behavioral aspect that greatly alters costs and viable technology options. The authors should incorporate this aspect into the discussion.	Rejected - Paragraph is correct as written. Previous paragraph raises some behavioral issues, and response to comment 273 does even more of that. No action needed
21572	1	11	26	11	27	Rephrase this sentence. It uses a double negative ("not confident that... support will not be reliable")	Taken into account - combined with other comment
23730	1	11	3	11	4	Does this statement applies to Geothermal?? See Ch7, p11 for possible conflict.	Taken into account - after checking IEA data, we found that geothermal was not only small but also slowly growing from 2000-2010, so removed reference to geothermal.
23731	1	11	34	11	34	Is this true? I understand that most countries are always examining energy expansion and operation plans, and, consequently, looking for all opportunities, including nuclear power.	Noted - Yes, this sentence is true. No further action needed.
24549	1	11	4	11	6	Incorrectly implies that biofuels are the only potential renewable source of transportation energy. Suggest adding vehicles powered through renewably generated electricity: 'Renewable energy potentials exist not only for stationary users via electricity but also for transportation through biofuels and electric-powered vehicles.'	Accepted - text revised as suggested.
35541	1	11	4	11	4	Is it the potential for large-scale growth or the potential to become a large (>33%) fraction of all energy?	Rejected - both, but growth potential is greater (from small base) than the potential to become >33%. And if we start, here, talking about possible massive penetration of renewables then we need to include lots of caveats because there are so many different perspectives on the topic. Thus we wrote text as it is. no further action needed.
40543	1	11	4	11	13	This paragraph contains very important point. So, this should be reflected in SPM.	Noted - thank you. We will pass this along. No further action needed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20757	1	11	40	11	40	pls add the date of the Fukushima accident and short description of what happened (nuclear disaster following earthquake and tsunami)	Taken into account - text revised to say "...Fukushima accident IN MARCH 2011"
19813	1	11	46		49	This sentence is ambiguous as to whether Fukushima had any effect. "aren't noticeable effects" is different from "some scaleback"	Taken into account - revised text to say "there aren't many noticeable EFFECTS from Fukushima..."
19564	1	11	47	11	49	The most recent news from the Finnish nuclear industry point to uncertainty in investments to build the newest reactor.	Accepted - deleted Finland
23217	1	11	5			"but also for transport through biofuels as well as electricity and hydrogen when generated from renewables (see 8.3)."	Taken into account - combined with other comment
20235	1	11	6	11	13	KEEP this para as it is important finding for policy makers. Move this para to SPM.	Noted - thank you. We will pass this along. No further action needed.
20841	1	11	7	11	13	Good text. There are several obstacles to overcome to introduce renewable energies and biofuels. When we explain these energies, both positive and negative sides should be featured.	Noted - thank you. No further action needed.
32457	1	11	7	11	10	It should be remained since the problems of RE and biofuels are mentioned	Noted - not clear what action point is here. Text is accurate and will be kept. No further action needed.
23218	1	11	8			"intermittent" is the wrong word - meaning on/off - so delete and on line 18 change to "variable"	Rejected - the right phrase is "variable and intermittent." Some actually are intermittent. No further action needed.
20435	1	11	9	11	9	It should be noted that extensive renewable energy use requires further research on availability of solar, wind, ocean, and hydroelectric power under future (!) climate conditions. This means, scenarios of regional/local climate change are needed with respect to meteorological parameters relevant for renewable energy sources, including the occurrence of extreme weather/climate events, especially.	Rejected - agreed, but we don't have space to do this here. All the impacts of climate change on RE, by the way, are not negative.
29767	1	11	25	11	27	"if investors and users are not confident that needed policy and market support will not be reliable." Confusing. 'needed policy and market support will be reliable' is more logical	Accepted - text revised as suggested
34765	1	12	10	12	10	Amend "Treaty" to "Kyoto Protocol"	Taken into account - revised text to say "Protocol" on line 10
25296	1	12	10	12	10	The word "Treaty" should be replaced with "Protocol".	Taken into account - combined with other comments (295)
22295	1	12	10	12	10	The word "Treaty" should be replaced with "Protocol." The legal architecture and relationship between the UNFCCC and the Kyoto Protocol is such that it is the UNFCCC that is the "Treaty" and the Kyoto Protocol is a "related legal instrument" of the Convention pursuant to Article 8, paragraph 2, and Article 17 of the Convention. Using "Treaty" to refer to the Kyoto Protocol conflates the two treaty instruments and gives them equal status when, in fact and in law, the Protocol is subordinate to the Convention.	Taken into account - combined with other comments (295)

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27292	1	12	11	12	13	Reference to "When AR4 concluded in 2007, diplomats were in the early stages of negotiations for possible amendment or replacement of the Kyoto treaty following the expiration of the original regulatory goals in 2012." should be replaced by "When AR4 concluded in 2007, Governments agreed during COP-13/CMP-3 on the "Bali Roadmap", for a two-track negotiation process that included the negotiation of further commitments for Annex I Parties under the Kyoto Protocol and long-term cooperative actions under the UNFCCC.	Taken into account - Text revised to say "When AR4 concluded in 2007, diplomats were in the early stages of negotiations for possible amendment of the Kyoto treaty while also exploring other mechanisms to encourage additional long term cooperation on mitigation. The regulatory goals of the original Kyoto treaty would expire at the end of 2012."
25297	1	12	12	12	12	The word "treaty" should be replaced with "Protocol."	Rejected -- the word "treaty" is correct here because we are trying to signal a broader point. Treaty means legally binding, and from sentences that go prior (where we focus on the Kyoto Protocol per se) it is clear to readers what is the Protocol and what, possibly, is the future--which could be a protocol or could be something else.
22296	1	12	12	12	12	The word "treaty" should be replaced with "Protocol." The legal architecture and relationship between the UNFCCC and the Kyoto Protocol is such that it is the UNFCCC that is the "Treaty" and the Kyoto Protocol is a "related legal instrument" of the Convention pursuant to Article 8, paragraph 2, and Article 17 of the Convention. Using "Treaty" to refer to the Kyoto Protocol conflates the two treaty instruments and gives them equal status when, in fact and in law, the Protocol is subordinate to the Convention.	Rejected - combined with other comment
20857	1	12	18	12	22	As mentioned above(No.18), 1.5 or 2 degrees celsius aren't agreed targets. However this text focuses on them, and it may mislead readers to thought that these targets have been already agreed. This text should be deleted.	Rejected - we call these "widely discussed" which is accurate. No further action needed.
24472	1	12	18	12	22	It's wrong to put emphasis on scenarios of 1.5 and 2 degree targets, because IPCC must keep neutrality and must cover full range of scenarios in table 6, chapter 6 page 19.	Rejected - we call these "widely discussed" which is accurate. No further action needed.
25672	1	12	18	12	22	This part should explain unlimited evaluation results because it is prejudicial and misleading to put an emphasis on limited scenarios from 1.5°C to 2°C. IPCC should be policy-neutral and should have responsibility to indicate unlimited evaluation results, as described in Table 6.1. The 1.5°C target is not realistic and even 2C target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract). These literatures are listed in the No4 line of this table.	Rejected - we call these "widely discussed" which is accurate. Moreover, this chapter has EXTENSIVE discussion of the infeasibility of these goals to the point that other reviewers are upset by that. No further action needed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20436	1	12	2	12	2	Reference should be made to experimental studies of nuclear fusion power which could be a very important energy source in the second half of 21st century.	Rejected - Maybe. But within the realm of what really matters for the next few decades and for this short introductory chapter where we focus (and the fact that we use "such as" in phrasing on line 2) makes the text accurate. No further action needed.
35544	1	12	2	12	2	What about small modular reactors? They deserve discussion here. Additionally, what are "Gen III" reactors - a brief description is warranted. Finally a refernece to where else in WG3 nuclear energy is dsicussed would be useful to the reader.	Taken into account - text revised to say "...and small modular reactors." added a cross reference to chapter 7.5.4.
19814	1	12	2			Explain what is Generation III. Some authors include Thorium in Gen III. Do you?	Rejected - We use the phrase "such as" to indicate examples. And in response to comment 305 we have added one more example plus a cross reference. That's enough.
27422	1	12	23	12	26	There are no institutions which aim to replace the UNFCCC process. Please exchange "replace" with "support" or sth similar.	Accepted - addressed through edits in response to comments #72. Text has been revised
27293	1	12	24	12	25	Reference to "In tandem, governments have also made a number of important decisions such as to extend the Kyoto Protocol's regulatory obligations at least to 2020" should be replaced by "In tandem, governments have also made a number of important decisions, in particular the adoption of the second commitment period of the Kyoto Protocol, from 2013 to 2020."	Accepted - text revised. The suggested sentence has been added, with the author's edits to the sentence in CAPS: "In tandem, governments have also made a number of important decisions, in particular the adoption IN DOHA IN 2012 of the second commitment period of the Kyoto Protocol, from 2013 to 2020." And updated reference to cite the Doha amendment

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35545	1	12	24	12	25	This statement should be expanded to include text reflecting recent developments, such as: "... though fewer nations are a part of KP2 for reasons such as X, Y, and Z and KP2 now accounts for x% of global emissions"	Taken into account - UNEP (2012) states: "... developed countries that are not participating in the second commitment period of the Kyoto Protocol (e.g. USA and perhaps Russia, Japan, Canada)..". In an informal UNFCCC text after Doha: "Canada, Japan, New Zealand, Russia and US have now withdrawn." [http://unfccc.int/files/kyoto_protocol/application/pdf/kp_consolidated_text.pdf]. Current ref. UNFCCC (2013) mentions these all, except for US. Sentence added to reflect this.
22297	1	12	24	12	26	The references used (Hohne et al 2012; UNEP 2012) cannot be used to support the statement that governments "made a number of important decisions such as to extend the Kyoto Protocol's regulatory obligations at least to 2020" because these references were both published BEFORE the UNFCCC Parties at COP/MOP8 meeting in Doha in December 2012 adopted the amendments to the Kyoto Protocol to provide for a 2nd commitment period running from 1 January 2013 to 31 December 2020 providing for emission reduction obligations for Annex B Parties to the Kyoto Protocol. The correct citation in relation to the decision of governments on the extension of the Protocol's regulation obligations should be UNFCCC decision 1/CMP.8 (2012) available at http://unfccc.int/resource/docs/2012/cmp8/eng/13a01.pdf#page=2	Taken into account - combined with comment 308. good comment. No further action needed.
35219	1	12	27	13	6	The assessment on UNFCCC process is not objective. Firstly, there is no literature that supports the argument that "many other institutional forms that could complement or even partially replace the UN-based process". It is suggested to remove "or even partially replace". Secondly, although other processes might be effective on mitigation to certain degree, no evidence shows that they are more effective than the UNFCCC process. It is suggested to: 1) add one sentence as follows at the beginning of this paragraph, "The UN process is an assurance of fairness, wide participation and legitimacy of any regime created (Hare et. 2010; Esty 2008), which is critical to approaching resolution of international affairs. Meanwhile, the growing complexity..." 2) add one more sentence as follows at the end of this paragraph, "However, no evidence shows that those international institutions are more effective than UN-based process (Gao, 2012)." Thirdly, on page 12 lines 36-38, the sentence describing BRICS should be removed for it is neither a negotiating group nor does it meet as a group in the context of climate change negotiations. Reference Hare W., Stockwell C., Flachsland C. and Oberthur S., 2010, The architecture of the global climate regime: a top-down perspective. Climate Policy 10: 600-614; Esty D.C., 2008, Rethinking Global Environmental Governance to Deal with Climate Change: The Multiple Logics of Global Collective Action. American Economic Review: Papers & Proceedings. 98:2, 116–121); Gao X., Wang W., Dai Y. 2012. The Impacts on UN Climate Change Frameworks from Other Multilateral Mechanisms. Journal of World Economy and Politics, (4): 59-71. (in Chinese)	Taken into account - the text around the UNFCCC process has been revised

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20842	1	12	27	12	30	Good text. Under the U.N. process, the diplomatic negotiation faces a deadlock. Considering this situation, negotiations out U.N. will play an important role to solve global warming.	Noted - thank you. Sadly, not everyone agrees.
31575	1	12	27			It is suggested to add one sentence at the beginning of the paragraph: The UN process is an assurance of fairness, wide participation and legitimacy of any regime created (Hare et. 2010), which is critical to approaching resolution of international affairs. Meanwhile, the growing complexity..... ; Hare W., Stockwell C., Flachsland C. and Oberthur S., 2010, The architecture of the global climate regime: a top-down perspective. Climate Policy 10: 600-614	Taken into account - The proposed text is too normative. But to address the commentor's point, the text around the UNFCCC process has been revised.
27294	1	12	27	13	41	The indicated paragraphs present highly political and subjective statements, and do not constitute adequate language for inclusion in the IPCC report. Furthermore, they contain blunt factual errors such as confusing BASIC for BRICS, and overestimating the weight of climate change in the G20 agenda. The suggested "decentralization" of international institutions that have engaged in the climate change topic is arguable: UNFCCC has supremacy over the global treatment of the issue; other institutions must take into account UNFCCC's regime when addressing climate change under their respective mandates, which are restricted. The indicated paragraphs should be removed.	Taken into account - We disagree on a few points: The proposal to remove the suggested text, which deals with arguably THE most important development (for good or bad) in diplomacy is inappropriate. The UNFCCC does not have ordained supremacy. The G20 has put this issue on its agenda (and we make it clear that the agenda is large and diverse). However, we did make an error with BASIC for which we apologize and the text has been corrected. Also a sentence has been added to clarify the UNFCCC process
27423	1	12	27	12	30	In addition to the negotiations on a new agreement, diplomatic talks focus also on rising ambition pre2020 under the ADP. Please add.	Taken into account - sentence added: "These talks are also aimed at raising the level of ambition and effort at mitigation prior to 2020."
40544	1	12	32	12	47	The expansion of various regime is better to be recognized, because it is a new feature of the global warming politics. Therefore, these sentences should not be deleted.	Noted, thank you. Sadly, not everyone agrees. No further action needed
34766	1	12	36	12	37	Delete reference to Russia and change "BRICS" to "BASIC". Russia has not, generally been coordinating policies and/or negotiating strategies with the BASIC countries. In the climate change context, Russia is an Annex I Party while each of the BASIC countries are non-Annex I Parties and hence have differing interests, particularly with respect to mitigation.	Taken into account - our error--see response to comment 314 which fixes this. No further action needed.
31576	1	12	36	12	38	it is suggested to change the sentence to: In the context of climate change negotiations, Brazil, India China and South Africa - the so-called BASIC countries - have met as a group in efforts to coordinate policies and negotiating strategies.	Taken into account - our error--see response to comment 314 which fixes this. No further action needed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22298	1	12	36	12	38	The reference to the BRICS countries as meeting as a group in the context of the climate change negotiations is not correct. The BRICS countries do NOT meet in the UNFCCC negotiations "in efforts to coordinate policies and negotiating strategies." Rather, it is the BASIC countries (composed of Brazil, South Africa, India, and China) that meet together and issue common statements and positions in the context of their participation in the UNFCCC negotiations as individual Parties and as members of the Group of 77. See for example the BASIC statement at Doha at the start of COP18 - http://unfccc.int/resource/docs/cop18_cmp8_hl_statements/BASIC STATEMENT AT COP18.pdf . Russia, on the other hand, is a member of the "Umbrella Group" - a group of non-EU developed countries which formed following the adoption of the Kyoto Protocol. Although there is no formal list, the Group is usually made up of Australia, Canada, Japan, New Zealand, Norway, the Russian Federation, Ukraine and the US. See http://unfccc.int/parties_and_observers/parties/negotiating_groups/items/2714.php	Taken into account - our error--see response to comment 314 which fixes this. We appreciate the Umbrella group comment as well, but given the level of discomfort this whole paragraph gives some people we aren't going to make it longer. No further action needed.
25295	1	12	37	12	38	There is no coordination is among BRICS nations.	Taken into account - our error--see response to comment 314 which fixes this. No further action needed.
22932	1	12	4	12	22	Both "the Kyoto Protocol" and "the Kyoto treaty" are used. I think it is better to use one of them.	Accepted - writing team will check for consistency
33024	1	12	4	12	22	It would be useful to refer the reader to the full discussion of Kyoto that appears in Chapter 13 here.	Taken into consideration - sentence added at end of paragraph: "International agreements are discussed in detail in chapter 13 of this report."
27421	1	12	4	12	22	Results from COP18 are missing	Taken into account - combined with other comment, see response to comment 308.
20758	1	12	40	12	40	It seems the word "with" shouldn't be there	Taken into account - text revised to say "its large agenda; the G20 has also helped to organize active ..."
35546	1	12	46	12	46	The Climate and Clean Air Coalition (CCAC) deserves a mention here.	Accepted - text revised to say "...renewable energy), the Climate and Clean Air Coalition (CCAC, which focuses on how limits on short-lived pollutants such as soot can help slow climate change), varied institutions..."
31201	1	12	49	12	49	idem	Noted - unclear on proposed action. No action needed
23220	1	12	49			IEA, 2011c is not listed. If World Energy Outlook, quote IEA, 2012 perhaps	Taken into account - reference corrected
22933	1	12	6			United National Framework Convention -> United Nations Framework Convention	Accepted - text corrected

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27291	1	12	9	12	11	Reference to "The main regulatory provisions of the Kyoto Protocol concerned numerical emission targets for industrialized countries (listed in Annex B of the Treaty) during the years 2008 to 2012" should be replaced to "The main regulatory provisions of the Kyoto Protocol concern numerical emission targets for industrialized countries (listed in Annex B of the Treaty) during the years 2008 to 2012 (to be complemented by further commitment periods), strict accounting and compliance rules, and three mitigation mechanisms (the Clean Development Mechanism, Joint Implementation and Emissions Trading).	Rejected - The suggested change is too complicated. The core idea gets lost with text that includes all these extra provisions. No further action needed.
31573	1	12	11	12	13	It is suggested to change the sentence to: When AR4 concluded in 2007, diplomats were in the early stage of negotiations for possible amendment of the Kyoto treaty following the expiration of the original regulatory goals in 2012 and negotiations on the enhanced long-term cooperation under convention were just under way.	Taken into account - Text revised to say "When AR4 concluded in 2007, diplomats were in the early stages of negotiations for possible amendment of the Kyoto treaty while also exploring other mechanisms to encourage additional long term cooperation on mitigation. The regulatory goals of the original Kyoto treaty would expire at the end of 2012."
24550	1	12	17	12	18	The author should note that there are now 91 pledges (the five countries which are not listed on the website that is referenced in the chapter are Argentina, Algeria, Cambodia, Mauritius and Dominican Republic). While these countries are not listed on the referenced UNFCCC pages, these non-Annex I country pledges are listed at FCCC/AWGLCA/2011/INF.1, with the exception of Dominican Republic, which made a pledge at the Plenary session at Doha COP18. Using the World Resource Institute's Climate Analysis Indications Tool (CAIT) 2005 emissions, these pledges represent greater than 80% of global emissions of all countries. WRI CAIT data can be sourced ordinarily be sourced from http://www.wri.org/tools/cait/ ; however, the data tool is currently under review at this time.	Taken into account - revised text to 91, to "about 80%" and added cite to UNEP (2012). Fraction of emissions was also estimated using EDGAR data in UNEP (2012) and that was also ~80%. So, given the uncertainty in the data "about 80%" is a good improvement. The UNEP gap report was added as reference to support this figure.
31574	1	12	18	12	22	Lacking reference	Taken into account - combined with comment 294
20051	1	12	21		22	Replace "far from what is probably needed" with more objective expression, as the range of "the pledges" is at least within the range of model results to achieve 450 ppmCO ₂ e stabilization (Figure 1.8).	Taken into account - revised text to say "Even if the pledges are fully implemented, it may be very hard to attain the widely discussed goals of 1.5 or 2 degree target unless all the countries immediately join international framework to reduce emissions substantially (Figure 1.8)".

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32471	1	125				<p>The page numbers refer to the pages of the pdf document (and do not coincide with the page numbers as printed in the bottom right of the document. Life Cycle Assessment (LCA) is standardised by ISO with that name. Therefore, it should never be referred to as Life Cycle Analysis. Furthermore, once defined, it can be referred to simply as "LCA". Many important works of Brandão et al. (e.g. 2013) and Levasseur are missing, which are particular relevant to chapters 8 and 11. These are:</p> <ul style="list-style-type: none"> -Brandão M, Levasseur A, Kirschbaum M, Cowie A, Weidema B, Jørgensen SV, Hauschild M, Chomkamsri K, Pennington D (2013) Key issues and options in accounting for carbon sequestration and temporary storage in life cycle assessment and carbon footprinting. The International Journal of Life Cycle Assessment 18 (1) 230-240. DOI: 10.1007/s11367-012-0451-6. http://link.springer.com/article/10.1007%2Fs11367-012-0451-6 -Levasseur A, Lesage P, Margni M, Brandão M, Samson R (2012) Assessing temporary carbon sequestration and storage projects through land use, land-use change and forestry: comparison of dynamic life cycle assessment with ton-year approaches. Climatic Change. DOI: 10.1007/s10584-012-0473-x. http://www.springerlink.com/content/b3251u56v728m870/?MUD=MP13. -Levasseur A, Brandão M, Lesage P, Margni M, Pennington D, Clift R, Samson S (2012) Valuing temporary carbon storage. Nature Climate Change 2, 6–8. doi:10.1038/nclimate1335. http://www.nature.com/nclimate/journal/v2/n1/full/nclimate1335.html. -Brandão M, Mila i Canals L, Clift R (2011) Soil Organic Carbon changes in the cultivation of energy crops: implications for GHG balances and soil quality for use in LCA. Biomass & Bioenergy 35 (6). 2323–2336. Special issue: Modelling Environmental, Economic and Social Aspects in the Assessment of Biofuels. http://www.sciencedirect.com/science/article/pii/S0961953409002402 -Brandão M, Clift R, Mila I Canals L, Basson L (2010) A Life-Cycle Approach to Characterising Environmental and Economic Impacts of Multifunctional Land-Use Systems: An Integrated Assessment in the UK. Sustainability 2(12): 3747-3776. Special issue: Life Cycle Sustainability Assessment. http://www.mdpi.com/2071-1050/2/12/3747/pdf -Mueller-Wenk R and Brandão M (2010) Climatic impact of land use in LCA - carbon transfers between vegetation/soil and air. The International Journal of Life Cycle Assessment 15(2) 172-182. http://www.springerlink.com/content/02628184t2q98051/fulltext.pdf -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. Springer. 125pp. -Brandão M (2012) Food, Feed, Fuel, Timber or Carbon Sink? Towards Sustainable Land Use: a consequential life cycle approach. PhD thesis. Centre for Environmental Strategy (Division of Civil, Chemical and Environmental Engineering), Faculty of Engineering and Physical Sciences, University of Surrey, UK. 246 pp. Appendices 541 pp. -Mulligan D, Edwards R, Marelli L, Scarlat N, Brandão M, Monforti-Ferrario F (2010) The effects of increased demand for biofuel feedstocks on the world agricultural markets and areas. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-16220-6. http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/16193/1/en24464_iluc%20workshop.pdf -Brandão M, Levasseur A (2011) Assessing temporary carbon storage in life cycle assessment and carbon footprinting: outcomes of an expert workshop. Joint Research Centre, European Commission, Ispra, Italy. <p>This Figure (like several following) makes a spurious attempt to quantify the unquantifiable.</p>	Rejected - comment does not apply to ch 1
20689	1	13	1	13	20		Taken into account - passed to SPM team

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35547	1	13	1	13	47	Two general comments on the discussion of the relationships between climate mitigation and world trade organizations. First, considering the behavioral aspects of the climate problem, does the structure of our world trade organizations contribute to the underlying drivers? Does the literature discuss how organizations such as the WTO could be reformed to incorporate externalities such as security and preserving environmental services into their role in regulating world trade? These are global externalities that cannot be easily addressed solely at the national level. Second, how effective have these global institutions been to-date? What are the lessons learned?	Rejected - The literature since AR4 focuses on how to add trade measures without broad WTO reforms since such reforms are really hard to implement. We cite an example--the Bacchus et al piece. I think our paragraph is accurate on this without getting into the weeds, such as whether/how to apply the shrimp/turtle and asbestos precedents. This topic is discussed further in ch 13 and we reference that chapter. No further action needed.
31202	1	13	12	13	13	his refers to the Porter Hypothesis: Porter, M., and C. van der Linde, 1995, Toward a new conception of the environment-competitiveness relationship, Journal of Economic Perspectives, 9(4), 97-118.	Rejected - yes, but this cite is very old and thus we just cite one of the more recent pieces in this vein. We are instructed to focus post AR4 wherever possible. No further action needed.
27424	1	13	23	13	26	This is an interesting analysis. What is the result?	Noted - The rest of the paragraph signals the issues and the kinds of outcomes--fragmented institutions, parallel agreements, etc etc. No further action needed.
19816	1	13	26		39	Similar comment. What results have come from this research? "In some settings..." which settings?	Taken into account - combined with other comment
19815	1	13	3			Research has "risen sharply", but what results has this research produced?	Taken into account - combined with other comment
27425	1	13	38	13	39	Is there a context of this sentence with the paragraph?	Rejected - I am confused by this comment since we state the issue and then in the same sentence indicate some of the results and conditions. No further action needed.
35550	1	13	43	13	47	Is their efficacy assessed in this report? If so, where? If not - they should be.	Taken into account - see response to your comment 341 which tries to address this issue. Measurement is REALLY hard.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35551	1	13	44	13	44	Consider adding to the end of the sentence, "...and also a long time before the mitigated climate change is realized in almost all cases (except the specialty pollution cuts)." or some similar text reflecting this fact	Taken into account - added sentence at end of paragraph: "While there are diverse efforts to engage these many different actors, measuring the practical impact on emissions has been extremely difficult and much of the scholarship in this area is therefore highly descriptive. "
40545	1	13	44	13	47	To utilize the business community is very important. For the purpose of enhanced involvement of business community, appropriate patent protection is necessary to implement their technologies. Therefore, description on the importance of patent protection here, as written in Chapter 15 P.40, L35-37 is strongly encouraged.	Taken into account - added cross reference to chapter 15 here
35548	1	13	5	13	6	This sentence is not clear; the second half of the sentence does not go with the first half.	Taken into account - sentence correct to say "...similar concepts THAT have..."
35549	1	13	7	13	7	The time frame is not just "completion" but the freezing of the drafts for new papers. Consider using: "since the AR4" as it is suitably vague.	Accepted - text revised to say "Since AR4"

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
26500	1	13	22	13	23	<p>"The growing understanding of the potential impacts of climate change for the world of work has led to increased concerns by organisations of employers and trade unions, as well as greater motivation to engage in the debate and actions to address climate change. The International Labour Organisation has documented that climate change might lead to more job destruction and income losses, and lower productivity over time (ILO, 2012). On the other hand, emerging evidence tends to suggest that most mitigation options could lead to the creation and more and better jobs, both in developed and developing countries. The German Pact for Employment and Environment between workers and employers was THE driving force of the multi-billion investment program on retrofitting and mitigation." Source: International Institute for Labour Studies (2012), Working towards sustainable development: Opportunities for decent work and social inclusion in a green economy (Geneva, ILO, 2012); ILO (2013 forthcoming), Sustainable development, decent work and green jobs, Report V. International Labour Conference, 102nd Session, 2013</p>	<p>Taken into account - added sentence: "Concerns have also been raised about the ways that emission controls could reduce employment and income." And added cites to both ILO reports.</p> <p>The impacts on employment could be either positive or negative. The sentence here, though, says something different—which is about the CONCERNS that have been raised about whether mitigation will harm employment and income. That point is exactly accurate, and it also reflects the larger tenor of the equilibrium-based economic modeling which sees departures from equilibrium as costing something. That doesn't mean society shouldn't spend money on mitigation. And it doesn't mean that some folks won't see higher employment and income from mitigation—for example, some kinds of construction workers if lots of CCS projects get built. But the sentence is accurate in reflecting the core concerns without (as would be inappropriate in chapter 1) our actually declaring whether (and how) mitigation will increase or decrease employment.</p>
26501	1	13	42	13	47	<p>At the end of line 47, to add "Employers and Workers Organisations have often played a pivotal role in national mitigation agreements, climate policies and projects. The South African Green Economy Accord as well as the Frech and Spanish roundtables and mitigation policies are examples. Similarly, there have been efforts to engage organisations of employers and trade unions along with governments in tripartite dialogues on the potential implications of climate change for the world of work and responses that may be warranted (ILO 2012, 2013)". Source: International Institute for Labour Studies (2012), Working towards sustainable development: Opportunities for decent work and social inclusion in a green economy (Geneva, ILO, 2012); ILO (2013 forthcoming), Sustainable development, decent work and green jobs, Report V. International Labour Conference, 102nd Session, 2013</p>	<p>Taken into account - see response to comment 330 which adds some citations to the work and to the basic ideas here.</p>

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21065	1	13	2	13	8	Please explain what you subsume under "forest-related emissions". And rework the text - for the biogeochemical and physical GWP it does not matter whether a substance is included in the KP or not. I suggest to orient the text on climate science, not policy.	Taken into account - removed "forest-related emissions" on p.14, line 3. To reflect the comment and to be more balanced/complete: "Most policy analysis" (line 2) replaced by "Much policy analysis" added "cover a wider array of CO2 sources and warming substances.." added "mitigation efforts across different substances and sources."
29946	1	14	1	14	2	Regarding 60% of total global greenhouse gas emissions: It is good that you specify that forest-related emissions are included. I think it is also needed to add "in terms of GWP100 weighted emission" (assuming this is what you have done). I guess the total consists of Kyotogases?	Taken into account - added cross reference to section 1.3.1 of this report
29945	1	14	1	15	24	1.2.1.5: this is a good and very useful section that builds a bridge to WG1 and shows that the WG reports are parts of the same AR5 report. I hope this perspective is also found in later chapters.	Noted - No further action needed.
29947	1	14	14	14	18	Yes, updates of references to WG1 may be needed. The figures referred to are included in a paper by Aamaas et al which has been accepted for Earth System Dynamics. A reference to this paper could be added . Here you will also find more background on how these figures are calculated, if that is needed. REFERENCE: A synthesis of climate-based emission metrics with applications, Aamaas et al. Earth System Dynamics (accepted) Will appear online soon.	Accepted - Added Aamaas et al cite, as suggested
26931	1	14	17	14	18	The paper which 8.34 is based on was not accepted before the WG1 deadline, but shortly after. The reference could therefore be changed to Aamaas et al., Simple emission metrics for climate impacts, Earth System Dynamics.	Accepted - Added Aamaas et al cite, as suggested
35552	1	14	2	14	3	Are forests now considered fossil fuels? The text in parentheses should be deleted, b/c as Fig. 1.3 shows, Land use CO2 (which is, presumably LULUCF) includes forestry and that is separate from the 60% from FF CO2.	Accepted - deleted text concerning forest-related emissions
35553	1	14	21	14	21	The statement about "different properties" is correct, but the references are secondary, you should go back to the IPCC earlier assessments (TAR: 2001 Prather, Ehhalt et al Atmospheric Chemistry Chapter and Penner et al. Aerosols Chapter) or even to the earlier publications, these later references give a mistaken view of our understanding and when.	Rejected - we have been asked to focus on things since AR4; that is true for hundreds of ideas in this report--there are earlier origins. References are fine. No further action needed.
35554	1	14	21	14	21	Talking of time horizons and metrics seems like a good place to put ref to the IPCC 2009 Metrics report and the other work of Fuglestvedt and Shine.	Taken into account - The section has been revised and a cite to Fuglestvedt et al has been added.
35555	1	14	22	14	22	The authors should add reference to "properties and indirect effects (Chen, W. T., Y. H. Lee, P. J. Adams, A. Nenes, and J. H. Seinfeld (2010), Will black carbon mitigation dampen aerosol indirect forcing?, Geophys. Res. Lett., 37, L09801, doi:10.1029/2010GL042886.) ---this is important since there are serious scientific differences on the amount of cooling from BC removal (even the sign as noted here). The indirect effects are critical, it is not there different properties alone.	Taken into account - The commenter's suggestion is a matter for chapters 7 and 8 of WG1 which we now cite to chapter 7). Yes, there are disagreements. Cross references added

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35556	1	14	24	14	24	The first paper to note that ODS were a major climate forcing precedes Velders and the IPCC FAR, please give proper credit to the historical work , and also a much better perspective on when we knew the science: Hansen, J., A. Lacis and M. Prather. Greenhouse effect of chlorofluorocarbons and other trace gases, J. Geophys. Res. 94, 16417-16421, 1989	Rejected - This is not a history of science essay--which is painful for one of our CLAs (Victor) to admit since he has a degree in History of science and has written widely in the field. Our instructions are to focus heavily on the post AR4 period. And in that period the Velders et al piece is really important because it quantifies the impact of the MP on forcing via regulation of the CFCs and others. No action needed
35557	1	14	27	14	27	The importance of short-lived climate forcers was highlighted in the TAR WGI chapters on atmospheric chemistry, aerosols and RF. This gives the mistaken view that this is new. To reference UNEP, Shindell and Victor is somewhat unbalanced here, and the authors should consider including appropriate historical references.	Rejected - combined with comment 357
35558	1	14	29	14	29	The text should define what "reduced carbon" is either in the text or in a footnote.	Taken in account - revised text to say "incompletely oxidized carbon"
35559	1	14	32	14	32	In this discussion of BC, the recent Bond et al. (2013) "Bounding" paper in J. Geophys. Res. is a critical citation as it is a massive review of BC's warming impact	Accepted - added reference to Bond et al (2013) paper.
35560	1	14	36	14	36	Ramanathan is not the only/first paper on this, see also J.E. Penner, M.J. Prather, I.S.A. Isaksen, J.S. Fuglestvedt, Z. Klimont & D.S. Stevenson (2010) Short-lived uncertainty? Nature Geo., 3(9): 587-588	Accepted - added suggested reference to Penner et al 2010
35561	1	14	36	14	40	"Studies that have.." This long sentence is basically true but has been developed over the past 20 years and is not really creditable alone to Unger's work as the net cooling is a major part the TAR, and AR4 assessment - please reference those chapters, not just a single model result. Also the grammar in line 37 needs to be clarified.	Taken into account - Actually this is three sentences, so isn't too long. Grammar at line 37 is fine--a prepositional phrase sets off the agreement between subject and verb. And Unger et al reference is for the final sentence where we make a specific point about net cooling. These points are intended for people who have selective knowledge about aerosols and will not be aware that we are looking at the big picture. Added cross reference to chapter 7 of IPCC WG1.
29948	1	14	38	14	40	Shipping is a sector that has received much attention for it's net cooling effect on climate, and may me a very relevant example to mention here. (See Berntsen and Fuglestvedt, PNAS, 2008) or Fuglestvedt et al Environ Science & Tech., 43, 2009.	Taken into account - added shipping to example list, as suggested, and added reference to Fuglestvedt

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23221	1	14	38	14	40	Change "biofuel" to biomass. Also this sentence simplifies the complexity of SLCPs (more commonly known as SLRF - short-lived radiative forcers). Suggest use reference: UNEP 2011e Integrated Assessment of Black Carbon and Tropospheric Ozone, Summary for Decision Makers, United Nations Environment Programme and World Meteorological Organization. http://news.sciencemag.org/sciencenow/Integrated%20Assessment%20of%20Black%20Carbon%20low%20res.pdf	Accepted - replaced biofuel with biomass
32390	1	14	11	14	14	Please refer to WGI Ch08 and the corresponding sections therein, for specifics on clouds/aerosols refer to Ch07.	Taken into account - revised sentence and added cross reference to WGI chapter 7
32391	1	14	18	14	18	Please remove placeholder and provide updated references to latest WGI Ch08 sections/figures .	Taken into account - text has been revised.
32392	1	14	36	14	40	Please refer to WGI AR5 Ch08.	Accepted - text revised as suggested
23222	1	15				Move "2010" to lower box above the last 3 column headings "20 years 100 years 500 years" and also give a year for "SAR (Kyoto)".	Taken into account - see response to comment 365. No response needed on how we format the table.
19817	1	15				"SAR" needs defining. In fact it would be useful to have a list of acronyms in addition to the Glossary.	Taken into account - combined with other comment
29949	1	15	1	15	11	Table 1.1 Good overview. Check WGI for updates.	Accepted - we will check the final WGI for updates when available
35563	1	15	1			Listing the GWP share of Global GHG emissions as % is misleading, b/c this table omits several strong warming agents, such as BC and tropospheric O3. Consider including them in this table or revising the far right columns	Rejected - our goal here is just to report for the Kyoto gases BECAUSE we don't have reliable inventories for all the others; we are trying to make a point about the importance of time horizon and GWP choice. Moreover, ozone is really hard to do because it is not directly emitted and it would be meaningless to calculate GWPs for precursors. No further action needed.
35562	1	15	1	15	10	It is not clear if the other F-gases are Kyoto or not - the authors should clarify this point. Also please give the main gases in the Table 1.1 caption or notes. Leaving it vague does a dis-service to the reader and these should be at least specified once because their contribution is very large compared to the listed F gases.	Taken into account - Added notes on NF3 and Other F-gases. Moved caption text on NF3 to note. Reference added to NF3 as added in 2nd KP period. Also added a line in the table above the rows with F-gases and added a subheader "F-gases."
27426	1	15	1	15	1	Spelling out GWP would facilitate the understanding of the panel.	Accepted - revised text to say "Implications of the choice of Global Warming Potential (GWP) for mitigation strategy. "

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20690	1	15	10	15	29	Some dubious statements here. Line 10: are there really multiple viable options? Line 15 if intended to portray absolute decarbonisation. Rebound effects are real (lines 28/29) and the Jevons paradox needs to be treated more seriously throughout the SOD. There is no apparent awareness here or elsewhere of the significance of such concepts as power density; EROI; or 'useful' energy.	Rejected - There is extensive discussion of Jevons (more generally rebound) in the policy chapters of WG3. Our chapter deals with this topic in passing on page 34 with cross refs. We do not have space for more in the chapter.
35564	1	15	12	15	24	This section is a bit misleading - of course the non-CO2 GWPs have uncertainty because CO2 is defined as 1 for all time periods! There is hardly a GWP for CO2 as it appears in the denominator of all other GWPs. SLCPs are SLCFs in WGI, please check (climate forcers), but either way there are extremely grave problems with using these in any protocol and certainly under Kyoto. This discussion should be dropped or heavily caveated. The first paper to demonstrate the SLCPs in this case NOx varied in climate forcing (GWP) by a factor of 10 depending on who emitted them (Wild, O., M. J. Prather, H. Akimoto, Indirect long-term global cooling from NOx emissions, Geophys. Res. Lett., 28, 1719-1722, 2001)- this needs to be brought up as BC is even worse. The only reason Kyoto works is that the gases are long-lived, well mixed in the troposphere and hence does not matter who/where they are emitted. The authors should not even suggest adding BC to Kyoto without a better scientific basis.	Taken into account - Deleted the "for example" clause that is set off in dashes. Of course there is huge variation in GWPs for Nox--it is not a forcing agent but a precursor to ozone. We don't present a GWP for Nox for that reason. We are not suggesting adding BC to Kyoto; we are merely talking about different properties of GHGs and aerosols and thus implications for mitigation strategy.
27427	1	15	12	15	12	The paragraph is biased against GWP, suggesting mitigation of SLCF was favorable. This is however a political decision. Please reformulate in a more balanced way, mentioning the pro /cons of GWP and other metrics. T	Rejected - This is not biased against GWPs. It is accepting GWPs as a concept and then talking about pros/cons of different time horizons and their implications. No further action needed.
29951	1	15	13	15	15	You may cite the First IPCC Assessment Report: 'These three different time horizons are presented as candidates for discussion and should not be considered as having any special significance'. (see page 59).	Taken into account - Added sentence: "Indeed, when GWPs were first presented by IPCC the analysis included the statement that '[t]hese three different time horizons are presented as candidates for discussion and should not be considered as having any special significance'." and added cite to IPCC WG1 first report at p.59.
29952	1	15	19	15	21	Good that you mention uncertainty ranges here. Please, check WGI for updates.	Accepted - we will check WGI for updates
35220	1	15	21	15	24	The climate effect of reducing SLCPs has large uncertainties at present, especially for aerosol including soot. Previous text in P14, Line 36-40 also expresses similar meaning of this. Suggest deleting these two sentences and waiting scientific communities to have a concrete conclusion on such matter.	Taken into account - revised text to say "or other metrics and mitigation strategies may be needed" Rest is accurate and correct. Regarding the other part of the comment, please see response to comments 377 and 375.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31577	1	15	21	15	24	This part prejudices the outcome of the UNFCCC negotiation and should be deleted.	Rejected - We are not prejudging anything. We are drawing out some logical implications of the analysis. No action needed
23223	1	15	23			Use term "black carbon" throughout text instead of "soot" eg also page 17, line 37	Accepted - replace soot with black carbon throughout
35565	1	15	26	15	26	This must refer to Chapter 1 of WG3 (not WG1), since Chapter 1 WG1 did not make this assessment. Please be explicit. Since you discuss that WG3 cannot really assess DAI (article 2) then this "conclusion" should be retracted, not endorsed here. The authors do discuss this later, but this conclusion must be very limited and involve some assumptions on the maximum C emitted (per WG3).	Taken into account - Change "AR4" to "AR4/WG3". Change "concluded" to "found".
35566	1	15	31	15	42	This would be the place to refer to the Royal Society 2009 report, not later on p.34. It was the first paper to set out the approaches you give here.	Rejected - this section has been deleted. Comment no longer relevant
29950	1	15	5	15	5	I suggest deleting "consistent with an approximate 100 year lifetime" since this gives a wrong impression of the behavior of CO2. See chapter 6 (Box 6.2: text and Box 6.2 figure 1) in WG1 and Joos et al. 2003 ACP (www.atmos-chem-phys.net/13/2793/2013/), see figure 1a. Better to explain how much of a pulse that is left in the atmosphere after e.g. 100 yrs, and then 500 yrs.	Taken into account - revised text to say: "removal is BROADLY consistent with a 100 year life time but the real lifetimes of CO2 are much more complicated and varied."
20052	1	15	1		11	Explain which column of "GWP-weighted share of global GHG emission (2010)" is used in this report for clarity.	Taken into account - Added sentence: At present, the 100 year GWPs are used most widely, and we show those values as reported in the IPCC Second Assessment Report (SAR) in 1995 and subsequently used in the Kyoto Protocol.
24551	1	15				This section is valuable and provides important commentary- suggest it should be kept if shortening the chapter	Noted - thank you. No further action needed.
29561	1	15	26	16	42	Given the text that follows, the title of this subsection seems somewhat misleading as there is relatively little information on emission trajectories. Instead the subsection focuses on the disconnect between political ambitions and political actions as well as on different interpretations of Article 2. - In addition, the text on the different high-level international meetings could probably be shortened.	Rejected - Many people wanted text on the high level meetings, so we struck a balance here. Section heading is fine in light of the last paragraph and the cross-refs to section 1.3 which details trajectories. The point here is to tie all that back to Article 2 and thus the int'l diplomacy. No further action needed.
19900	1	16	18	16	18	The BASIC countries have met, but I think not the BRICS countries in relation to climate change policy.	Accepted - changed BRICS to emerging on pg 17, line 17
19901	1	16	18	16	18	The 80% holds for the developed countries, and also indicate compared to 1990 or 2000 levels	Rejected - This comment appears to relate to line 21. But that line is accurate. No further action needed.
35567	1	16	19	16	30	The "broad scientific view" is NOT that 2C above pre-industrial ought to be avoided. In fact, it was AR3 (the famous Burning Embers figure) that stated it was 2C above 1990 levels - not pre-industrial. Several "political" agreements since then have cited 2C above pre-industrial times, but that has not been corroborated by the science.	Taken into account - text has been revised to clarify point on 2C

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20759	1	16	28	16	28	I would add "they will be difficult OR IMPSSIBLE to attain" as it was mentioned earlier that it is virtually certain that the targets of 1 and 1.5 degrees warming are not possible to achieve.	Accepted - text revised as suggested except to say 'extremely difficult' instead of 'impossible'
20691	1	16	28	17	4	Would it not be useful to flag thorium as a potential resource when discussing nuclear?	Noted - I think the page numbers are off because nuclear does not appear where indicated. And in any case we can't mention every aspect of every technology--Thorium is hardly the mainstream viable approach for nuclear. No further action needed.
23224	1	16	29			Strange quoting a 2006 reference when talking about 2009 Copenhagen outcomes. Is this reference essential?	Rejected - the reference doesn't refer to Copenhagen. Copenhagen is mentioned in the sentence that begins on line 24. The reference is at the end of a different sentence (which begins on line 26) that makes a different point. No further action needed.
25298	1	16	35	16	35	It is not clear what is meant by 'Uncertain Probability'.	Taken into account - text revised to say "...owing to the difficulty in assessing the probability of..."
19818	1	16	35			"uncertain probability" should be "low probability"	Taken into account - combined with other comment
19819	1	16	38			"increaseing exponentially" Is it a rapid increase or a gradual one? Both can be exponential.	Rejected - text is fine. The idea is to indicate directionality and the second derivative. No further action needed.
31388	1	16	44	16	44	Please list the six shift that you refer to	Taken into account - lead sentence is revised.
23732	1	16	44	16	44	"These six shifts since AR4". It is necessary to be more clear about them.	Taken into account - text to be revised per team discussion
24552	1	16				This section is valuable and provides important commentary- suggest it should be kept if shortening the chapter	Noted - thank you. No further action needed.
33025	1	16				While mentioning these challenges is useful, it would also be useful to highlight additional challenges in the AR5 process including: 1) the exploration of the entire solutions space; 2) a consistent scenario process across working groups; and 3) the common use of calibrated uncertainty language across working groups - an innovation since the AR4.	Taken into account - Following the team discussion, this section has been revised for clarity

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35568	1	16	43	17	14	This section is rather disappointing. It talks (in a somewhat rambling fashion) about some of the challenges for mitigation policy, but it doesn't really talk about the challenges for this report (which is the heading of the section). Indeed, one of the major challenges for AR5 is to present a clear picture of the successes and failures of mitigation efforts to date, and the challenges for mitigation that lie ahead. That does not come through clearly in this chapter. The nature and extent of future challenges also depends in large part on the degree of mitigation sought. Yet, this introductory chapter, and this section in particular, treats "mitigation" as though it were a single objective—i.e., no clear distinction between challenges for mitigating 5% of GHG emissions vs. mitigating 95% of emissions. Please focus the discussion on the value added of AR5. Too much of the Chapter 1 text is general statements and platitudes that could have been written long ago.	Taken into account - Following the team discussion, this section has been revised for clarity
23697	1	16	44	16	47	This sentence is unclear. Can it be simplified?	Taken into account - this section has been revised per team discussion
29693	1	16 of 48	38		42	REPLACE: Geoengineering schemes to alter the planet's radiation balance have attracted particular attention because they have potentially high leverage on climate, creating as well possibly many risks that are difficult if not impossible to forecast and raising many challenges for the design of effective regulatory mechanisms (Rickels et al. 2011; Gardiner 2010; IPCC 2012; Keith, Parson, and Morgan 2010) WITH: Because they have theoretically high leverage on climate, geoengineering schemes to alter the planet's radiation balance have attracted particular attention; however, because they also create many risks that are difficult if not impossible to forecast, only a small number of scientists have considered them seriously (Rickels et al. 2011; Gardiner 2010; IPCC 2012; Keith, Parson, and Morgan 2010).	Accepted - text revised as suggested. Author's edit to sentence: "small but growing number of scientists..."
22299	1	17	17	17	18	The sentence "Notably there has been a large shift industrial economic activity toward the BRICS countries - especially China - that has affected those nations' emission patterns" should be reworded in order to focus not only on the BRICS but also on developed countries. The rewording should be as follows: "At the same time as developed countries continue to have a dominant share in global economic activity, despite the world financial crisis, and to contribute a large share of global emissions, there has also been a large shift in industrial economic activity toward the BRICS countries - especially China - that has affected those nations' emission patterns." REFERENCE TO WDR 2012 INDICATORS FOR HIGH INCOME OECD	Taken into account - "At the same time, emissions across the industrialized world are largely unchanged from previous levels." Deleted sentences from line 21-28
31578	1	17	18	17	18	This sentence highlights the speciality of China, it is suggested to delete the wording "especially China"	Rejected - the reality is that the vast majority of this rise in emissions is from China and we would like to state that fact here. No action needed.
23225	1	17	20			"... renewable energy technologies." Delete "eg biofuels and wind". No need.	Accepted - text revised as suggested
35570	1	17	23	17	25	Perhaps the most recognizable example here would be ground-level ozone formation (smog) that has recently been reaching record levels in Asian countries, creating concern about local/near-term health impacts, and making international headlines. As efforts ramp up to mitigate the immediate health threats of smog in these scenarios, a climate "co-benefit" would also be realized through the reduction of NOx emissions.	Taken into account - text has been deleted so suggested change is no longer relevant
30735	1	17	24	17	24	Suggest adding "and health" in the middle of "environmental ills". Should read: "linked to many local environmental and health ills and thus the local benefits..."	Taken into account - text has been deleted so suggested change is no longer relevant

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31389	1	17	25	17	28	Please explain "C40"	Taken into account - text has been deleted so suggested change is no longer relevant
21573	1	17	25	17	28	The role of state-level actions in the US (e.g. California) and Canada (e.g. Quebec) could also be mentioned here and more could be said about actions taken outside the UN negotiations. In particular, actions taken by cities and businesses are important.	Taken into account - text has been deleted so suggested change is no longer relevant
35571	1	17	25	17	25	The authors can - and probably should - note here that the RCPs used in AR5 adopt fairly stringent air pollution controls, much more than the AR4's SRES (van Vuuren et al 2011 ClimCh, and the AR5 WG1 chapters 1 & 11.	Taken into account - text has been deleted so suggested change is no longer relevant
35572	1	17	30	17	30	What is missing here is the WG1- WG3 link and validation of the WG3 models for emissions - do they actually reproduce the past 30 yr of observed GHG? It may be too late to do this, but it seems like an important gap in this WG3 assessment. Such variations in the anthropogenic emissions of CO2 and CH4 could be tested against atmospheric observations. With only CO2-eq (which is more important for climate), the reader loses the connection to the real world and checks on the major GHG.	Noted - comment redirected to chapter 5&6 teams
35573	1	17	32	17	32	While it's completely understandable why the focus is on "direct greenhouse gases", it at least warrants highlighting that this excludes the impact of important warming agents such as tropospheric ozone and black carbon.	Rejected - See lines 37-38 for an explanation of why we don't do that. Text revised to include Tropospheric ozone precursors in the list of GHGs we don't examine here
19902	1	17	37	17	28	Do you use the GWP values of the IPCC AR4 or IPCC SAR?	Accepted - edited text to indicate that values are taken from SAR
35574	1	17	37	17	37	Include "tropospheric ozone" in this list of warming agents that are not examined here.	Accepted - not quite because of the precursor issue. Text revised as suggested, and per comment 414
35575	1	17	38	17	38	You have also omitted some obvious SLCPs with known and well established GWPs such as NOx and CO and VOCs - these have comparable data, but like aerosols (and BC), their GWP depends on where and when they are emitted and so cannot be so easily summed into CO2-eq. This basic knowledge is from the TAR, Wild et al (2001) and then the AR4. This is an important distinction since it is not because of lack of comparable data alone that you should not include these. The authors should consider revising /adding to the text accordingly.	Taken into account - combined with other comments
35569	1	17	4	17	7	The growing recognition of the influence of non-CO2 warming agents is commendable. As such, mention/discussion of the Climate and Clean Air Coalition (CCAC) is warranted, esp since it is new since AR4.	Taken into account - we added text to mention CCAC in section 1.2.1.4 where we discuss institutions that are addressing climate change mitigation. Mention of CCAC does not fit here.
20858	1	17	9	17	11	As mentioned above(No.18), 1.5 or 2 degrees celsius aren't agreed targets. However this text focuses on them, and it may mislead readers to thought that these targets have been already agreed. This text should be deleted.	Rejected - We discuss them because they are "widely discussed goals". That is widely known. No further action needed.
25673	1	17	9	17	11	This part should explain unlimited evaluation results because it is prejudicial and misleading to put an emphasis on limited scenarios of 2°C. IPCC should be policy-neutral and should have responsibility to indicate unlimited evaluation results, as described in Table 6.1. The 2C target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract). These literatures are listed in the No4 line of this table.	Rejected - We discuss them because they are "widely discussed goals". That is widely known. No further action needed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33030	1	17				It's surprising that this section does not have a more intimate link to Chapter 5. The connection/referencing to the discussions in that chapter could be strengthened.	Accepted - will cross check with ch 5 final text
23045	1	17	16	17	17	Mitigation as discussed here is only relevant to the Industrialised nations while adaptation is a priority for the Developing countries. These two need to be given the prominence they deserve with respect to the relevant countries/regions though it is noted that adaptation is shallowly mentioned in section 1.4.5 of this chapter!	Rejected - no further action needed. The chapter is about mitigation and adaptation is referred to, but it cannot be center stage. We already emphasized the importance of adaptation in 1.4.5
29768	1	17	27	17	27	"C40", better write the full name "if investors and users are not confident that needed policy and market support will not be reliable. Innovations	Accepted - but text deleted per comment 405
23046	1	17	30	17	30	EDGAR data set needs to be explained or described since it looks as an acronym in this text	Rejected - This is addressed in the annex and in the citations and does not need to be handled in text. No further action needed.
23227	1	18				Panel A. Transport 13% doesn't add to Other 4% and Road 10%.	Taken into account - figures have been revised and the rounding errors have been corrected
27428	1	18				Figure 1.3: Please add Panel A and B to the SPM! Information on sector emissions is currently missing.	Noted - redirected comment to SPM team.
19820	1	18				Top right pie. Why use a + sign. Surely all the %s are +	Editorial - copyedit to be completed prior to publication
34495	1	18	1	18	17	The figure in Panel A has to be modified so that it is more clear. The current color scheme and the font is confusing	Editorial - copyedit to be completed prior to publication
33027	1	18	11	18	16	Caption: the lines highlighted could be replaced by a simple reference to Annex II that contains a comprehensive list of emissions categories.	Rejected - have added this detail so that non-expert readers will understand what we are saying. We expect this will be a widely viewed figure and thus it must be clear, on one page, what it shows. No further action needed.
35576	1	18	15	18	15	Do the authors mean "AFOLU" and not just "FOLU"? Also there is considerable uncertainty in AFOLU sources - is this uncertainty portrayed fairly?	Accepted text revision to AFOLU. We are reporting the central estimates from one data set (which we cite and which the IPCC has decided to use as its central data set). Other chapters--including the whole chapter on AFOLU--deal with measurement issues in detail.
23226	1	18	5			Add a cross reference to Chapters 7-11 here.	Accepted - cross reference to chapters added as suggested
30736	1	18	7	18	7	This figure is described as "emissions by gas", but the figure itself has three separate values for CO2. The current design is not intuitive for the reader. Suggest including these all as one colour with dotted lines denoting the various sources, or as three shades of one colour.	Taken into account - comment redirected for figure revision
23803	1	19				Transport sector contribution add up to 14% and not 13% as noted.	Taken into account - this was a matter of rounding; figure have been revised and rounding errors corrected

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19145	1	19				I assume that the GHG emissions in panel A for AFOLU are many because of land use changes (forestry to agriculture), but what are the GHG emission of AFOLU in the energy sector?	Noted - Writing team presumes the reviewer refers to fuel use for tractors, etc., and heating for greenhouse horticulture. These are indeed included in the AFOLU sector, for which Ch. 11 will provide more details and answers the question.
23229	1	19				Panel C - could merge with current Fig 1.4.	Rejected - Panel C presents quite different info and works well with the other two panels. If we merge it with figure 1.4 then that makes figure 1.4 too complicated.
23228	1	19	1	19	6	Text doesn't seem to match Fig 1.3	Taken into account - % for energy production/use sectors and for agriculture changed to 66% and 13% as in fig. 1.3(a).
22300	1	19	12	19	13	The references to "Annex B" in this text should be clarified. Does this refer to "Annex B" of the Kyoto Protocol? If so, it should be so stated, and it should also be clarified whether it includes the US and Canada (which are both not Parties to the Kyoto Protocol).	Taken into account - text regarding Annex B has been clarified throughout the chapter
19903	1	19	15	19	16	The greenhouse gas emissions from Annex I countries are about 2.5 times as high in 2010, using the recent EDGAR data. The number 6 seems very high. The inclusion of non-CO2 gases and LULUCF sources makes a major difference in the outcome. There is no analytical basis to exclude any gases or sources, incl. LULUCF. Please check, and present the numbers including all sources and gases	Taken into account - the text has been revised to say 2.5 times larger, and we've checked for consistency throughout this chapter; also figure is to be revised for clarity
35580	1	19	15	19	15	"developed world (Annex B) ..."? The authors should be explicit as to who was included in this.	Rejected - The previous paragraph, in detail, plus the caption to figure 1.4 explain what this is about. Figure pending revision per team discussion topic I. No action needed.
27429	1	19	15	19	20	Overall, per-capita emissions in the developed world are roughly flat over time and remain in average about six times larger than those from developing countries, although the latter have been rising steadily for the last decade. There is huge variation within these categories as some very low income countries have extremely low per-capita emissions while some developing countries have per-capita emissions comparable with those of some industrialized nations. All seven countries with the highest per capita emissions are now developing countries (non-annex-b), and a number of developed countries have lower per capita emissions than some of the leading developing countries.	Taken into account - this paragraph has been revised; text added to say "moreover a number of developed countries now have lower per capita emissions than some of the leading developing countries. "

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27430	1	19	15	19	20	<p>While it is right that per capita emissions of least developed countries are considerable lower than those of developed countries, it is no longer true that per capita contributions of developing countries are generally higher than from industrialised countries. As a general statement this is only true for least developed countries. See http://data.worldbank.org/indicator/EN.ATM.CO2E.PC: The average per capita emissions of OECD countries were 9.98023812 t in 2009. 24 countries worldwide have higher per capita emissions than this OECD-average. Please see the numbers on 2009 per capita emissions as listed by the World Bank in "CO2 emissions (metric tons per capita)".</p> <p>Applying the definitions of the Kyoto Protocol, only eight developed countries / Annex B countries (Luxemburg, Australia, USA, Canada, Estonia, Russian Federation, Czech Republic , Netherlands) but 16 developing countries (Non Annex B) are among those countries with most per capita emissions. All seven countries with highest per capita emissions are developing countries: Qatar, 44.02 t; Trinidad and Tobago, 35.75 t; Kuwait, 30.30 t; Brunei Darussalam, 23.68 t; United Arab Emirates, 22.60 t; Aruba, 21.53 t; Bahrain, 20.70 t. Only one J12developed country has more than 20 t per capita emissions: Luxemburg, 20,37t.</p> <p>Also, some of the BASIC countries have now per capita emissions in the range of those of industrialised countries: Per capita emissions of China were 5.77 t in 2009. A number of developed countries had lower per capita emissions: France, 5.61 t; Hungary, 4.86 t; Latvia 2.95 t; Portugal, 5.40 t; Romania, 3.70 t; Sweden, 4.70 t; Switzerland, 5.37 t;</p> <p>Per capita emissions of South Africa were 10.12 t in 2009. Again, a number of developed countries had lower per capita emissions: Austria, 7.45 t; Belgium, 9.60 t; Bulgaria, 5.6 t, Croatia, 4.86 t; Cyprus 7.51 t; Denmark 8.27 t; Finland 10.03 t; France, 5.61 t; Germany 8.97 t; Greece 8.14 t; Hungary, 4.86 t; Iceland, 6.37 t; Ireland 9.33 t; Italy, 6.66 t; Japan, 8.63 t; Norway 9.75; Poland 7.83 t; Portugal, 5.40 t; Romania, 3.70 t; Serbia, 6.31 t; Slovak Republic, 6.25 t; Slovenia, 7.50 t; Spain, 6.72 t; Sweden, 4.70 t; Switzerland, 5.7 t;United Kingdom, 7.7 t.</p> <p>These facts show that the general claim that developing countries' per capita emissions "remain considerably lower" than those of industrialised countries is no longer valid.</p>	<p>Taken into account - The WB quoted only refers to CO2 from FF+cement, thus incomplete. However, point taken, in lines 15-16 added: "on average" and considering adding a line cf. comment Ch1 ID 440, e.g. "a number of developed countries now have lower per capita emissions than some of the leading developing countries"</p>
35581	1	19	16	19	18	<p>It is important to show the uncertainty here, perhaps even as the spread across countries. Could the authors put whiskers for some time (eg, 2000) to estimate this?</p>	<p>Taken into account - paragraph text has been revised</p>
35577	1	19	2	19	2	<p>These %s reflect the emissions #s in Fig. 1.3; but they are inconsistent with the warming %s listed in Table 1.1, which states that CO2 is 73% (not 76%) and CH4 is 20% (not 16%). Please clarify what these percentages reflect. Perhaps it is the invocation of Table 1.1 in line 1 that is confusing.</p>	<p>Accepted - The confusion was caused by the last 3 columns of table 1.1 missing a reference to AR5 (WG I). Added this reference in Table 1.1 and to UN Clim Conv and KP in p. 19, line 1.</p>
23230	1	19	21	19	22	<p>Think AFOLU and industry have higher emissions than transport which don't "dominate" - see Fig 1.3. And need a reference to show elec emissions have tripled since 1970 - really? Fig 8.1.1 shows 2.8 t to 7.0 t in 2010.</p>	<p>Rejected - This sentence refers to the trend at global level, not to the present shares. So no action required. However, reference added to figures 7.3 and 8.1.1 and made clear the first part refers to the power sector.</p>

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35583	1	19	21	19	21	The % used in this section are relevant, but when the absolute amounts differ by so much one gets a misleading picture of the importance to climate - can an absolute numbers be used (in ())?	Rejected - We have absolute numbers in many other places. It is useful to look at both percents and absolutes. No further action needed.
35582	1	19	21	19	22	Can we make this assertion with certainty given the 50% uncertainty on LULUCF emissions and 25+% uncertainties associated with non-CO2 emissions inventories?	Taken into account - the uncertainty language throughout the chapter is revised and should resolve this issue
23231	1	19	24	19	25	See Fig 8.1.3. And reword	Taken into account - Reference to figure 7.3 and 8.1.3 added, and to fig. 1.3.a
23232	1	19	27	19	29	Delete- just repeats Fig. 1.3 data	Taken into account - Suggestion adopted; added "Direct emissions from".
35584	1	19	27	19	27	The AFOLU numbers have huge uncertainties - 25% for CH4 at least and 50% for N2O, plus ? for CO2 - can the authors at least indicate this as it may affect the relative importance of the sources.	Taken into account - we added reference to figure 1.3.a for more details on AFOLU
19821	1	19	27			AFOLU needs defining and adding to an acronym list	Accepted - AFOLU will be defined in the glossary; it's also now defined in the caption and the first occurrence in main text
24553	1	19	29	19	29	Figures are unclear. For example, buildings are responsible for an additional 14% of total emissions due to their electricity use. Suggest specify that these figures are for direct emissions only (e.g. "The direct emissions from the transport and buildings sectors...") to avoid confusion	Accepted - added "Direct emissions from".
31390	1	19	30	19	31	This text seems to relate to a given study. Please reflect this in this sentence. Generally, forest related GHG emissions are more due to land use change, deforestation and forest degradation. Sustainable forestry will also contribute to emissions, but due to photosynthesis such emissions will be temporal.	Taken into account - discussion on AFOLU is revised
21066	1	19	30	19	34	Please clarify how emissions from harvest and other stock changes in forests were included in emission estimation, how forest degradation and deforestation (land use-change) were assessed and accounted for. Only attributing emissions to burning or decomposition of biomass must be sustained by respective references and should show other numbers than given here.	Taken into account - discussion on AFOLU is revised
35585	1	19	35	19	35	There are a series of papers on national attribution that evaluated uncertainties, including for CH4 and N2O - they should probably be mentioned/used: Hohne, 2011(already in refs); Ito, A., Penner, J. E., Prather, M. J., de Campos, C. P., Houghton, R. A., Kato, T., Jain, A. K., Yang, X., Hurtt, G. C., Frolking, S., Fearon, M. G., Chini, L. P., Wang, A., Price, D. T. (2008), Can we reconcile differences in estimates of carbon fluxes from land-use change and forestry for the 1990s?, Atmos. Chem. Phys., 8: 3291-3310; Prather, M.J., J. E. Penner, J. S. Fuglestvedt, A. Kurosawa, J. A. Lowe, N. Höhne, A. K. Jain, N. Andronova, L. Pinguelli, C. Pires de Campos, S.C.B. Raper, R. B. Skeie, P. A. Stott, J. van Aardenne, F. Wagner (2009), Tracking uncertainties in the causal chain from human activities to climate change, Geophys. Res. Lett., 36, L05707. [doi:10.1029/2008GL036474].	Taken into account - paragraph on uncertainties has been revised and further citations added.
35578	1	19	4	19	4	This does not mention the AFOLU or LUCF sources of CO2 which are a major source and very uncertain.	Taken into account - text has been revised and a new paragraph added to further discuss uncertainties including around AFOLU
35579	1	19	4	19	4	"include NET CO2 from biomass..." the primary CO2 is recycled bio and not a source, all of this depends as noted on loss from soils etc. versus the regrowth of the forest (huge sink). Please amend the text to reflect this.	Taken into account - the section on uncertainties has been revised.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35221	1	19	6	19	6	This paragraph discusses emissions by sectors instead of by regions. It does not change the meaning of this paragraph by removing the latter part of the content in the parentheses. It is suggested to remove "of which half originated in China".	Accepted - text deleted as suggested
31579	1	19	6	19	6	This sentence over-highlights China, it is suggested to delete the wording "of which half originated in China"	Accepted - text deleted as suggested
29770	1	19	1	20	11	Emission figures of non-Annex I countries, non-Annex B countries, Annex B countries. Please indicate what the difference among the two groups of countries. And for Annex B countries, please clearly indicated that developed countries that were not part of Kyoto Protocol, like US, is included in the numbers or not.	Taken into account - text edited to refer to glossary and figure 1.4 for definition. Figure will be revised per team discussion I
20054	1	19	15		16	"four times" in SPM (p.4 line 22) instead of "six times"!??	Accepted -text checked and updated to be consistent with p. 4 to say "two and a half times"
20053	1	19	2		6	Make the numbers consistent with Figure 1.3 (p.18).	Accepted - % for energy production/use sectors and for agriculture changed to 66% and 13% as in fig. 1.3(a).
30737	1	20				For the legend of this figure, suggest ordering the items according to where they fall in the figure, particularly the four time periods	Taken into account - all figures have been revised.
19141	1	20				This figure shows that there is considerable potentio in the AFOLU sector at up to \$100t/CO2-equ. Yet the next paragraph plays this down!	Noted - redirected comment to SPM team
23585	1	20				Are the vertical axis CO2 or CO2 eq.? The answer is probably not the same for the three panels	Taken into account - all figures have been revised. The issue of CO2 or CO2e will be clarified
33028	1	20				For purposes of comparability, it may be useful to use the same region definitions in the top panel and in the bottom panels. I.e. consistently apply developing/industrialized countries OR annex B/Non-Annex B.	Taken into account - all figures have been revised.
22301	1	20		20		The references to "Annex B" in this text should be clarified. Does this refer to "Annex B" of the Kyoto Protocol? If so, it should be so stated, and it should also be clarified whether it includes the US and Canada (which are both not Parties to the Kyoto Protocol).	Taken into account - all figures have been revised.
22302	1	20		20		The country groupings contained in this Figure 1.4 in which G-20 membership is used as a grouping criterion are not consistent with the traditional country groupings used by IPCC (which are either UNFCCC Annex I (e.g. OECD 1990 countries and Economies in Transition) and non-Annex I (e.g. Asia, Middle East and Africa (MAF or AFM), Latin America (LAM)) countries). Figure 1.4 should be changed in order to reflect the traditional IPCC country categories or groupings rather than create new ones which are not even recognized as such in the UNFCCC regime. Providing for consistent country groupings within and across chapters will also allow for more scientifically rigorous comparability among country groupings. Figure 1.4 should be replaced, instead, by Figure 5.2.1 from Chapter 5, as Figure 5.2.1 is consistent with traditional IPCC practice in relation to country groupings.	Rejected - These categories are approved by TSU. No further action needed.
27432	1	20	1	20	1	Title of the vertical axis: please add CO2eq in the brackets (Gt CO2eq/yr); legend: Please put the symbols for the periods of economic recessions in a chronological order; in the figure: the last change in global GHG emissions of 1,6%/yr. starts 2008, but has no ending. Since the timeline ends at 2010, you might add 2010, or explain, why this period has no ending. See also our comments in the SPM and TS on this figure	Taken into account - all figures have been revised.
27431	1	20	1	20	2	The different country groups should be made clearer through brighter coloring.	Taken into account - All figures will be redrawn and we will ensure that country groupings are clear with appropriate colors.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27433	1	20	1	20	2	This is a very good and illustrative figure, but see our comments on the choice of regions.	Noted. Thank you
35586	1	20	2			There are several issues with these figures: (1) It needs to be stated very clearly in the caption and in the plots and in their axes that these are only energy CO2 and, therefore, only reflect 60% of global GHG; (2) It should be highlighted that the change since 1970 is driven almost entirely by "DC-G20"; (3) The inconsistent use of country groupings can be quite confusing. At least have a footnote or annex stating which countries are in which categories (or a reference to the AnnexII where they are defined); (4) Why is per capita metric used in panel (b) - why not per GDP or per km^2? or per...? Per capita is no better (or worse) than other metrics and selecting one to the exclusion of all others tells a skewed story, especially since virtually no resource on Earth is distributed on a per capita basis. Additionally, this does not appear to be consistent with Chapter 5.	Taken into account - all figures have been revised.
19142	1	20	23	21	2	This paragraphs talks about considerable potential and risks. The potential is given as 15-225 EJ/yr. However, the energy chapter (7) gives the present biomass energy consumption as 54 EJ/yr and the maximum potential as 500 EJ/yr, one quarter of the NPP (2ZJ). I don't know why sustainable livelihoods are mentioned as a constraint? There is sufficient NPP to more than meet the maximum potential, especially if the rural population is encouraged to use improved varieties of annual and perennial plants on various land-use types to enhance productivity. They should welcome it.	Noted - No caption here. Comment does not refer to Ch. 1 but probably refers to Ch. 7 (energy) or Ch. 11 (AFOLU)
27382	1	20	36		38	BRICS is not a group in the context of climate change negotiations. In the context of climate change negotiations, BASIC (Brazil, South Africa, India and China) is the correct group.	Taken into account - text has been revised per other comments
33960	1	21	15			"LCD" is "LDC"	Accepted - text corrected
25299	1	21	35	21	35	Consider dropping the statement: "For LDCs, avoiding future emissions in pursuit of their development goals is critical" . The statement is prescriptive and is not supported by any scientific reference.	Accepted - text revised as suggested. Also "must" is removed from following sentence
22303	1	21	35	21	35	The sentence "For LDCs, avoiding future emissions in pursuit of their development goals is critical" is not supported by any reference. Furthermore, such a categorical statement is not necessarily true nor reflect scientific consensus. It certainly does not reflect the multilateral treaty consensus reflected in the 3rd preamble paragraph of the UNFCCC which states, in part, "that per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow to meet their social and development needs." The sentence should instead be reworded more neutrally as follows: "For LDCs, minimizing or reducing the rate of growth of their future emissions while ensuring the effective pursuit of their development goals is critical." Such a formulation will reflect more accurately the likelihood that LDC emissions will either have to rise or continue to rise depending on the economic development pathway that they choose to take, and that the challenge for LDCs (as well as other developing countries) is not how to avoid such emissions but rather to minimize the growth of emissions.	Taken into account - combined with other comments, text has been deleted
29769	1	21	8	21	12	The per capita GDP in USD is based on PPP or exchange rate, and for which year?	Rejected - the number represents a three year average of GNI.
33029	1	21				This box may be better placed in 1.4 as its focus is more on decoupling emissions and embedding mitigation actions in SD goals than on emission trends of those countries.	Taken into account - Box placement will be done at production. No further action needed

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20692	1	21	42	22	26	This Section is superficial. Responses to precautionary measures are in part reflective of the quality of those measures. Placing wind turbines where there is little wind; solar panels where there is little Sun; power plants burning palm oil thousands of miles from where tropical forest has been destroyed, etc, reinforces biases towards the status quo as well as engendering opposition - as does the perceived self-interest (greed) of many developers of such sub-optimal schemes. By contrast, under the UK system, 125 metre high turbines can be placed by law a mere 350 metres from residential homes - without any compensation, or formal recognition that aerodynamic modulation can affect sleeping patterns and health for some people at a distance of up to 1.5 kms. This section needs to be written by someone who actually understands the problem from the grassroots up.	Noted - comment redirected to SPM team
19144	1	22				Chapter 1 comments start here. I cannot understand the GHG emissions in the non-AFOLD sectors for biomass especially the energy sector. The various sectors should be explained	Rejected - The sectors are explained in the text with other figures (e.g., 1.3) offering more breakdowns and cross-references to sector chapters in the main report. No further action needed.
22304	1	22				The country groupings contained in this Figure 1.5 in which G-20 membership is used as a grouping criterion are not consistent with the traditional country groupings used by IPCC (which are either UNFCCC Annex I (e.g. OECD 1990 countries and Economies in Transition) and non-Annex I (e.g. Asia, Middle East and Africa (MAF or AFM), Latin America (LAM)) countries). Figure 1.5 should be changed in order to reflect the traditional IPCC country categories or groupings rather than create new ones which are not even recognized as such in the UNFCCC regime. Providing for consistent country groupings within and across chapters will also allow for more scientifically rigorous comparability among country groupings. Otherwise, the entire Figure 1.5 should be deleted.	Rejected - TSU approved these categories.
35587	1	22	1	22	10	There is no mention of the macro-scale challenges / inefficiencies /barriers to effectively implementation at the highest levels of decisionmaking. Such a discussions is warranted in the text.	Rejected - This box is illustrative; it can't cover everything, and if we focus on high level decision making failures of LDCs people will rightly say that related failures apply to other kinds of countries. No further action needed.
23584	1	22	13	22	12	Rather than referring to figure 1,1 caption, repeating the relevant information and expliciting INT TRA which does not appear in figure 1.1 would more convenient for the reader	Taken into account - figure and caption has been revised
35588	1	22	20	22	20	The text around Figure 1.5 (and the figure itself) is very useful, however it is important not to skip the 1980s decade - please include. Also, are these decadal averages? or single year? Also, this is the time to give breakdowns by gas if possible (could be in appendix or tabulated elsewhere), so that it can be checked against WG1 budgets and atmospheric observations.	Taken into account - figure has been revised for clarity
25300	1	22	24	22	25	The statement: "the sustained economic growth in the emerging economies has fuelled continued growth in world emissions since then" needs rephrasing. The statement gives an incorrect impression about the present and historical contribution of developing countries to the stock of emissions. The rephrasing should include the data about the historical per capita emissions of nations.	Rejected - The statement is exactly correct. It refers to emissions, not the stock. And when you look at the decomposition (see the next page) it is clear that the single largest driver is economic growth. No further action needed

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22305	1	22	24	22	25	The phrase "the sustained economic growth in the emerging economies has fuelled continued growth in world emissions since then" presents an incomplete portrayal of the contributors to global emissions growth and contradicts the presentation of the data in Figures 1.4 and 1.5. It should instead be rephrased as: "the economic growth in developing countries contributed to continued growth in world emissions even as emissions from developed countries also continued to play a major share in world emissions since then."	Rejected - The statement is exactly correct. It refers to emissions, not the stock. And when you look at the decomposition (see the next page) it is clear that the single largest driver is economic growth. No further action needed
40546	1	22	25	22	28	Developing countries of G20 (G20-DC) have higher GDP and also GHG emissions. They can be classified as emerging, intermediate states between developed and developing countries. Therefore, categorization of these countries is better not to be simply classified as non-annex B, (such as found in Fig.1.4. bottom). In this regard, classification in Fig1.4. upper picture, (i.e., Developing countries in G20), seems to be very reasonable. Because G20 covers every developing countries counted as top 29 of GDP with minimum exceptions (Taiwan and [????]).	Noted - Thank you--that was our intention. No further action needed.
22306	1	22	26	22	27	The phrase "the developing countries that are members of the G20 - such as China and India - continued to grow despite the world economic crisis", while literally true, presents an incomplete picture that renders it inaccurate. As Figure 1.1 on page 8 in fact shows, the growth of developing countries (whether in the G20 or not) rose and fell virtually in tandem with the rise and fall of the growth rates of developed countries (albeit the rates of growth were higher in developing countries). In order to be accurate, the phrase should be reworded as follows: "despite the great volatility in the growth rates of developing countries as a result of the world economic crisis and the economic difficulties in developed countries, the developing countries generally sustained positive growth rates"	Rejected - The original text is accurate, clearer and shorter than the proposed revision. No further action needed.
23586	1	22	29	22	29	CO2 should be inserted between "the trends in" and "emissions", isn't ?	Accepted - CO2 inserted as suggested
35589	1	22	29	22	29	The Kaya decomposition is carefully explained, but what is not explained is that this is truly arbitrary in that it depends on the linear independence of the choice of driving "factors" - different selections of such factors or overlapping trends in two of them would produce indeterminate results ?	Taken into account - discussion on Kaya identity has been revised for clarity
35590	1	22	30	22	30	This statement should start by saying, "ONE WAY TO DECOMPOSE THE FACTORS CONTRIBUTING TO total emissions is ..." As is, the text makes it sound like the Kaya identity is the lone way of decomposing the factors that drive emissions.	Accepted - text revised as suggested
35591	1	22	38	22	38	There is a far more important reason why you cannot compare soot and aerosols - it is impossible to convert to CO2-eq without careful analysis of where and when emitted.	Noted - This comment does not apply to indicated text since line 38 doesn't exist on page 22. In any case, the difficulties of doing CO2eq calculations is addressed in detail elsewhere in the chapter and special new wording is added to address precursor and locational pollutants.
29958	1	22	4	22	6	A useful reference in this context is also Ekholm,, Ghodusshi, Krey, Riahi, The Effect of Financial Constraints on Energy-Climata Scenarios, Energy Policy, forthcoming	Rejected - This portion of the text is focused on LDCs. Proposed reference does not seem to be germane. No further action needed.
20693	1	22	28	23	26	Such are the importance of embedded emissions that they should be covered here.	Noted - comment redirected to SPM team

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23233	1	23				No C intensity reduction showing for 2001-2010. Need to check if this section overlaps with Ch 5 - not cross-referenced	Rejected - That's because carbon intensity rises (see the top of the 2001-2010 bar. Chapter 5 is cross-referenced (see lines 18-19). No further action needed.
20843	1	23	11	23	12	The carbon intensity of energy of highly industrialized world owes to not only natural gas and renewables but also nuclear energy. "to natural gas and also to renewables" should be amended into "to natural gas, renewables and also to nuclear".	Accepted - added nuclear
25608	1	23	11	23	12	See comment No.1.	Noted, no action needed
21574	1	23	12	23	14	The statement that the 40-year pattern of emissions is strictly related to growth is not true in the advanced economies. It would be worth mentioning this year, as the current text suggests that the only way out of high emissions grown is low economic growth, which is clearly not the case in rich countries.	Rejected - This sentence is correct. In fact, the first half of the sentence talks about things that can decouple.
25301	1	23	15	23	19	The statement about the comparability of developing countries of G20 (which includes India) with North American carbon and energy intensity in 1980s needs to mention whether the GDP is measured in MER or PPP. No reference is provided for the statement: 'It may be expected that they will follow similar trends as these countries in the future'.	Taken into account - sentence has been revised
22307	1	23	15	23	17	This sentence presents an incomplete comparative picture between so-called emerging economics and North America in the 1980s. It should also present per capita income levels. In this regard, it should be reworded as follows: "In the large emerging economies, while today's levels of carbon intensity and energy intensity are comparable with those of North America in the early 1980s (IEA, 2012b), the 2010 average per capita income levels of these emerging economies are approximately 30% or less of the per capita income levels of OECD countries in 1980." The wide divergence in per capita income levels between developed and developing countries can be seen in, for example, http://www.inequalitywatch.eu/spip.php?article102	Taken into account - text revised
35592	1	23	9	23	9	The text and figure (1.6) are a little confusing b/c the text reads that there is a "slight recarbonization" in the most recent decade, but there appears to be a massive change in carbon intensity (from a slightly negative change to a slight positive change, coupled with a very large change in GDP per capita that have driven the sea change - and indeed, reversed the trend (in looking at black triangles) from the previous 3 decades. The authors should revise the text and / or figure accordingly.	Rejected - The term "slight" is correct. It is really important not to over-state the trend in the last decade. This happened at a period of massive re-intensification of the Chinese (and other) economy. That, along with lots of coal, created recarbonization. But nobody expected that would happen back in 2000--it just happened. And now we need to be careful not to imply that this is some big change that is permanent. No further action needed.
25302	1	24	1	27	43	The six perspectives of mitigation are not exhaustive of the literature. The key perspectives such as 'capacity to pay' and 'CBDR and leadership of industrialized countries' (as in UNFCCC, Article 3.1) should be included.	Taken into account - a number of the perspective paragraphs (2nd, 4th) have been revised to be more inclusive.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40547	1	24	1	27	13	<p>About the figure 1.7 panel A of cumulative emissions of greenhouse gases, Match Project presented datasets of CO2 including LUCF, CH4 and N2O(Hoehne et al., 2011). As it has already been written in the text, CO2 including LUCF, CH4 and N2O have some uncertainty, but the cause of global warming is not limited to CO2 from fossil fuel. So, the outcome of match project which include LUCF, CH4 and N2O should be mentioned additionally in the figure as well, describing about the uncertainty of these data, which is more objective.</p> <p>Reference Höhne N., H. Blum, J. Fuglestvedt, R.B. Skeie, A. Kurosawa, G. Hu, J. Lowe, L. Gohar, B. Matthews, 7 A.C. Nioac de Salles, and C. Ellermann (2011). Contributions of Individual Countries' Emissions to Climate Change and Their Uncertainty. Climatic Change 106, 359–391.</p>	Taken into account - text added on uncertainty that deals with panel A. Figures revised per team discussion I
33031	1	24	10	24	19	Please make sure that these numbers on shares of primary energy match those presented in Chapter 7 for RE, nuclear and fossil fuels.	Taken into account - we will check for consistency with Chapter 7. The cross reference was corrected to reference ch 7
20844	1	24	2	24	3	Good text. It is difficult to change the energy system. Despite this difficulty, there are many opinions saying that it is easy to change it. In order to have readers recognize energy system correctly, this text should be kept.	Noted, thank you. No action needed
30738	1	24	25	24	28	The description in these lines does not seem to match the figure (i.e., EU countries are shown separately in the figure).	Taken into account - all figures and corresponding captions and text to be revised for clarity
35594	1	24	25	24	26	To state that this figure illustrates "total" emissions is false. It illustrates 60% of emissions as it is only for energy CO2.	Taken into account - co2-e is clarified through the the text
23235	1	24	26			Better to say "Ten countries account for about 70%...."	Accepted - deleted 'about'
20760	1	24	29	24	29	I recommend to add "climate CHANGE problem", as climate alone is not a problem.	Accepted - inserted 'change'
35595	1	24	29	24	42	<p>This attribution of cumulative GHG emissions and thus "climate responsibility" was evaluated by an international team of experts initiated under the UNFCCC Secretariat, their work was more than just compilation and evaluated the scientific underpinnings of the Brazil Proposal. The key papers (also noted in other places) that are relevant to the discussion here are: #1 den Elzen, Michel, Jan S. Fuglestvedt, Niklas Höhne, Cathy Trudinger, Jason Lowe, Ben Matthews, Bård Romstad, Christiano Pires de Campos and Natalia Andronova, 2005. Analysing countries' contribution to climate change: Scientific and policy-related choices. Environmental Science and Policy, 8 (6): pp. 614-636. #2 Prather, M.J., J. E. Penner, J. S. Fuglestvedt, A. Kurosawa, J. A. Lowe, N. Höhne, A. K. Jain, N. Andronova, L. Pinguelli, C. Pires de Campos, S.C.B. Raper, R. B. Skeie, P. A. Stott, J. van Aardenne, F. Wagner (2009), Tracking uncertainties in the causal chain from human activities to climate change, Geophys. Res. Lett., 36, L05707. [doi:10.1029/2008GL036474], #3 Ito, A., Penner, J. E., Prather, M. J., de Campos, C. P., Houghton, R. A., Kato, T., Jain, A. K., Yang, X., Hurtt, G. C., Frolking, S., Fearon, M. G., Chini, L. P., Wang, A., Price, D. T. (2008), Can we reconcile differences in estimates of carbon fluxes from land-use change and forestry for the 1990s?, Atmos. Chem. Phys., 8: 3291-3310; and #4 Hoehne et al 2011 (in the chapter refs). The uncertainties are critical, as well as the time frame (period of emissions; period of evaluation), as well as the background atmosphere. The simple summing of CO2 is only a first-order estimate and this is not well represented here. The LUCF CO2 has serious uncertainties and the simple numbers here do not reflect that.</p>	Taken into account - figure has been revised

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40548	1	24	31	24	31	It says "GHG emissions" where it should be global anthropogenic "CO2 emissions." Otherwise, it is inconsistent with SPM and TS . The captions in Figure TS.4 and Figure SPM.4 is different from that of Figure 1.7(A)	Taken into account - text has been revised to be clear that we mean CO2e. We will check for consistency throughout the chapter
35223	1	24	33	24	37	Figure 1.7B presents useful information on the contribution of cumulative emissions of developed and developing countries to increased temperature, rising sea level and reduced sea ice, instead of cumulative emissions themselves. It is suggested to provide a complete original figure and to replace related text by the following, "From the perspective of the accumulated CO2 emissions from the burning of fossil fuels and land using, Panel B shows that since the Industrial Revolution, developed countries have contributed to most of the accumulated green house gases emissions in the atmosphere. Therefore developed countries should shoulder more responsibilities for the increased CO2 concentration."	Taken into account - paragraph text has been revised
35596	1	24	34	24	37	Panel B of Fig. 1.7 does not show this. It looks pretty equally spaced over time. Please revise the text and/or figure accordingly.	Rejected - Panel B shows exactly this. Look at the blue line (industrialized). It is higher than the green line which until a few decades ago was very close to pre-industrial (ie, nearly zero marginal contribution). Now they have shifted. All figures and corresponding text has been revised
24380	1	24	36	24	37	This statement is incomplete. However, if taking account the size of population, the gap of accumulated emissions on per capita bases is still very large between developed countries and developing countries. Reference: Teng Fei, Hejiankun, Pan Xunzhang, Zhang Chi(2010), How to Measure Carbon Equity: Carbon Gini Index Based on Historical Cumulative Emission Per Capita. Advances In Climate Change Research, vol.6 No.6.449-455; Yu Shengmin, Gao Xiang, etc.(2010),Operational Definitions of Historical Per-capita Cumulative Emission Rights and Equitable Sharing Options. Advances In Climate Change Research, vol.6 No.6.456-460	Taken into account - revised text to say "Still other studies have looked at the historical cumulative per-capita emissions, thus combining two of the different perspectives discussed here." and added cite to Teng et al., though the article found was published in 2011 vol. 2 no. 3 rather than 2010 vol. 6 no. 6 of the same journal
35597	1	24	37	24	42	This deserves further discussion: Do emissions before [1990] "count" as much as those emitted after that date since: (a) the world didn't know it was a problem before ~1990, (b) we were more or less in equilibrium with carbon sinks for a while after Industrialization, and (c) the warming impact declines over time (i.e., emissions in 1900 are not contributing to warming as much as emissions now)	Rejected - That's a normative question for the most part--certainly parts "a" and "c" are normative. Part "b" is incorrect in a strict sense. The point we are making here is much narrower and simpler. No further action needed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19899	1	24	41	24	25	Wei et al and Botzen et al look at energy CO2 emissions only, and therefore presents rather high contributions for the developed countries. Hohne et al. Includes all GHG emissions only until 2005. Therefore the sentence that it includes many sources does not hold for the studies Wei et al and Botzen et al. The authors may want to mention this difference, or may only cite the model-comparison study of Hohne which involves many authors from different countries, and includes a model comparison study including many models. The authors may try find literature on contributions of climate change, that accounts for all GHG emissions (including land use and non-CO2) and includes also the recent historical emissions for the period 2005-2010, as this would show that the developing countries surpass the developed countries soon, whereas Wei for example concludes that developed countries have contributed about 60-80%.	Taken into account - text is revised. Sentence added "However, the contributions of industrialised and developing countries vary significantly based on the choices made in the calculation. The share of developed countries can be almost 80% when excluding non-CO2 GHG, LULUCF and recent emissions (until 2010) or about 45% when including these emissions and discounting for technological change"
40549	1	24	43	24	46	Chapter 5 P42 L1-6 describes that around 25% of Chinese GHG emission is for exported one and carbon leakage is approximately 5-19%. Please refer this figure in SPM and TS.	Noted - comment redirected to SPM team
26095	1	24	48	25	2	You need to be more careful about comparing these columns; China has the biggest absolute change between columns B and C, but Russia has a larger absolute change than the US, and the UK (GBR) has a bigger proportional change than any of those three.	Rejected - the review comment is technically correct but does not add much to the message that embodied emissions matter. Our text is correct. No action needed
23236	1	24	48			Better as "Comparing the annual consumption (middle bar) and annual production (right hand bar) of Fig..."	Accepted - text edited as suggested
23234	1	24	5			Could reference the SRREN	Rejected - it is referenced a lot. For this report lets keep the focus on chapter 7.
35593	1	24	9	24	9	Does the framing of technology opportunities into energy demand and energy supply alternatives leave anything off the table? Is there a 3rd category not mentioned here - efficiency improvements in energy transmission (e.g., policies or technologies that promote reduced transmission line losses on the grid)?	Rejected - We use "demand and supply" broadly here. Chapter 7 (the text wrongly mentions chapter 6--that has been fixed) deals with this in more detail, and elsewhere in chapter 1 we callout efficiency in particular. The supply network includes transmission. All that said, in well run T&D systems transmission losses are just a few percent and lots of effort can cut them marginally. In some systems the fractions are higher and thus so are the opportunities. chapter 7 deals with this. No further action needed.
29771	1	24	19	24	19	AOFLU', wrong spelling, should be 'AFOLU'	Accepted - text corrected
26309	1	25		25		Panel B figure has no time indication on "x" axis. It is supposed 1750 to 2010.	Taken into account - all figures to be revised for clarity
29562	1	25				Time should be added on the x-axis	Taken into account - all figures to be revised for clarity

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23587	1	25				The scale of horizontal axis is missing in panel B.	Taken into account - all figures to be revised for clarity
22513	1	25		27		Please, as the UNFCCC was adopted in 1992, show also in Figure 1.7 (A), the column for cumulative emissions from 1992 to 2009.	Rejected - there are lots of ways to add this up. We are just making one point here, which is cumulative over the lifetime of the problem rather than choosing some arbitrary year. No further action needed.
23237	1	25				Better as 4 separate figures - not panels. Panel A is CO2 only surely - not CO2e. Add "Annual" to "consumption" and "production". Panel B has no x axis title.	Taken into account - all figures to be revised for clarity
39151	1	25				This figure only shows energy CO2 emissions - 60% of total GHG emissions, and even less of a percentage historically (see Fig. 1.3). It is grossly misleading to include a graphic that suggests that Annex I nations accounted for 75% of cumulative emissions from 1750-1970. Indeed, as Fig. 1.3 shows, energy CO2 in 1970 was barely 50% of the total GHG picture! In addition, an overall framework for thinking about atmospheric commitments should logically include not only past and current emissions, but also decisions that put in place infrastructure that commits a nation to future emissions (i.e., the idea of infrastructure lock-in as discussed in, e.g. Davis et al., 2010: "Future CO2 Emissions and Climate Change from Existing Energy Infrastructure" Science, 329(5997). A policy-neutral presentation of cumulative emissions would not only include all gases and all sectors, but should also reflect commitments to future emissions. With respect to a source for non-energy CO2 emissions, the authors should strongly consider utilizing the MATCH database (www.match-info.net) and associated references (such as Hohne et al., 2011: Climatic Change, DOI 10.1007/s10584-010-9930-6) as they include CO2, CH4 and N2O from all major sectors for all nations from 1750-2100 under various IPCC scenarios. Additionally, literature should be cited and its underlying data employed (such as Pongratz & Caldeira, 2012: Environ. Res. Lett., doi:10.1088/1748-9326/7/3/034001) to illustrate how historic LULUCF emissions are significant and should not be ignored in discussions of historic responsibility and cumulative emissions. If retained in some heavily modified form, the panel on the right in SPM.3 is also misleading and should be shown in absolute numbers, not percentages as it will likely lead the common policymaker to make inaccurate conclusions. Finally, the panel on the right uses 1970 as a cut off year. A far more relevant year to make the cut-off would be 1990 or 1992. It is also very misleading to show these as percentages since elsewhere in the SPM (p. 3, lines 40-41) it states that "at current levels, every 12 years an amount of FF CO2 is emitted comparable to the total cumulative emissions before 1970".	Taken into account - Figure 1.7a is CO2-e from all sources. Co2-e to be clarified here and throughout the text
19822	1	25				Needs horizontal axis label and scale	Taken into account - all figures to be revised for clarity
22308	1	25				The visual arrangement of the columns creates the visual impression that all three columns represent a temporal continuum in which one sees the shares of global emissions for some countries are rising while that of other countries are decreasing, when in fact, the middle and right columns are variations of how 2010 emissions can be allocated to countries depending on whether consumption or production-based emissions are reflected. A more accurate graphic would be to have the 1751-2009 column as is, create a new "Production 2010" column beside it whose height is to scale relative to the 1751-2009 column (i.e. it would be shorter) and then this shorter "Production 2010" column could then be connected to another graphic that shows country shares of 2010 production-based emissions. The same treatment could also be provided for the "Consumption 2010" column. See, e.g., attached "Rearrangement of Figure 1.7A"	Taken into account - all figures to be revised for clarity

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19345	1	25	12	25	13	It is better to say "most developing countries have lower per-capita emissions than industrialized nations" instead of "some developing countries already have higher per-capita emissions than some industrialized nations", according to the figure.	Rejected - 'some' is fine here
35599	1	25	15			As with the text on p. 9, line 10-15: The text here states: "Second, much of this shift has arisen in the context of globalization in investment and trade, leading to higher emissions that are "embedded" in traded goods and services, suggesting the need for additional or complementary accounting systems that reflect the ultimate consumption of manufacturing goods that cause emissions rather than just the geographical place where emissions occurred during manufacturing (Houser et al. 2008; Davis and Caldeira 2010; Peters, 14 Davis, and Andrew 2012; Peters et al. 2011)." The document does not consider the net wealth embedded in the sale of trade goods that could be used to offset or implement emission control strategies in the countries that produced the goods and services. Are the authors aware of any economic research that provides a balanced approach towards consumption and wealth generation associated with carbon producing trade goods?	Noted - The wealth embodied in trade is the province of macroeconomics and trade economics. That's a huge field. But that's not our point--our point is not to be "anti" or "pro" trade. It is to point out that because of embodied trade there is an additional externality. No further action needed.
35600	1	25	15			This figure only shows energy CO2 emissions - 60% of total GHG emissions, and even less of a percentage historically (see Fig. 1.3). It is grossly misleading to include a graphic that suggests that Annex I nations accounted for 75% of cumulative emissions from 1750-1970. Indeed, as Fig. 1.3 shows, energy CO2 in 1970 was barely 50% of the total GHG picture! In addition, an overall framework for thinking about atmospheric commitments should logically include not only past and current emissions, but also decisions that put in place infrastructure that commits a nation to future emissions (i.e., the idea of infrastructure lock-in as discussed in, e.g. Davis et al., 2010: "Future CO2 Emissions and Climate Change from Existing Energy Infrastructure" Science, 329(5997). A policy-neutral presentation of cumulative emissions would not only include all gases and all sectors, but should also reflect commitments to future emissions. With respect to a source for non-energy CO2 emissions, the authors should strongly consider utilizing the MATCH database (www.match-info.net) and associated references (such as Hohne et al., 2011: Climatic Change, DOI 10.1007/s10584-010-9930-6) as they include CO2, CH4 and N2O from all major sectors for all nations from 1750-2100 under various IPCC scenarios. Additionally, literature should be cited and its underlying data employed (such as Pongratz & Caldeira, 2012: Environ. Res. Lett., doi:10.1088/1748-9326/7/3/034001) to illustrate how historic LULUCF emissions are significant and should not be ignored in discussions of historic responsibility and cumulative emissions. If retained in some heavily modified form, the panel on the right in SPM.3 is also misleading and should be shown in absolute numbers, not percentages as it will likely lead the common policymaker to make inaccurate conclusions. Finally, the panel on the right uses 1970 as a cut off year. A far more relevant year to make the cut-off would be 1990 or 1992. It is also very misleading to show these as percentages since elsewhere in the SPM (p. 3, lines 40-41) it states that "at current levels, every 12 years an amount of FF CO2 is emitted comparable to the total cumulative emissions before 1970".	Taken into account - combined with comment #529
35601	1	25	15			There are several problems with this figure. Heavy revision - if not total exclusion - of this figure is warranted: (1) ignores 25% of warming agents, (2) there is no time on the x-axis; (3) there need to be error bars or shading to show the uncertainty in attribution	Taken into account - all figures to be revised for clarity
21575	1	25	16			Include scale on horizontal axis.	Taken into account - all figures to be revised for clarity
40551	1	25	16			Y-axis is cumulative percent of "CO2e", but it should be "CO2" as it is supposed to indicate global anthropogenic Co2 emissions, not GHGs. The same problems in TS (Figure TS.4) and Ch.1 (Figure 1.7(a)).	Taken into account - all figures to be revised for clarity

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
40552	1	25	16			The corresponding text or the Figure explanations needs to indicate how the CO2 concentrations are calculated. Sum of developed and industrialized countries do not match with All countries. Also, x-axis has no name.	Taken into account - all figures to be revised for clarity
27435	1	25	16			Please check the units for GHG emissions in the vertical axis titles of the figures. If you are looking at different gases, than you should add CO2eq, as you already do for figure E. But in figure C and D the units are missing.	Taken into account - all figures to be revised for clarity
27434	1	25	16	25	16	Does the figure show all emissions or just CO2 emissions from fossil fuel combustion (as you wrote for the same figure in TS.4)?	Taken into account - all figures to be revised for clarity
19343	1	25	16			As lined in "Page 24, line 27", it is said "if the 27 members of the EU are treated as a single country". So it is suggested that EU is shown as a single country in Fig 1.7 panel A	Taken into account - combined with other comments
35598	1	25	5	25	6	Delete mention of "emissions rights". It is unnecessarily controversial.	Accepted - deleted the phrase referring to emission rights
40550	1	25	5	25	6	There are various ways of interpreting the above equity principles and applying them to the design of a burden-sharing framework as described in Chapt.4 4.7.3.2. Therefore, this expression is not a suitable one and better to be deleted.	Taken into account - text revised and sentence already deleted per other comment. Also text add to p. 24 line 24: "This discussion engages questions of burden-sharing in international cooperation to mitigate climate change, a topic addressed in more detail in chapter 4."
33032	1	26				Please note the agreed AR5 standard to use 2010 Usdollars across the report. Panel D will need to be updated to 2010 USD accordingly.	Taken into account - all figures to be revised for clarity
35602	1	26				What do the %s in the bars represent? Also, Australia - as a major economy and a major emitter should be included in these plots.	Taken into account - all figures to be revised for clarity
35603	1	26				There are several issues with this figure. Heavy revision - if not total exclusion - of this figure is warranted: (1) The y-axis says 2010, but the captio says 2012. The caption should probably be revised; (2) The choice of abseyar is deeply influential to FSU and EU nations; a more unbiased and representative view would be, say, 1995 or 2000 or 2005; (3) the caption says "emissions" - is this all GHG or just energy CO2? presumably it's only energy CO2, in which case the y-axis should not reac "CO2e", but just "CO2" and the caption should explicitly state that this is only 60% of global GHG emissions.	Taken into account - all figures to be revised for clarity
19346	1	26				Panel C and Panel D didn't mention the year. And the emission is consumption or production isn't clear.	Taken into account - all figures to be revised for clarity

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19347	1	26				As lined in "Page 27, line 23", it is said "the relationship between emissions and mitigation obligations under the Kyoto Protocol". So it is suggested that emission reduction target presented in Kyoto Protocol and actual emission reduction are compared in Fig 1.7 panel E.	Noted - this is an important point. We originally followed this approach. But there are two problems with it. First, it obscures total volumes. Second, it requires assigning a target to countries that did not join. Thus we adopted a simpler approach that puts the focus less on the original Kyoto agreement (which has run its course by this time) and more on emission patterns. Lines 23-24, revised sentence to say: "change of emissions by country during 1990-2010. 1990 is a base year for most of the Annex B countries in the Kyoto Protocol"
23238	1	27	1	27	2	Add "CO2" emissions to caption	Taken into account - These figures will be reworked and proper qualifiers added.
27436	1	27	1	27	1	The description of figures should follow right after them so that one doesn't have to turn over the pages all the time.	Editorial - copyedit to be completed prior to publication
19904	1	27	11	27	13	Olivier et al. 2011 only reports emissions from 1970. What data is used for the pre-1970 emissions? The data from Hohne et al. 2011? Here more details on the underlying datasources need to be given. I would also give the cumulative emissions for the period until 2010. Please also revise the order of the column, as the production numbers are normally being reported	Taken into account - all figures to be revised for clarity
34496	1	27	20	27	22	" From the perspective....low intensity" This is a controversial statement	Taken into account - revised text to say "emission obligations might be adjusted to reflect each country's state of economic development while creating incentives for countries to transition to higher economic output without concomitant increases in emissions."
20761	1	27	23	27	23	parenthesis is not closed	Accepted - closed paren

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22309	1	27	24	27	28	The references to "Annex I countries" in these lines, when made in the context of the Kyoto Protocol, is legally inaccurate. "Annex I" refers to the list of countries included in Annex I of the UNFCCC that have mitigation commitments under Art. 4.2(a) and (b) of the UNFCCC. With respect to the Kyoto Protocol and the binding numerical mitigation targets thereunder, the corresponding list of countries that are subject to such numerical mitigation obligations is in "Annex B". These Annex B Kyoto Protocol Parties have an aggregate mitigation target of "at least 5 per cent below 1990 levels in the commitment period 2008 to 2012" under Article 3, paragraph 1, of the Kyoto Protocol (for the text of the Kyoto Protocol, see http://unfccc.int/resource/docs/convkp/kpeng.pdf ; the exact figure for Annex B Parties' aggregate target is 5.2% below 1990 levels - see http://unfccc.int/cop3/fccc/info/indust.htm). In this regard, the statement that "The Annex I countries excluding Canada and the USA, have a target of reducing their greenhouse gas emissions by 4.2% on average for the period 2008-2012 relative to the base year, which in most cases is 1990" should be reworded. The "Annex I" reference should refer, instead, to "Kyoto Protocol Annex B countries". Furthermore, the source or origin of the "4.2%" figure should be identified and clearly explained, as it is not consistent with the legal text of the Art. 3.1 of the Kyoto Protocol. If the 4.2% figure is based on original calculations made by the chapter authors to account for the non-participation by the US and Canada in the Kyoto Protocol - i.e. deducting the targets of the US and Canada from the aggregate Annex B target - then the methodology should be referenced and explained.	Accepted - in this paragraph, all instances of Annex I are replaced with Annex B. Also, sentence revised to say "USA, have targets that collectively lead them to reduce their..."
35224	1	27	27	27	31	According to the Kyoto Protocol, the aggregated emission reductions target of Annex I parties in the commitment period of 2008-2012 is 5%, rather than 4.2%. It is suggested to replace the text by the following, "According to the Kyoto Protocol, the Annex I countries have an aggregated target of reducing their greenhouse gas emission by at least 5 % in the commitment period of 2008-2012, compared to the base year, which in most cases is 1990."	Taken into account - combined with comment 557
35604	1	27	27	27	29	Worth citing Fig. 1.5 which shows that A1 nations have reduced their emissions by ~4.5% below 1990 levels in 2010.	Taken into account - Text of lines 33 to 36 has been deleted per comment 560 so suggested change is no longer relevant. However, added line 34 after bracket: "Indeed, from 1990 to 2011 the Annex B nations have reduced their collective emissions by XX%, even without obtaining emission credits through the Kyoto Protocol's Clean Development Mechanism (CDM) (UNFCCC, 2013b). Thereby, they are certain to comply with their collective target quite comfortably.
19905	1	27	36	27	36	I would not refer to den Elzen et al. 2009; 2011, but I would refer to the more recent paper: den Elzen MGJ, Meinshausen M, Hof AF (2012) The impact of surplus units from the first Kyoto period on achieving the reduction pledges of the Cancún Agreements. Climatic change 114:401-408.	Taken into account - text has been deleted

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35605	1	27	36	27	37	The authors should also explicitly state that, "...many distinct underlying forces AND THE LARGE INFLUENCE BASE YEAR SELECTION CAN HAVE IN ANY ANALYSIS OR EMISSIONS REDUCTION PLEDGE."	Taken into account - added sentence: "Some of those restructuring economies used base years other than 1990, a process allowed under the Kyoto Protocol, because they had higher emissions in earlier years and a high base year arithmetically leads to larger percentage reductions."
22310	1	27	40	27	43	The sentence "However, most of these cuts may have been due to the scaling-back of GHG-intensive industries in the transition economies" needs to be reworded because it is ambiguous. In fact, the Annex I countries (other than the Annex I economies in transition) have not reduced their aggregate emissions below 1990 levels (despite their commitments under Art. 4.2(a) and (b) of the UNFCCC), as can be seen in the UNFCCC's official GHG data (excluding LULUCF) at http://unfccc.int/files/inc/graphics/image/jpeg/ghg_total_excl_2012t.jpg , showing that non-EIT Annex I countries' GHG emissions grow 9.2% in 2000, 11.2% in 2005, and 4.9% in 2010, above 1990 levels. While the EU's emissions fell by 2010 to 15.4% below 1990 levels, most of the other big non-EU Annex I economies' emissions have increased far beyond their 1990s levels by 2010 - e.g. Norway by 8.2%, US by 10.4%, Canada by 17.4%, New Zealand by 19.8%, Australia by 30% (see http://unfccc.int/files/inc/graphics/image/jpeg/ghg_total_excl_2012c.jpg). Annex I aggregate emission reductions have, between 1990 and 2010, clearly and unambiguously been driven by the economic collapse and consequent emission reductions in Annex I economies in transition after 1990. Hence, the sentence should be reworded by simply deleting the word "may".	Noted - redirect comment to SPM team
35606	1	27	44	27	45	What is the basis for saying that all countries are likely to comply with Kyoto? Experience to date suggests otherwise. All countries who are members do not comply with the WTO, and that is a much stronger and traditional organization that offers "juicier carrots" and "bigger sticks" than Kyoto.	Taken into account - text has been revised

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35226	1	27	46	27	47	<p>The assessment of KP's impact on emissions from developed countries is too general. It is suggested to replace the sentences by the following, "One interpretation is that treaties such as Kyoto Protocol have certain impacts on policy-making and actions (such as Formulating a legal and regulatory framework to address climate change, introducing domestic mitigation strategies, applying the Kyoto mechanism to reduce the costs of emission reductions, and so forth) in countries with legally-binding quantified limitation or reduction targets. (Krishnamuti and Hoque, 2011; Djamel and Ibrahim, 2011). This is why nearly all the countries that ratified the Kyoto Protocol have complied to the KP. If there were no Kyoto Protocol, the effectiveness of these policies could have been much weaker. (Hare ect. 2010). In addition, the CDM under the Kyoto Protocol has provided great incentives for emission reduction in developing countries, with about 1.15 billion tCO2eq emission reduction credits (Pechaket 2011; Wang etc., 2008; see also table 13.4 in TS)."</p> <p>Reference: Krishnamuti C., Hoque A., 2011. Efficiency of European emission markets: lessons and implications. Energy policy 39 : 6575-6582; Djamel K., Ibrahim A. 2011. The impact of the European Union emission trading scheme on the electricity-generation sector. Energy Economics, 33: 995–1003; Hare W., Stockwell C., Flachsland C. and Oberthur S., 2010, The architecture of the global climate regime: a top-down perspective. Climate Policy 10: 600-614. Pechak O., Mavrotas G., Diakoulaki D. 2011. Role and contribution of the clean development mechanism to the development of wind energy. Renewable and Sustainable Energy Reviews, 15: 3380-3387. Wang C., Fu P., Chen J. 2008. Contribution of clean development mechanism to the mitigation of greenhouse gas emissions. Journal of Tsinghua University (Sci. & Tech.), 48(3): 358-362.</p>	<p>Taken into account - revised text to say: "emissions by setting clear standards as well as institutional reforms that have led countries to adjust their national laws. From that perspective, the presence of the Kyoto obligations is why..."</p>
31580	1	27	46	27	47	<p>o. One interpretation is that treaties such as Kyoto have had certain impacts on policy and actions in countries with legally-binding quantified limitation or reduction targets, indicated by, for example, dedicated regulation system creation to address climate change, domestic mitigation strategy launching and application of flexible mechanisms regulated by Kyoto protocol to reduce mitigation cost (Krishnamuti and Hoque, 2011; Djamel and Ibrahim, 2011), which is why nearly all the countries that ratified the Kyoto obligations are likely to comply. Elaboration of domestic climate policy may also have occurred in the absence of the Kyoto; however, it's development and ambition would have ben less certain and , most liky, weaker (Hare ect. 2010). Reference: Krishnamuti C., Hoque A., 2011. Efficiency of European emission markets: lessons and implications. Energy policy 39 : 6575-6582 ; Djamel Kirat, Ibrahim Ahamada. 2011. The impact of the European Union emission trading scheme on the electricity-generation sector. Energy Economics, 33: 995–1003; Hare W., Stockwell C., Flachsland C. and Oberthur S., 2010, The architechture of the global climate regime: a top-down perspective. Climate Policy 10: 600-614.</p>	<p>Taken into account - combined with comment 564</p>
19348	1	27	50	28	3	<p>The expression in this part is not proper, as the author seems to disagree with "common but differentiated responsibility".</p>	<p>Taken into account - this idea here is not that CBDR was written into Kyoto but rather that the Kyoto commitments are consistent with CBDR kinds of ideas. The text has been slightly revised for clarity</p>
19622	1	27	14	27	14	<p>An additional argument justifying that emissions of greenhouse gases are higher in emerging economies, is due to the relocation of highly polluting firms from developed countries into developing countries. Maybe a comment on this issue should be mentioned in the document.</p>	<p>Noted - This is an important point, but exactly this point is made in the "third" perspective.</p>

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19662	1	27	19	27	20	It is not necessarily the case that as economies mature and become more efficient they shift to high-value added industries such as services that yield low-emissions but high economic output. Economies need to be seen within their entirety, as economies mature they do shift towards services but this does not automatically mean that emission levels per se are lower than before but more likely that emission intensities are lower, i.e. emissions per unit of output- this is because as economies become more efficient they increase their economic output whose emissions levels can offset in the longer run any efficiency (and lower emissions) gains achieved.	Rejected - We are not making that claim. Instead, we are talking about typical patterns. And text here is properly caveated. No further action needed.
20055	1	27	20		22	Add caution needing to take into consideration "embedded carbon" in products before such reward is considered, as rapid transition by replacing domestic productions with imports can lead to substantial carbon leakage because of it.	Noted - unclear on proposed action. Text is properly caveated and the whole idea behind dealing with embedded carbon is to reduce leakage.
20859	1	28	12	28	14	As mentioned above(No.18), 1.5 or 2 degrees celsius aren't agreed targets. However this text focuses on them, and it may mislead readers to thought that these targets have been already agreed. This text should be deleted.	Rejected - They are widely discussed goals Text is OK to look at them. No further action needed.
25674	1	28	12	28	14	This part should explain unlimited evaluation results because it is prejudicial and misleading to put an emphasis on limited scenarios from 1.5°C to 2°C. IPCC should be policy-neutral and should have responsibility to indicate unlimited evaluation results, as described in Table 6.1. The 1.5°C target is not realistic and even 2C target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract). These literatures are listed in the No4 line of this table.	Rejected - They are widely discussed goals Text is OK to look at them. No further action needed.
33033	1	28	13			Reference to Figure 1.6 should instead be to Figure 1.8, should it not?	Accepted - corrected to fig 1.8. The text has a hyperlink field attached that needs to be updated to fig 1.8 (by TSU?). All figures and corresponding text has been revised.
23240	1	28	13			Fig 1.6 or Fig 1.8?	Taken into account - combined with other comment
35608	1	28	13	28	13	The text should be referring to Fig. 1.8 not Fig. 1.6?	Taken into account - combined with other comment
23241	1	28	19			Not panel C of Fig 1.7.	Accepted - revised to panels A and B
35609	1	28	21	28	21	Avoid the use of the term "lucky values" when referring to GHG emissions parameters. There really is no "luck" to it. These values are what they are, we just don't have a good understanding.	Rejected - Nobody else has commented on "lucky" and the term conveys a lot of meaning so we are using it. No further action needed.
35610	1	28	27	29	31	The authors should consider shortening the text here. Perhaps put some of this information in a Table?	Taken into account - combined with comment 569
27298	1	28	3			The following reference should be added, in order to provide a comprehensive assessment of the Kyoto Protocol: "The stringent accounting and compliance rules of the Kyoto Protocol and standards for ensuring the environmental integrity of efforts undertaken should also be taken into account."	Rejected - we don't have space for this and need to avoid "should" statements. But response to 564 will address the spirit of this comment, which I think is that Kyoto does a lot more than just set standards. No further action needed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23242	1	28	31	28	33	Is also the UNEP report 2012 on Bridging the Gap	Taken into account - text has been revised and added a new sentence says: "A large number of other studies also look at the size of the gap between emission trajectories and the levels needed to reach goals such as 2 degrees." Cites to Cline, Yamaguchi, den Elzen (2008) added to end of added sentence.
19907	1	28	33	28	37	I would consider delete this paragraph (see previous comment), but otherwise I would not refer to Cline (2011) as this is grey literature, but I would refer to the many peer-reviewed publications with up-to-date 2 degree pathways here, for example, see Chapter 6 in Table 6.3 for an overview of the literature on contraction and convergence in 2050, like the paper of Tavoni et al. (2013); den Elzen et al. 2008; 2012; etc. (see Chapter 6: for details)	Taken into account - combined with comment 579
19906	1	28	33	28	40	I would consider to delete this paragraph, as effort-sharing is rather sensitive. I would focus on the global emission challenge to reach 2 degree (less sensitive), and make use of the information of Chapter 6 work. I would not go into the issue of effort-sharing. Here, 2 burden-sharing studies are cited, from grey literature, whereas there are many burden-sharing studies, each with each own reduction allocation, as extensively described in Table 6.3 (Chapter 6). This section in Chapter 6 gives a good overview on the reductions needed according to different effort-sharing methods.	Taken into account - combined with comment 579
19908	1	28	37	28	40	I would consider delete this paragraph (see previous comment), but the 80-95% reduction target (see G8) is in absolute emission levels, and not in per capita emission levels. Again there is peer-reviewed literature available.	Taken into account - combined with comment 579
35607	1	28	4	28	5	Omitting any assessment of Cancun / Copenhagen is a glaring omission and not representative of the recent successes on the Convention.	Rejected - Edits earlier in the document add mentions of these. Neither Copenhagen nor Cancun offer a perspective, this close to those events, that we can use to evaluate mitigation efforts. And the whole purpose of the section here is to talk about those perspectives. No further action needed.
33034	1	28	40	28	43	Please use caution making statements about the achievability of specific targets, as this text does. For the IPCC it may be more appropriate to make statements on the requirements of reaching such targets.	Taken into account - combined with comment 579
25675	1	28	41	28	43	This part should be deleted completely because the 1.5°C target is not realistic and even 2°C target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract). These literatures are listed in the No4 line of this table.	Rejected - these are widely discussed goals and thus ok to examine. But see comment 580. No further action needed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35227	1	28	47	28	48	This assumption is completely biased. In fact, some developed countries have given little support to international cooperation under the UNFCCC and the KP, and therefore the whole process has been delayed. Many studies have shown that the mitigation efforts made by developing countries have been greater than those of developed countries (SEI, 2011 ; UNEP , 2010). It is suggested to delete this sentence and to use the words "delay" and "full participation" in this chapter with the same definitions of those in chapter 6. Reference Stockholm Environment Institute (SEI). 2011. Comparison of Annex 1 and non-Annex 1 pledges under the Cancun Agreements. UNEP, 2010. The Emission Gap Report - are the Copenhagen Accord Pledges sufficient to limit global warming to 2 to 1.5° C?	Rejected - It is a statement of fact that the Clarke et al analysis (which is what is being discussed here) shows that participation delays by those countries make the 2 degree goal even harder to achieve. But see comment 579. NO further action needed.
20762	1	28	48	28	48	pls use 2 degree goal consistently with earlier use. Also I recommend to always indicate that the degrees are Celsius or centigrade.	Editorial – copyedit to be completed prior to publication. Will check for consistency
30059	1	28	9			(...without any) further (policy interventions...)	Taken into account - revised text to say "without further policy"
23239	1	28	1	29		Reads like a summary of the report. Chapter 1 as an introduction should just set the scene	Noted, this chapter is an introduction and overview; it is fine if we presage some results. No further action needed
21577	1	28	6	29	31	There needs to be more detail provided on the probability of exceeding different temperature targets. Line 44 for example needs to specify the probability these models were aiming for.	Rejected - Way too much detail our chapter. No further action needed
19349	1	28	6			This sention mentioned 14 models. The difference of the model and coresponding results are not clearly explained. Maybe a table is needed here.	Taken into account - we don't have space for a table here. But all figures will be revised and the updated figure to 1.8 may show this more clearly.
35612	1	29	11	29	14	Has anyone examined potential roles that reforming the WTO to better account for the effects of "failing to properly account for global-scale externalities when evaluating trade agreements" could help solve the climate problem? If so, discussion of that literature here might be warranted.	Rejected - This is a big topic; here we only have space to make the general point. Elsewhere, in response to a comment from you, we have noted how we have addressed trade issues. And we have cited a WEF document chaired by Jim Bacchus on eactly this topic-- while grey, that document is very important because Bacchus was chairman of the WTO Apellate Body when many of the most controversial precedent cases were handled. No further action needed.
27437	1	29	12			It is recommended to add "on emission reductions" behind "international agreements"	Accepted - text revised as suggested

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21576	1	29	21	29	24	This paragraph needs to mention the potential of "green growth", particularly relying on evidence from advanced economies. For example, Germany is following a significant rate of decarbonisation, yet it is among the richest and growing countries in Europe.	Rejected - We talk about green growth elsewhere. Here we are making a much narrower point about the impact of economic expansion on emissions-- especially as it is treated in the IAM models. But see response to 593. No further action needed.
35613	1	29	21	29	24	The phrase "If growth is high then so are emissions" is not clear. The intent appears to be "If economic growth is high, it has usually followed historically" that emissions increase as well. However, even this more clear statement is inaccurate without appropriate caveats as it seems to overgeneralize a historic correlation that is not always true at the country or annual level. As economies reduce their energy intensity, the likelihood of simultaneous economic growth and emissions reductions increases. The point of the paragraph is well taken - that the models generally predicted higher global emissions when they have higher global economic growth assumptions. However, it seems like the statement would benefit from a caveat noting that this is due to them "still observing a positive correlation between GHG emissions and economic growth at the global level over the time period analyzed as the two do not become delinked." Indeed, as the U.S. has demonstrated in 2012, the economy grew by 2.2% while energy CO2 emissions decreased by almost 4%(!).	Rejected - see response to 591
35614	1	29	21	29	24	Left as written (e.g., "If growth is high, then so are emissions") does not leave room for the delinking of GHG emissions from GDP growth mitigation put forward on page 33, line 28. The authors should consider revising the text accordingly.	Taken into account - text revised to say "Typically, these models assume that if growth..." and added sentence: "Of course, in the real world countries can delink economic output and emissions, such as through mitigation policy."
35611	1	29	3	29	3	This is an inaccurate statement. It is not "impossible to say whether any goal is achievable". It is possible, just extremely difficult. For example, we know with great precision that we cannot achieve any of the climate change objectives if the world economy and the world energy systems continue on the path they are on today. The uncertainties are only in the relative outcome of alternative future options. However, even then, we know that the costs and impacts of inaction are very likely to be much greater than the costs of transforming our energy systems. The text should be revised accordingly.	Taken into account - text revised to say "to say with precision the cost required to achieve any particular goal because"
27402	1	3	18	3	19	Scholar is a quite unusual word for scientist. Does the term stand more for students here?	Rejected - "scholar" is fine. No further action needed
19169	1	3	22	3	28	The problem is surely to study trends in atmospheric concentrations, not trends in emissions. The two are not necessarily related	Rejected - the text here is fine and accurate. For most pollutants, atmospheric concentrations are a "stock" with long lags and thus if you want to study policy trends what really matters is trends in emissions; their impact on the stock in any give year is hard to discern.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35216	1	3	27	3	43	Only emission flow rather than historical cumulative emissions is mentioned here for the explanation of “the trends in total emission of GHGs”. It is suggested to add more elaboration on historical cumulative emissions in this section with reference to related descriptions on page 24 (Line14-37) in order to provide a more balanced and objective conclusion.	Taken into account - combined with other comment 48.
35225	1	3	27	3	43	A lack of substantial mitigation efforts from developed countries is one of the main reasons why global emissions have continued to increase in the past decade. However, whether developed countries have fulfilled their commitment to achieving substantial mitigation under Article 4, principle 2(a) of the Convention is not discussed in the SPM. To provide a more balanced discussion on the causes of a rising GHG concentration, it is suggested to add the following sentence at the end of this paragraph, “Per capita emissions of developing countries are still far less than that of developed countries. Besides the rapid economic growth in developing countries, a lack of substantial mitigation efforts in developed countries is another key reason why global emissions have been constantly increasing in the past decade. Given the fact that developed and developing countries are currently in different stages of development and in order to ensure equity for all, developed countries should make greater efforts in reducing emissions per capita and provide effective financial and technical support for developing countries. Meanwhile, developing countries should avoid following the carbon-intensive pattern of developed countries and maintain a moderate growth in emissions.”	Taken into account - text revised. Sentence at line 27-29 deleted. At line 36, text revised to say "population, income, POLICIES,..." While we appreciate the spirit of the commentor's point, the proposed insertion was too long and much too policy prescriptive.
35493	1	3	27	3	29	This statement leads one to believe that non-CO2 gases and non-energy sectors (i.e., LULUCF) will be included in the trends and analysis, but most analysis only relates to energy CO2 - 60.7% of the problem. The authors should explicitly state this fact throughout as it is critically important.	Taken into account - text on CO2e will be clarified throughout the text
35494	1	3	27	4	25	The lead sentence of the first five conclusions could have been written at any time in the past decade. The authors should state up-front what is new since AR4.	Taken into account - We have changed the lead sentence to the first conclusion (see comment 48). The lead for the second, fourth and fifth conclusions is necessary to create context for the rest of the conclusion to be comprehensible. The lead sentence for the third conclusion could not have been written at any point in last decade--that's one of the chief findings of AR5.
23203	1	3	30			"annual" global GHG emissions "in 2012"	Taken into account - text revised. The word "annual" was added. The year (2010) was added per comment 36.
30053	1	3	30			(... CO2-eq) (which year?????)	Taken into account - combined with other comments. The year 2010 was added
19898	1	3	31	2	32	The greenhouse gas emissions from Annex I countries are about 2.5 times as high in 2010, using the recent EDGAR data. The number 4 seems very high. The inclusion of non-CO2 gases and LULUCF sources makes a major difference in the outcome. There is no analytical basis to exclude any gases or sources, incl. LULUCF. Please check, and present the numbers including all sources and gases	Taken into account - we checked the values and corrected the text

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34492	1	3	32	3	32	"Since AR4, the total emissions from countries listed in Annex 1..." Please provide the classification of countries in the text itself. Very few people will turn and look at the annex since it is not a technical term.	Rejected - for the executive summary this is fine. Line 31 defines where Annex 1 comes from. Beyond that, there is no acceptable simple classification beyond just Annex 1 itself. It is not feasible to list all the countries here. For clarification, text added to refer to glossary for list of countries.
35495	1	3	32	3	32	Actually, this occurred by the completion of the AR4 (by 2007 according to your figures). The text should clarify this point.	Rejected - We are rewriting text here to clarify exactly which emissions are in this calculation and which not. But the trends move slowly. And we don't need to clarify that per-capita rises were already high by AR4. Our central point here is that total emissions have risen a lot, but if we just state that, some governments may want to see per capita figures in the same paragraph.
35217	1	3	34	3	35	EU is a regional organization rather than a sovereign state. Thus, it is suggested to take EU as 27 member states when analyzing countries' contribution of GHG emissions.	Rejected - On this question, the EU actually pools sovereignty, negotiates as a single group, and implements int'l law through a single policy mechanism. See comment #26
23204	1	3	34			And in the main text, why say "about" 10 countries? Better to say "The 10 largest emitting countries (including the EU members) accounted for around 70% of total GHG emissions in 2010."	Rejected - We say "about" to signal that there is some uncertainty due to measurement. That can be done by putting the "about" to modify the number of countries or the total fraction of emissions. Both are correct. The text is accurate as written.
27403	1	3	34	3	35	Please indicate also which 10 countries accounted for 70% of the global emissions. The EU should not be the only country to be named.	Rejected - We name the EU simply to identify that we are treating the EU as a single unit. The names of the about ten countries are clearly indicated in main text.
31199	1	3	36	3	36	"income per capita" would make more sense: the author refers to it on line 30, per capita controls for main heterogeneity between countries, namely size	Rejected - The lead to the sentence is "The driving force for emissions..." That implies that we are talking about absolute levels (not just trends and not just per-capita). In any case "income" is a general term and fine here.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23205	1	3	36			for "increasing" emissions	Rejected - The lead to the sentence is "The driving force for emissions..." That implies that we are talking about absolute levels (not just trends and not just per-capita). The text is fine as it is.
27404	1	3	36	3	36	Somewhere in chapter 1 the uncertainty grades which are used should be explained. It is preferable to provide a table about the respective percentages attached to the grades.	Taken into account - text added pointing to the annex in chapter 2 that does just what the reviewer suggested.
35496	1	3	39	3	39	"induced effects" seems so weak to describe the large climate feedbacks on emissions of natural and human systems. The authors should consider clarifying the text to more accurately reflect the impact(s).	Taken into account - text revised for clarity: "The dominant driving forces for emissions include population, the structure of the economy, income and income distribution, policy, patterns of consumption, investment decisions, individual and societal behaviour, the state of technology, availability of energy resources and land-use change. Feedback from changing climatic conditions add to the emissions of natural and human systems, e.g., thawing permafrost areas or higher cooling demand in response to a warmer climate."
23206	1	3	40			Suggest change "fuels" to "energy sources" since for example, wind or solar are not commonly seen as fuels.	Accepted - text revised as suggested
23207	1	3	42			Is "large" the best word? Essential? Significant? Major?	Rejected - "Large" is fine. See comment #65
35497	1	3	42	3	42	By using the term "likely" here, do the authors mean to use calibrated uncertainty language here ? 66% chance? Also, the authors should explain "large role" in the past? What about in the future?	Taken into account - text revised. Deleted "It is likely that..."
20840	1	3	44	3	45	When it comes to energy supply, many countries consider "environmental conservation", "energy-security", and "economy" what we call "3E". So, "economy" should be added to the sentence here.	Rejected - text is fine here because we use the phrase "such as" to indicate that this is a non-exhaustive list.
20233	1	3	44	4	13	KEEP this para as it is important finding for policy makers. Move this para to SPM.	Noted, no further action needed. Thank you.
32456	1	3	44	3	45	The aspect of economy should be added.	Rejected - combined with comment 66. Text is fine here because we use the phrase "such as" to indicate that this is a non-exhaustive list.
35498	1	3	45	3	45	Does "very likely" mean 90-%ile? Please clarify.	Taken into account - deleted sentence lines 45-47.
35499	1	3	45	3	47	Where is the evidence that progress is very likely larger than it may seem based on identified climate policies alone? Why might it not be smaller than the progress that would have been without other policies, such as energy policies that promote increased use of high-carbon fuels?	Taken into account - combined with comment 69

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27400	1	3	5	3	5	The term "pollutants that affect the climate" is unclear. Pollutants need to have a media/pool/reservoir to contaminate like air/atmosphere, water, soil which affect human health and ecosystems directly. GHGs are not regarded as pollutants. It seems however they are meant by the term pollutant here. The term does not exist in the Glossary, in the chapters the term GHG is used and pollutant as well in sense of causing harm to humans and ecosystems directly. Also, the WGI text uses GHGs. the new meaning added to the term "pollutant" causes confusion and inconsistencies. Therefore insert before "pollutants" " GHGs and". This should be regarded in the whole chapter.	Taken in to account - combined with comment 23
35492	1	3	9	3	12	Discussion of the Copenhagen / Cancun commitments is warranted, particularly seeing as how they include a far greater percentage of global emissions than the Kyoto Protocol	Rejected - The sentence here is about "international diplomacy" generally and the illustrations are UNFCCC and Kyoto. Text is clear that those illustrations are not exhaustive.
27401	1	3	9	3	10	The term "pollutants that affect the climate" is unclear. Pollutants need to have a media/pool/reservoir to contaminate like air/atmosphere, water, soil which affect human health and ecosystems directly. GHGs are not regarded as pollutants. It seems however they are meant by the term pollutant here. The term does not exist in the Glossary, in the chapters the term GHG is used and pollutant as well in sense of causing harm to humans and ecosystems directly. Also, the WGI text uses GHGs. the new meaning added to the term "pollutant" causes confusion and inconsistencies. Therefore insert before "pollutants" " GHGs and". this should be regarded in the whole chapter.	Taken into account - combined with comments 23 and 71
26308	1	3	32	19	15	In page 3, 32nd line, it is stated that, on a per capita basis, emissions from industrialized countries are nearly four times higher than those from developing countries. In page 19, 15th and 16th line, it is stated that per capita emissions in the developed world are (...) six times larger than those of developing countries.	Taken into account - these numbers have been checked and corrected for consistency.
33015	1	3				Please be careful with the application of likelihood statements. Throughout the ES it seems that statements are applied without the necessary quantitative analysis in the underlying chapter. Without this analysis, the use of this language does not conform to the AR5 Guidance note, and therefore may be best to remove.	Taken into account - probabilistic language has been removed from the ES
27405	1	3		4		This ES is written very comprehensible and well structured. However, understanding/quick reading would be facilitated if the key assessment results/messages were presented at the beginning of each paragraph and highlighted in bold letters.	Accepted - TSU has provided updated guidance on the structure of the ES for all chapters. Changes to the ES have been made accordingly.
21561	1	3	1	4	44	There needs to be consistency in the use of standard IPCC terminology in this section and if used, they should be italicised. E.g. p.4, l.6: "virtually certain"; p.4, l.16 "virtually certain".	Taken into account - probabilistic language has been revised for consistency with IPCC standard
19652	1	3	27	3	36	Please mention the year(s) you are referring to when referencing estimates of emissions/numbers	Taken into account - text added: "in the year 2010."
19651	1	3	30	3	30	Please add the year you are referring to when referencing the 50.1 billion tonnes of CO ₂ equiv and explicitly mention that these are on a cumulative basis and if they refer strictly to man-made emissions or include natural emissions as well. Ideally it would be could to mention here as well how this figure translates in ppm atmospheric concentrations and the likelihood of exceeding 2C global warming so that the reader could better grasp the scale of the problem	Taken into account - combined with comment #36
19650	1	3	4	3	4	I would add the qualification here along the lines that the world has seen relatively active efforts but far from sufficient around the globe to design and adopt etc	Rejected - This is a good point, but it is already made in many other places in the text.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19648	1	3	6	3	7	Mitigation policies worldwide have also included public investments initiatives (e.g. R&D) and information-based measures (e.g. labelling, energy performance certificates) in addition to market-based, regulatory and voluntary instruments. These would need to be acknowledged as well.	Taken into account - text added: "These policies also include other efforts to address market failures, such as public investments in research and development (R&D) needed to increase the public good of knowledge about new less emission-intensive technologies and practices."
19649	1	3	7	3	10	I do not see the logic behind this sentence. Diverse economic development strategies have been pursued with a view to improving human welfare and job opportunities, that is true, but often not incorporating mitigation policies or on the contrary pursuing conventional development paths at the expense of increased climate instability. I would recommend rephrasing or deletion of this sentence.	Rejected - we have reviewed this sentence for clarity and it is fine.
30726	1	3	27			Bolding the six main conclusions outlined in the executive summary will improve readability and is in keeping with formatting from other chapters.	Accepted - TSU has provided updated guidance on the structure of the ES for all chapters. Changes to the ES have been made accordingly.
30727	1	3	29	3	30	A reference to what year GHG emissions reached an all time high is suggested.	Taken into account - combined with comment #36.
31713	1	3	6	3	6	Add: They have included, AMONG OTHERS, market - based approaches.....	Accepted - text revised as suggested
23044	1	3	11	3	12	The success and Weakness in implementation of these instruments need to be highlighted here	Rejected - this is an important point, but we address implementation elsewhere in the document. Our team is concerned, especially given the sensitivities around what we already say about feasibility of goals like 2 degrees, that we not right at the start of this document start delving into questions of implementation of UNFCCC and Kyoto.
19909	1	30				Why such a range an emission range for 2010?	Taken into account - all figures to be revised for clarity
30739	1	30				Second and third panels of this figure are very difficult to interpret.	Taken into account - all figures to be revised for clarity
31581	1	30				middle and bottom panels, what does that exactly mean by Full and Delay Participation?	Taken into account - all figures to be revised pending team discussion I
34497	1	30				Can you change panel B and panel C. Currently it is too dense with information	Taken into account - all figures to be revised for clarity
23588	1	30				The vertical axis for the middle and bottom panel should be CO2 eq. What is the rationale for introducing the Kyoto gases, why for NTE only ? Is total CO2eq. used for OS ?	Taken into account - all figures to be revised for clarity
22514	1	30				Figure 1.8 is quite unclear, could it be improved?	Taken into account - all figures to be revised for clarity

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33035	1	30				A key is missing for the top panel to explain what each of the lines represent. To simplify the figure, the lines could ultimately be removed, but if they are kept, a key would be needed to clarify exactly what is represented.	Taken into account - all figures to be revised for clarity
27438	1	30		31		Give each panel a name so that one can view them separately. (One might also divide the explanation paragraph up for facilitation.)	Taken into account - all figures to be revised for clarity
19823	1	30				Why do we have CO2e in the top graph and CO2 in the others? This could be explained in the caption.	Taken into account - all figures to be revised for clarity
20763	1	30	1			I find the lower two panels difficult to read and recommend to enlarge them	Taken into account - all figures to be revised for clarity
35615	1	30	1			A few comments: (1) The blue striped box in the top panel should be "450 CO2" not 450 CO; (2) The middle and bottom panels should have labels that read "450 ppm" and "550ppm" respectively; (3) Why is the range of the model runs so much larger for the 450 ppm [middle panel] scenario?; (4) this is only for energy CO2 - the caption should explicitly state this and the axes should be revised to read "CO2" not "CO2e"	Taken into account - all figures to be revised for clarity
20056	1	30	1	31	13	Delete the descriptions and plotted points for Kyoto gas and forcing, as Kyoto gas concentrations and forcings are not comparable with the other description and points in GHG concentrations and forcings.	Taken into account - all figures to be revised for clarity
20057	1	30	1	31	13	Delete the descriptions and plotted points for Category 0 from the middle panel and those for Category 2 from the bottom panel to avoid bias, as it seems 450ppm goal is out of Category 0 and 550ppm goal is out of Category 2 according to Table 6.1 of chapter 6 (p.19) .	Taken into account - all figures to be revised for clarity
20058	1	30	1	31	13	Replace "but probably not 450" (p.31 line 11) with more objective expression, as the range of "those pledges" is at least within the range of model results to achieve 450 ppmCO2e stabilization (Figure 1.8).	Taken into account - text revised to say "are likely consistent with a 550ppm goal and are at the upper end of the range for a 450ppm goal."
19192	1	30-31				A collaboration between Swiss Re and public-private sector partners (BHP Billiton, ClimateWorks, DONG, McKinsey, Vattenfall and the World Bank) have worked on six scenarios for future power supply mixes in 2050. The outcome "Building a sustainable energy future" presents how to address the effects of climate change caused by oil, gas and coal, while at the same time satisfy the energy needs of a developing world. The scenarios take into account financial, political and societal factors and analyses the possible effect of low-carbon options, such as renewable energy sources on climate change. The report is presented to help governments, corporations and businesses plan their power needs as they seek to get the mix right: fossil fuels will still play an important role while renewable energy will become increasingly important. http://media.swissre.com/documents/Scenarios_for_Climate_Change.pdf	Rejected - This report is grey and does not convey information that is essential and unavailable from other sources. And it doesn't really fit here.
20236	1	31	14	31	29	KEEP this para as it is important finding for policy makers. Move this para to SPM.	Noted - no action needed
35616	1	31	14	31	17	The sentence should be rewritten to clarify its meaning.	Taken into account - deleted "and the countries that make efforts"
40553	1	31	14	31	29	A realistic, not idealistic, discussion is very important for SPMs. Therefore, please incorporate the discussion on "second-best" issues into SPMs.	Noted - redirected to SPM team
20860	1	31	19	31	20	In this text, "many models" suggest the feasibility to realize 2 degrees target. However, according to the text on P28, line 43-45, "only 8 among 14 scenarios" suggest the same thing. These two text should be identified.	Taken into account - combined with comment 579
35617	1	31	19	31	20	This statement that 2C is feasible appears to be in direct contradiction to the conclusions at the bottom of p. 28	Rejected - statement about feasibility is about "first best" most optimistic assumptions. Text is clear. No further action.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20861	1	31	20	31	22	In this text, "some models" suggest the feasibility to realize 2 degrees target. However, according to the text on P28, line 47-48, "only 2 of 14 models" suggest the same thing. These two text should be identified.	Taken into account - Changed "many" to "several" in line 20. And change "some" to "many" in line 21. This sentence will be revisited once ch 6 is finalized to see if still feasible.
19663	1	31	14	31	29	The use of "optimal", "first best" and "second best" language seems somewhat adhoc in this paragraph. "Optimal and "first best" solutions are typically associated with standard welfare optimisation equilibrium economic theory according to which any markets and price signals ensure that demands meets supply and deliver "optimal" solutions in the absence of externalities, imperfect markets, imperfect information and host of institutional barriers. These notions need not be confounded with "optimistic assumptions" such as the level of economic growth rates assumed in the baseline. This is because, whether or not reaching a 2 degree is feasible depends partly on how economic-energy systems are modelled and how endogenous technological change is modelled in addition to "optimistic" or "pesimistic" assumptions. In other words, even under optimistic assumptions, standard economic models (e.g. CGE models) still project high costs related to achieving a 2degree target, whereas other models (e.g. macroeconomic simulation models) under optimistic assumptions indicate low costs or even benefits from achieving a 2degree stabilisation target. The feasibility of achieving 2degree climate stabilisation target does indeed depend on optimistic or pesimistic assumptions but it may depend even more on key socioeconomic behavioural assumptions such as technological change and sudden jumps in the uptake of innovations. I think the paragraph needs to make a distinction between optimal/first-best and second-best assumptions which are more linked to the theory underpinning the energy-economy models being used (i.e. modelling assumptions with, given a certain scenario, optimisation models projecting higher mitigation costs than simulation models), on one hand, and optimistic versus pesimistic assumptions which pertain more to the formulation of baseline and mitigation scenarios and can be largely independent of the model being used (ie scenario assumptions with, given a certain model setup, optimistic scenarios leading to lower costs than pesimistic scenarios). As it stands, the respective paragraph mixes up these distinctions creating some confusion.	Taken into account - the comment was cut off so we can't see the entire comment. We disagree that the "second best" language is ad hoc. The following revisions were made to address the concern with the word "optimistic": 1.) "...only when the most FLEXIBLE assumptions..."; 2) deleted "optimal" at line 16; 3) "...with the most FLEXIBLE 'FIRST BEST' assumptions many models..."
20059	1	31	19		20	Change the description, as this sentence (especially the expression "many") contradicts "only 8 among 14 scenarios found that emissions controls broadly consistent with limiting warming to 2 degrees would be achievable even under optimal conditions" (p.28 line 43-45).	Taken into account - text revised, removed "only" from p.28. See line 38 of p. 29 of the revised text. And Change "many" to "several" in line 20. And change "some" to "many" in line 21 (see lines 19-21. p. 32 of the revised version).
20060	1	31	20		22	Change the description, as this sentence (especially the expression "some models find the goal infeasible") contradicts e.g. "If some portions of the developing world are allowed to delay their participation, which is a politically likely, then only 2 of 14 models found 2 degree goal achievable" (p.28 line 47-48).	Taken into account - combined with comment #611. Also, in page 28, we described about EMF 22. Here several other projects are considered. No discrepancy.
23047	1	31	31	31	32	There is need to discuss adaptation too given its significance to developing countries	Rejected - this chapter's mandate is on mitigation. Please see 1.4.5 where we briefly discuss the necessity of adaptation

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21578	1	32	1	32	13	This paragraph could mention that climate change is often treated as a "threat amplifier", particularly by foreign offices which have examined the potential consequences of climate change for human security.	Rejected - this is a question for impacts analysis and not chapter 1 of WG3. No further action needed.
30060	1	32	1			(All) replace for A lot of	Taken into account - split the sentence into two with a full stop at the end of "sustainable development"
32607	1	32	4		13	This paragraph could benefit from a cross-reference to Chapter 2 on Robust Decision Making, tolerable pathways etc. The point about the difficulties of CBA could be underscored by the developments in UK debate around Impact Assessment, including papers of the where the government has acknowledged fundamental difficulties, the Joint Regulators Group has concluded that fundamentally different approaches are required, and the UK Energy Regulator Ofgem is adopting revisions to its Impact Assessment framework based on explicit representation of Strategic and Sustainability issues (Ofgem, 2012; see comments on Impact Assessment for Chapter 2).	Accepted - cross reference to ch 2 added
35618	1	32	14	32	48	Readers might expect to see some discussion of the liability and legal framework risks associated with large scale CCS mitigation technology included in this section. The authors did cover more advanced impacts and risks associated with geoengineering, so it seems like an appropriate thing to add to the text.	Noted, We covered some of the risks associated with geoengineering because any talk of geoengineering without that generates an avalanche of comments and because there is no chapter that really deals with geoengineering properly. But CCS issues are addressed in some depth in association with the power supply options. See also comment 14 (which is nearly identical and also made by you).
32393	1	32	23	32	26	"...impacts much greater than..." -- this seems rather unspecific and it would be good if more precise language and references could be given.	Taken into account - cross references to be added
21579	1	33	1	33	3	Much more needs to be said on high impact (extreme) climatic events, as these events are what determines the costs of climate change. The length of the 'tail' is very different across models, and the costs is also very different. This needs to be acknowledge upfront as it will have consequences on how cost and risks are treated in the rest of the report.	Rejected - We cite here the Weitzman challenge and have a whole section on risk management pointing, centrally, to tail risk management (though not quite using such language)--see previous page (p.32). No further action needed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35622	1	33	10	33	12	This is a very good point, but awkward and has some errors in odd exceptions. Consider revising to something like: "Unlike many ... its sources are truly global and level. All Kyoto greenhouse gases have atmospheric... emitted. The opposite holds true for SLCPs like aerosols (including BC) and local effects may dominate. The Kyoto GHG spread worldwide..."	Taken into account - Proposed edit makes for even clunkier text and adding the phrase "and level" will create confusion because "level" also implies trends that are flat, which is wrong. The SLCPs are addressed elsewhere. Moreover, since the SLCPs include methane we cant just refer to them generally here because its lifetime is 12ish years and the interhemispheric mixing time is 2-3, which means that while methane is a SLCP it is nonetheless a global pollutant. Revised text to say "MOST of its sources..." And added text: "Extremely short-lived pollutants, such as soot, do not mix globally yet these, too, entrain many issues of international cooperation. Often this pollution moves across regional borders. And coordination across borders can also help promote diffusion of best practices to limit these pollution sources."
30740	1	33	16			"International collective action is unavoidable" is a rather dramatic statement which is not directly linked to any evidence, and is also somewhat beyond the point of this paragraph. Something like "In this context, international collective action is necessary to properly address the issue" would seem better placed here.	Rejected - Other comments (notably 625, 631, 638) lead us to provide more illustrations and citations and context. The pithy sentence at line 16 is correct and accurately reflects the views of the writing team.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35623	1	33	17	33	17	Is coordination on policies to control emissions "needed"? Every nation could decide to act independently and still solve the problem. It's a question of ambition, not coordination; this needs to be clarified in the text. The notion of collective action being needed should be disaggregated with respect to ambition vs. efficiency vs. effectiveness. Coordination is not necessarily needed for any of those to solve the problem if the magnitude/scale of action is big enough.	Taken into account - new text here will focus on ambition and its impact on collective action. But we avoid the statement that disconnected unilateral actions (or what analysts call "tacit bargaining") would lead to effective outcomes. There is not a single result in the tacit bargaining literature that suggests that solution will work UNLESS some new technology appears that makes unilateral action essentially costless--what game theorists call a "harmony" game. there is a rather massive literature on these points in other fields of scholarship; for a plain english summary the Victor 2011 book discusses. revised text to say: "As the level of ambition to manage the risks of climate change rises, collective action can help governments achieve efficient and effective outcomes in many ways."
27439	1	33	24			It is recommended to add "Moreover, to achieve an effective global impact, a critical mass of financial support is needed." See also http://www.weforum.org/reports/scaling-low-carbon-infrastructure-investments-developing-countries or http://www3.weforum.org/docs/WEF_EI_CriticalMass_Report_2011.pdf .	Taken into account - combined with comment 625
21582	1	33	26	33	37	This paragraph needs to explicitly mention the role of investments in end-use technologies versus investments in energy-producing technologies. At present, far more public effort is focussed on energy-producing technology, while the biggest potential benefits come from end-use technologies (see Wilson et al., Nature Climate Change, 2, 780-789, 2012.)	Rejected - this is much too much detail. There are whole chapters on the energy supply and end use systems and finance. We cross reference them extensively. No further action needed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35624	1	33	28	33	29	This statement is not true. Many developed nations have done so without the technological changes; they've done so by shifting the types of economic activities they perform.	Taken into account - OK--but we need to get serious about how those structurally changed economies have done their delinking--some of that is pure structural change (which actually involves pretty radical changes in technology--think of everything that allows a modern service-based economy to function) and imports of emission-intensive goods from other economies. Edits here fix the statement to make it accurate at the global level. Revised sentence to say "Radical delinking of GDP growth at the global level will probably"
29899	1	33	3			Cross-reference is necessary about geoengineering, for example section 3.3.8	Taken into account - discussion on geoengineering has been revised
21580	1	33	3	33	8	Geoengineering needs to be discussed separately from other adaptation measures. Geoengineering is only beginning to be discussed, and most options that have been proposed are decades away from being applicable. The mention that geoengineering could 'crudely offset the impacts of some climate change' should be removed, as this is only under very narrow and local conditions and does not represent the body of literature on geoengineering.	Taken into account - discussion on geoengineering has been revised
21581	1	33	3	33	8	Geo-engineering has already been discussed earlier in the chapter so there is no need to mention it here. Currently, this chapter gives undue weight to a proposal that is still in the early stages of development and not currently being considered an option by governments. Suggest this text is removed or at the very least shortened significantly.	Taken into account - discussion on geoengineering has been revised
25303	1	33	34	33	34	Besides WBCSD 2009, the authors should consider other credible references like UN 2009 (World Economic and Social Survey: Promoting Development, Saving the Planet; UN 2011 (World Economic and Social Survey: The Great Green Technological Transformation) as well as peer reviewed research literature.	Accepted - both UN cites added as well as IEA "Energy Technology Perspectives 2012"
19824	1	33	35		36	This is a very sweeping statement, since capital costs of solar are coming down rapidly and capital costs of coal and nuclear have in the past been subsidized. Also nuclear fuel cost is a small proportion of total electric power cost.	Taken into account - text revised to say "nearly all low"

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20173	1	33	38		42	It is unclear what is the evidence to support the statement 'To stimulate investment in appropriate technologies at the right time and place, it will help if countries and other key actors such as firms would consider the full life cycle of technology and enable a portfolio of technologies to be developed in parallel, not sequentially'. It seems to ignore that many other factors need to be taken into account to promote investment and to influence firms' technological behaviour. The recommendation to consider 'the full life cycle of technology' is too vague to orient technological strategies. In many cases such a cycle cannot be anticipated since technologies change as they are disseminated and improved. It is also unclear what is meant and what is the ground for recommending that technologies should be developed 'in parallel, not sequentially'. To stimulate investment in appropriate technologies a set of interventions need to be implemented both to increase demand of such technologies (demand-pull policies) and to encourage their development and diffusion (technology-push policies) including, for instance, open innovation schemes for the production of technologies as public goods, subsidies and prizes.	Taken into account - edits to delete this and revise per comment 650 will address your point.
35625	1	33	38	33	41	The authors should strongly consider building on this thought to discuss the idea of "infrastructure lock-in". Work by Davis et al (http://www.sciencemag.org/content/329/5997/1330.abstract) in Science, 2010, should be cited.	Taken into account - added text: "The high fixed cost of infrastructures also create "lock-in" effects that help explain why it is difficult to change real world emission patterns quickly," and cited Davis et al and IEA World Energy Outlook 2012.
35626	1	33	39	33	39	"...technology and global trade(?)" does not the amount of goods traded because of technology change their footprint? The authors should consider pointing this out explicitly in the text.	Taken into account - combined with other comments
23985	1	33	4		5	Should read "geoengineering" that could crudely offset the impacts of some climate change (Cicerone, 2006), but could also cause other problems of its own.	Accepted - text revised as suggested.
33036	1	33	4	33	8	It would be useful to reference the full examination of geoengineering options in Chapter 6 here.	Accepted - added cross ref to ch 6
23243	1	33	4			Cross reference geoengineering to Chapter 6 where it is discussed - and also cross reference Annex 2 on LCA in line 39. More cross-referencing throughout would help the reader	Taken into account - combined with comment 653. No further action needed
35619	1	33	4	33	4	What is meant by "crudely" in this context? Consider deleting the word or expanding upon it.	Rejected - Crudely here has the conventional meaning--in a rough, crude way. We have lots of comments telling us NOT to expand this topic and also tight space so no further action needed. We've added cross reference to Chapter 6 which deals with this in more detail.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20174	1	33	43	34	5	Businesses have been historically active in international cooperation in the deployment of technologies. For example, wind turbine manufacturers and developers frequently cooperate with local partners on the deployment of wind energy in different markets, including training sub-suppliers, transferring technological know-how in the form of, inter alia, personnel training, and implementing high-level quality standards'. This statement seems to refer to deployment through the sale of equipment, which does not lead to the creation of technological capacity in the recipient country. It ignores the difficulties that firms in developing countries have found to obtain up-to-date technologies, as illustrated by the barriers found by Chinese producers of wind turbines (Joanna I. Lewis 'Technology Acquisition and Innovation in the Developing World: Wind Turbine Development in China and India', Studies in Comparative International Development, December 2007, Volume 42, Issue 3-4, pp 208-232). For an effective deployment of appropriate technologies a number of measures need to be adopted, including financing and the use of the flexibilities allowed by the TRIPS Agreement to mitigate the negative impact that intellectual property rights may have on technology diffusion. Overall current Section 1.4.4 needs a substantial revision to address key issues relating to technological development and transfer, taking into account different levels of development and countries' needs.	Rejected - This comment is very confusing. The comment seems to point our focus on the sale of equipment. But in reality at p.34 lines 1-2 we actually focus more on training and know-how than equipment. So the point of the comment is unclear. And by referring to "flexibilities allowed by the TRIPS agreement" we open a can of worms because those flexibilities are seen in very different ways. Knowing that, we refer more generally to the "public domain" (line 3). No further action needed.
23986	1	33	8			Add to reference: United States Government Accountability Office (2011). Climate Engineering: Technical status, future directions, and potential responses. Washington, DC (GAO-11-71).	Rejected - this is treated as grey literature by IPCC and should be used only when essential. Given the sensitivities on geoengineering it is better to refer folks to chapter 6 and fuller cites here.
33037	1	33				Please make sure to include references in this section to justify the claims. Currently there is not one.	Taken into account - combined with comments 631 and 625. no further action needed.
31686	1	33	10	33	16	Unlike many matters of national policy, a defining characteristic of the climate change issue is that its sources are truly global. Nearly all climate-altering gases have atmospheric lifetimes sufficiently long that it does not matter where on the planet they are emitted. They spread worldwide and affect the climate everywhere. Thus national governments develop their own individual policies with an eye to what other nations are likely to do and how they might react. Even the biggest emitters are mostly affected by emissions from other countries rather than principally their own pollution. International collective action is unavoidable The Countries must bear responsibility according to their contribution to emissions	Rejected. This is just a direct quote from our chapter. No further action needed. The only proposed change is the "countries must bear responsibility" but that is too prescriptive.
23048	1	33	10	33	16	This paragraph puts blame on all world countries as being emitters of GHGs contributing to climate change. It is well known that the great emitters are the industrialised countries!	Noted, We disagree on the point about assigning blame in this paragraph. Rather, the paragraph talks about the structure of a problem for which emissions entrain multiple countries. For additional clarification see comment 625

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
31687	1	33	17	33	24	Collective action is needed on many fronts. Those include not only coordination on policies to control emissions but also collective efforts to promote adaptation to climate change. International coordination is also needed to share information about best practices in many areas. For example, many of the promising options for reducing emissions involve changes in behaviour; governments are learning which policies are most effective in promoting those changes and sharing that information more widely can yield practical leverage on emissions. Coordination is also essential on matters of finance since many international goals seek action by countries that are unwilling or unable to pay the cost fully themselves, The Countries are causing the problem is responsible for the financial support and technology transfer	Taken into account - added text: "International cooperation, including financial transfers, can also help diffuse knowledge and capabilities to countries as they adapt to the effects of climate change (cites). Indeed, in response to these many logics for international cooperation on mitigation and adaptation extensive intergovernmental and other coordinating efforts are under way (cites)." Cited Bali Action Plan, Durban Platform, World Bank 2010. Also cited section 1.2.1.4 and also chapter 13
29563	1	33	9	33	24	There are numerous studies on these issues, yet this subsection doesn't name a single reference.	Taken into account - combined with comments 631 and 625. no further action needed.
35620	1	33	9	33	24	Section 1.4.3 does not have a citation and needs several for the statements that are made.	Taken into account - combined with comments 631 and 625. no further action needed.
35621	1	33	9	33	24	Note that coordination is already taking place at many levels. And this should be reflected in this section.	Taken into account - combined with comment 631. no further action needed.
19350	1	33	9			It should be mentioned here that developed countries have more advanced information and technologies, they should be the role of leader encouraging international actions.	Taken into account - combined with comment 631. no further action needed.
29772	1	33	9	33	24	No reference for this part?	Taken into account - combined with comment 631. no further action needed.
29694	1	33 of 48	3		5	As we noted in our comments on the FOD, it is dangerous and misleading to suggest geoen지니어ing is a "risk management approach" when geoen지니어ing technologies are speculative, with unknown short- and long-term impacts on climate, environment and biodiversity. Reference to geoen지니어ing as an element of a risk management approach should be DELETED.	Taken into account - discussion on geoen지니어ing has been revised
29695	1	33 of 48	5		8	PROPOSED TO DELETE: "Since AR4 a growing number of studies have looked at geoen지니어ing options—the technology, possible impacts and risks of testing and deploying geoen지니어ing, and strategies that might be needed to govern geoen지니어ing (Barrett, 2008; Victor, 2008; The Royal Society, 2009)." This sentence adds nothing substantive or informative.	Taken into account - discussion on geoen지니어ing has been revised
35627	1	34	13	34	13	It's better to say 2 degrees C than invoke DAI which is truly not well defined and likely local.	Accepted - text revised to say: it will be unlikely to achieve widely discussed goals such as limiting warming to 2 degrees at least without drastic...

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
20437	1	34	16	34	19	References are missing for data of energy demand decline after Fukushima accident! For which area was calculated the cited energy demand by 5%? May be the decline of electricity demand in the Tokyo area during the summer 2012 in comparison with that in summer 2010 also a result of different weather conditions, as reduced demand for cooling, e. g.?	Taken into account - 1) line 16, revised text to say: "curbed nationwide domestic household electricity demand (by cutting the hours of air-conditioning and replacing more energy efficient appliances such as LED etc.) by 5% in winter 2012 (January-February) in comparison to the same period in previous year according to survey by Ministry of Environment of Japan (Minty of Environment, Japan 2012)." 2) Changed lines 18-19 to say: "Similarly, electricity demand in the Tokyo area was around 10% lower in June-September 2011 compared to the same period in previous year and about 40% of the reduction in electricity use resulted from conservation of electricity used for air-conditioning (K. Nishio and K. Ofuji 2012)."
20764	1	34	16	34	16	pls add the date of the Fukushima accident	Taken into account - text revised to say "accident in May 2011, in Japan changes in life style and behavior curbed"
30741	1	34	16		19	This section describes behavioural changes; it does not relate specifically to subcategory 1.4.4, 'Promoting Investment and Technological Change'.	Rejected - The relationship is via energy efficiency. If we talk about investment and technological change then we need to discuss how the hardware interacts with behavior. That's a big field of resarch.
31582	1	34	16	34	19	Lacking reference.	Taken into account - combined with other comment (663)
40554	1	34	16	34	17	It is needed to present the factual basis of "5%" in the part "After the Fukushima Daiichi accident, life style and behavioral change curbed energy demand by 5% during the winter 2011-12 compared with the previous year"	Taken into account - combined with other comment (663)
24422	1	34	16	34	18	It is true that energy or electricity demand was lower after Fukushima Daiichi accident, but this is mainly due to lack of access to sufficient energy sources, which forced people to reduce energy consumption. This paragraph sounds people naturally changed their behavior and curbed energy demand.	Taken into account - combined with other comment (663)

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35628	1	34	22	34	25	As written, the language is too policy-prescriptive and breaches IPCC's mandate to be policy-relevant without being policy-prescriptive. Consider revising to read, "A report by UN (Energy, 2010) suggests that energy efficiency policies and measures need to be..."	Taken into account - text revised to say "measures are often most effective when they are an integral part of energy sector reform which helps to ensure that"
19416	1	34	31	34	36	The sentence "While many policy efforts focus on end-use efficiency, improvements in efficiency are relevant across the entire value chain from primary energy supplies to final users" addresses my previous concerns. Most of the "action" is on the productive side of the economy -- the creation and movement of goods and services consumes far more energy (some two-thirds of all energy consumed globally) than energy used in households and for personal transportation. And, yes, a lot of energy is consumed in transforming primary energy into final energy.	Noted - no action needed
21583	1	34	34	34	36	This statement is contradicted by the paper of Wilson et al. (Nature Climate Change, 2, 780-789, 2012.), which shows that the potential for improvements in energy efficiency in end-use technology far outweighs that of investments in energy production.	Noted, The statement doesn't have anything to do with that topic--the statement here is about the Jevons effect and is our effort to put claims of a complete offsetting Jevons effect (which some other commenters want to acknowledge) into perspective.
35629	1	34	40	34	40	The tone of this sentence could be made more positive by including something along the lines of: "adaptation is primarily the scope of WG2, there are"	Accepted - text revised as suggested
24091	1	34	41	34	45	The simply and binary juxtaposition between mitigation and adaptation does not make sense. Especially the last few lines read as if mitigation should be intensified /only if/ adaptation was difficult	Noted, it makes complete sense, especially in regard to the earlier discussion about risk management. Mitigation and adaptation are elements of a strategy--they are complements and in some settings substitutes. And the sentence here does NOT say that mitigation should be intensified only if adaptation is difficult--it is a statement about the impacts of both on the damages and costs. no further action needed.
24092	1	34	41	34	45	The reference to geoengineering appears to be a simple policy recommendation that is not backed up by arguments or literature.	Taken into account - combined with other comments
23988	1	34	42		45	Use of the word perhaps is not strong enough to indicate that "geoengineering" is not a real policy option, but is a multiplicity of speculative notions, some of which are quite dangerous. I recommend striking these references to geoengineering. As written the meaning is not clear. Geoengineering is neither part of adaptation nor mitigation, but is a proposed form of heavy-handed manipulation.	Taken into account - combined with other comments
21584	1	34	42	34	42	Remove the text in brackets: "and perhaps also geoengineering". Geo-engineering cannot be considered at the same level as adaptation and mitigation given its early stage of development.	Taken into account - combined with other comments

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22941	1	34	43			add 'and success' to "overall policy strategy". In addition, this reference can help provide signal/direction for further examination of these notions, while acknowledging that a focus on adaptation is "beyond the scope of this report": Susanne Moser and Maxwell Boykoff, eds., Successful Adaptation to Climate Change: Linking Science and Policy in a Rapidly Changing World, Routledge 2013. http://www.routledge.com/books/details/9780415525008/	Taken into account - combined with other comments (672)
20438	1	34	45	34	45	Adaptation strategies are much less uniform than mitigation strategies due to regionally different features of the global climate change, due to uncertainties of climate change scenarios and, finally, due to different socio-economic situation and technical resources of countries concerned. Further, there exist an interaction of adaptation and mitigation actions. For example, increased energy demand for air conditioning could result in more GHGs emission, if not renewable energy sources are used.	Taken into account - the section on adaptation has been slightly revised to reflect the commentor's point
21585	1	34	45	34	45	Replace "and perhaps also prepare geoengineering" with "and perhaps further investigate geoengineering options"	Taken into account - combined with other comments (673)
24554	1	34	6	34	15	This paragraph is clear and contains important content- suggest it should be kept if the chapter is shortened	Noted, thank you
23987	1	34	8			Climate is always changing, so what are you saying here?	Noted, this comment seems to be mis-labeled. There is no reference to climate variability at line 8
26502	1	34	10	34	10	one possible reference to back this statement that investment in energy efficiency has the potential to promote high value added activities and job creation is (ILO, 2012, 2013): Source: International Institute for Labour Studies (2012), Working towards sustainable development: Opportunities for decent work and social inclusion in a green economy (Geneva, ILO, 2012); ILO (2013 forthcoming), Sustainable development, decent work and green jobs, Report V. International Labour Conference, 102nd Session, 2013	Accepted - cites added as suggested
26310	1	34	16	34	18	Add "in Japan" after "Fukushima Daiichi accident".	Taken into account - combined with other comment
29773	1	34	16	34	19	Are the data for global, Japan nationwide, or a specific area in Japan?	Taken into account - combined with other comment
29564	1	34	37	35	13	This subsection could give some more detail about recent political developments, such as the discussion concerning the Green Climate Fund.	Rejected - we are concerned not to get too heavily involved writing about things that are rapidly in flux. No further action needed.
29697	1	34 of 48			45	Again, as we wrote in our FOD comments, we propose deletion of this parenthetical reference to geoengineering. It is premature (and radical) for the IPCC to suggest here that geoengineering will play a role, perhaps a large one, in overall policy strategy, on par with mitigation and adaptation.	Accepted - phrase on geoengineering deleted at line 45
29696	1	34 of 48	41		42	As we wrote in our FOD comments, we propose deletion of this parenthetical reference to geoengineering. It is premature at best to suggest that a speculative climate response such as geoengineering could or should play ANY role in a overall climate policy let alone a "larger role."	Taken into account - combined with other comment
23546	1	35	15	35	15	Can you add a sentence here that gives the reader single, unified, major thread to follow? This might involve a series of themes, but any way to suggest what you have discovered makes the entire report coherent or that underlines the most important evolving arguments of it will be useful to the reader.	Rejected, I wish we could. There is no single theme--we are a committee of hundreds not a Leviathan. No further action needed.
23244	1	35	15			The figure produced by TSU of a cube representing the report structure would be useful to include here.	Taken into account - figures to be revised and updated
35630	1	35	33	35	44	It would be nice if Chapter 5 addressed the linkage to WGI on emissions - i.e., do they make sense (WGI sense that is) insofar as the historical numbers quoted here match observed increases?	Taken into account - deleted lines 34-39. This may be a comment for Ch 5. Ch 1 cannot deal with this issue.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35631	1	35	34	35	34	"many such pollutants (including particles), the..." The authors focus on BC, so they should not not omit discussion of it here.	Taken into account - the previous sentence was revised to say: "gases and particulate pollutants that affect climate."
35632	1	35	39	35	39	Does the trading actually increase the CO2 emitted per GDP? Is this mentioned anywhere here? e.g., China is less efficient in making the widget and then you have to ship it to the US.	Noted - it's a mixed bag. IN some cases trade makes emission intensity higher because of transport costs; in others the emissions are lower because of efficiency. For heavy industry the effects are mainly to raise emissions because countries that have trade advantages tended to have less energy efficient industries plus there were transport emissions. This is also a huge issue in food now with the "food miles" movement. most serious studies show local food has higher emissions (because local trips have lower load factors and long distance transport isn't that energy intensive when done by ship) but now there is some new work suggesting the opposite. Our chapter assumes that chapter 5 deals with these kinds of issues, and in any case per comment 688 we are just going to simplify the claims we make about what that chapter does.
35633	1	35	47	36	15	Doesn't all of Chapters 7-11 comprise the energy system? Thus Chapter 7 is really the "energy supply (or production) system". The others are the energy end-use system. People need to think in terms of the entire system - one does not get transportation without fuel, or light without power. What affects one part affects others. In short, the definition of "energy system" changes throughout the entire AR5 and, as a result, the authors should make a concerted attempt to ensure cross-chapter consistency in defining this throughout the report.	Taken into account - at line 46, text revised to say "energy supply systems" and added sentence: "Together, chapters 7-10 cover the energy system as a whole."

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
32608	1	35	5		6	I have seen no evidence of this statement on "balancing mitigation and adaptation". It is often made, but actual empirical examples are extremely rare. Given the science and centrality of the collective action problem, it is likely that both mitigation and adaptation are structurally inadequate, there is little evidence of fungibility between the mainstream funds for energy / LULUCF versus most adaptation-related expenditures etc. Perhaps tellingly the paragraph is statement without reference. The final sentence hints at a hypothesis - finite diplomatic resource - but I could equally posit the opposite: the pie of diplomatic resource to tackle climate change is driven by the level of concern, both rise or fall together, and rising expenditure on adaptation will correlate with anxiety to mitigate emissions to reduce even larger future adaptation expenditures. In the absence serious literature (?) we are all guessing, it would be useful to clarify the points rather than assume a position.	Taken into account - This is an important point and will be discussed with team discussion E. The point we are trying to make here is a larger one of macro strategy--from the imaginary perspective of a social planner (although we don't use that language because the language would get in the way). The idea is that the countries on the "front lines" for each of these activities--mitigation and adaptation--are quite different. It is a large, conceptual point not a detailed one that comes out of some particular study. The reviewer makes the useful point, too, that the players are different--the agents differ. Added sentence: "As a practical matter, the relevant policy makers also differ. For mitigation many of the key actions hinge on international coordination and diplomacy. For adaptation the policy makers on the front lines are to a much greater degree regional and local officials such as managers of infrastructures that are vulnerable to extreme weather and changes in sea level."
29774	1	35	16	35	16	Should 'Chapters 2-5' be 'Chapters 2-4'?	Accepted - corrected
26311	1	35	27	35	30	As sustainable development deals with economic growth, environmental protection and social equity (the three pillars), it should be better to add at the end of the sentence: "(...) and synergies involved with economic growth, protection of the environment, social equity, justice and other goals."	Accepted - text revised as suggested.
34282	1	36	12	36	13	Since the definition of measures includes technologies, processes and practices, please consider adding 'processes' to this sentence.	Accepted - text revised as suggested
33038	1	36	16	36	18	Chapter 12 may be better referenced as its own entity, as it also covers aspects that would relate it more to the sector chapters.	Accepted - text revised so chapter 12 is referenced as its own entity
23245	1	36	3			Suggest "Passenger and freight transport systems are covered in Chapter 8." Change "energy products" to "energy carriers".	Accepted - text revised as suggested
23246	1	36	6			Mention the Bioenergy Annex in Chapter 11	Accepted - text revised to mention the bioenergy annex in ch 11

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
34281	1	36	7	36	11	For a clearer understanding of the term 'co-benefit' as it is used in the AR5, I suggest following the Glossary definition more closely. In particular, it is important to understand that 'co-benefits' and 'adverse side-effects' are used to describe the "effects that a policy or measure aimed at one objective might have on other objectives, without yet evaluating the net effect on overall social welfare". Picking examples where the evidence is more robust (such as energy efficiency and air pollution, see section 6.6) and mentioning the major channels through which they operate at firm and consumer level (decarbonization of energy supply, fuel switching in energy demand sectors, and reduction of energy demand through efficiency improvements and behavioural/structural change) would be helpful to frame the assessment in the following chapters. The last sentence of the paragraph should also mention the caveats of quantifying co-benefits and adverse side-effects (see Box TS.4). Finally, you may want to add a few sentences to help readers to better understand what aspects of co-benefits/risks are covered in which chapter.	Taken into account - Text revised
21586	1	36	9	35	13	These two sentences should be expanded to include more information on the potential for financing adaptation, which is a big topic in international climate negotiations.	Rejected - This comment appears to relate to page 35, not p.36. In response to other comments we have added a bit more discussion of finance as it relates to adaptation, but inserting that topic into this paragraph would be unwise because this paragraph is really about the macro tradeoffs and actors who get engaged in these activities. see response to comment 692.
23247	1	36	9			Change "of soot" to "local air pollution". Is not just firms that switch - could be a household - eg in rural Africa or wherever.	Accepted - text revised as suggested
35634	1	36	9	36	9	"of ozone, soot, and other particles..." all particles including SOA are harmful as is surface ozone.	Taken into account - combined with comment 699
20439	1	37	18	37	18	To add: Annual Report of the Environmental Agency. Umweltbundesamt 2012, 13-14. www.umeltbundesamt.de/uba-info-medien /4213.html	Noted - proposed action unclear. Doesn't indicate specifics on where to insert cite
20440	1	37	18	37	18	To add: Aresta, M. (ed.).2010. Carbon dioxide as chemical feedstock. Weinheim, Wiley-VCH.	Noted - proposed action unclear. Doesn't indicate specifics on where to insert cite
21562	1	4	1	4	2	Geo-engineering is mentioned here and elsewhere in the chapter seemingly at the same level of understanding and development as adaptation. These are very different options. Adaptation must occur and relies on a range of effective actions. Geo-engineering is still at an early stage, and many proposed options are decades away from being understood or applicable. Geo-engineering could be mentioned once in this chapter but it needs to be defined and explained in its own context.	Taken into account - team has pared back discussion of geoengineering to a few key points, including a mention in the ES. Text is narrow and accurate here. Neither adaptation nor geoengineering sit easily inside WG3, where the focus is on mitigation, but both need mentioning to help set mitigation efforts in their proper larger context. We have deleted this passing reference here--see comment 82.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
30054	1	4	1	4	2	(as well as other possible respnses such as geoengineering) elimination	Accepted - text on geoengineering deleted
21564	1	4	11	4	11	"unless... a wide array of cost-effective low emission technologies were available". Note that in Ch.6, p.22, l.19 it states that the 450ppm goal is possible given options available to us today.	Noted - What chapter 6 actually says is more nuanced, as is our text here. The point is actually that these options be TESTED and viable (BECCS is not, for example) AND that they be "cost-effective" within current realms of acceptable cost, which is not the case. Our language is consistent to the wording in Chapter 6
33016	1	4	12	4	13	Discussions of feasibility of mitigation targets may be better framed about the requirements to reach certain targets. Feasibility in itself is subject to wide interpretation, and is binary in its nature subject to wide ranging assumptions, and therefore not the best presentation for the IPCC.	Rejected - we have had an extensive discussion of this in our chapter and thus discussed "feasibility" (which is something lots of policy makers want to know) in context of conditions. Text ok.
27408	1	4	12	4	13	Is it in general unlikely or only if international action is lacking or mitigation options are not available?	Taken into account - uncertainty language throughout the chapter has been revised to be consistent with IPCC terminology
23543	1	4	14	4	15	This fourth claim reads as implausible. Not only policies must be developed but INSTITUTIONS will need to be developed. By claiming this, one doesn't have to imply the more radical point: that new regimes will be demanded. But certainly new institutions will. It is really very important to set up this expectation internationally and to provide a place where it can be cited. It will be needed, and it will be complicated and encounter much resistance. (NOTE that at p. 12: 27-30 you actually discuss exploring new institutional forms. So an earlier mention is certainly consistent with your more in depth discussion later.) (Also p. 29: 11-14 -- Yet again, the mention of institutional formation.)	Accepted - We kept the fourth claim narrow to focus on the diversity in responses. We talk a lot about institutions elsewhere in the text, and by implication institutions are important here too. But if we claim here that institutions will just encounter resistance then we skate onto thin ice as the policy literature says some institutions encounter resistance and others not. Thus we stayed narrow for this finding to make sure it remains accurate. However, we will make one edit; text revised to include institutions as suggested.
24534	1	4	14	4	15	Sentence is unclear. Suggest replace with 'Fourth, it is likely that deep cuts in emissions will require a diverse portfolio of policies and technologies as well as changes to human behaviour.'	Taken into account - combined with other comment. Sentence has already been edited (per comment 76) to say "changes in human behaviour and consumption patterns"
23208	1	4	15			"changes in" human behaviour.	Taken into account - combined with other comment (76 and 87)

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
23983	1	4	2			The phrase "geoengineering—for example through capacity-building" is not clear. I suggest dropping the use of the term geoengineering, since it is not really a response to any national priorities. Just use the term "capacity building" or mention fuel switching, for example.	Taken into account - combined with other comment (82)
35500	1	4	2	4	2	It is unclear what the text after geoengineering is referring to - "capacity building" for geoengineering - the authors surely do not mean to say that. Please clarify the text.	Taken into account - combined with other comment (82)
19172	1	4	24	4	25	All the forms of "uncertainty" are purely the personal opinions of people who have a conflict of interest in making them	Noted - No further action needed
20234	1	4	24	4	35	KEEP this para as it is important finding for policy makers. Move this para to SPM.	Noted - No further action needed. Thank you.
35507	1	4	27	4	27	The text states that "profound uncertainties arise in the socioeconomic factors addressed in WG 3." Do you really mean "uncertainty" (lack of knowledge), or is it "variability" (differences across populations)? Or a combination of the two? The authors should clarify and give some specific examples.	Rejected - we mean uncertainty, not simply variability. I think the sentences that follow provide illustrations of the types of phenomena we are talking about; inserting specific technological or other examples is probably not appropriate here in the summary.
19170	1	4	3	4	4	The problem is to study trends in atmospheric concentrations, not trends in emissions. The two are not necessarily related	Rejected - emissions lead to concentrations (with other mediating factors along the way). WG1 makes that abundantly clear. No further action needed.
33017	1	4	36	4	40	It seems odd that the Chapter 1 ES has a section summarizing Chapter 2. Wouldn't this text be better placed in the Chapter 2 ES?	Taken into account - Authors will check to make sure the findings are reflected in the underlying chapter and most importantly, iterated with Chapter 2 authors to assure that they accurately reflect their chapter text as well.
30055	1	4	38	4	40	(and possible ... appear quickly) elimination	Rejected - text here on geoengineering perfectly summarizes the larger points we make in the main text. The whole idea is "emergency response" as part of a risk management strategy. Text revised to say "potentially very risky geoengineering technologies" per comment #98
23984	1	4	39			Should read "deployment of POTENTIALLY VERY RISKY geoengineering technologies as a last resort"	Accepted - text revised as suggested
35501	1	4	4	4	4	Discussion of the Copenhagen / Cancun commitments is warranted, particularly seeing as how they include a far greater percentage of global emissions than the Kyoto Protocol	Rejected - we are making a different point here about the impact of past agreements. Per your comment we mention copenhagen/cancun elsewhere and discuss further in main text. No further action needed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35503	1	4	4	4	4	"twice the rate" - is this in percent or in terms of absolute emissions - the absolute growth rate (which is more important than % for climate) is probably larger than the 1970s.	Rejected - we are trying to write compactly here and make a different point and thus we talk about rates. Absolute data are available in the main text if you want them. No further action needed.
35502	1	4	4	4	5	It's worth inserting text that reads, "... due almost entirely to the carbon-intensive growth of major emerging economies."	Rejected - this will be read as a swipe against the emerging economies and thus require balancing text to talk about levels of effort by the Annex I countries. That's too much text here. We are making a much narrower point, which is that despite these agreements emissions are growing quickly. that's it. No further action needed.
30729	1	4	42	4	44	"GHGs already loaded into the atmosphere and virtually certain to be emitted in the future" implies that these are the same GHGs. Suggest re-writing to distinguish between the two groups: those already loaded, and those certain to be emitted. Adding a comma and the word "those" between the two may suffice.	Accepted - text revised as suggested
20856	1	4	6	4	13	As mentioned above(No.18), 1.5 or 2 degrees celsius aren't agreed targets. However this text focuses on them, and it may mislead readers to thought that these targets have been already agreed. This text should be deleted.	Rejected - Text refers to these goals as "widely discussed" which is accurate. No further action needed.
20753	1	4	6	4	8	Not clear: if it is virtually certain, why is there medium agreement in []?	Taken into account - uncertainty language throughout the chapter has been revised to be consistent with IPCC terminology
30728	1	4	6	4	8	The first part of this sentence describes this finding as "virtually certain", which does not seem to line up with the "medium agreement, robust evidence" description provided at the end of the sentence. Additionally, since this statement deals with modeled numeric values, providing a more quantitative description of this finding may be useful.	Taken into account - uncertainty language throughout the chapter has been revised to be consistent with IPCC terminology
19171	1	4	6	4	8	The problem is surely to study trends in atmospheric concentrations, not trends in emissions. The two are not necessarily related	Noted - This is a duplicate comment. See response to comments 46 and 94
24471	1	4	6	4	13	It's wrong to put emphasis on scenarios of 1.5 and 2 degree targets, because IPCC must keep neutrality and must cover full range of scenarios in table 6, chapter 6 page 19.	Rejected - combined with other comment (104)
25671	1	4	6	4	13	This part should explain unlimited evaluation results because it is prejudicial and misleading to put an emphasis on limited scenarios from 1.5°C to 2°C. IPCC should be policy-neutral and should have responsibility to indicate unlimited evaluation results, as described in Table 6.1. The 1.5°C target is not realistic and even 2°C target is extremely difficult to attain, as described in (Höhne, 2011, conclusion) and (Rogelj, 2011, abstract). These literatures are listed in the No4 line of this table.	Rejected - as far as I can understand this comment, it seems to raise the same point as comment 104. The text in this paragraph refers to these goals as "widely discussed", which is accurate. No further action needed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21563	1	4	6	4	13	This statement that the current trajectory is not consistent with 2degC is not complete and should mention that the probability of achieving the 2degC goal diminishes, and that it assumes that emissions continue on the same trajectory. Also, this paragraph should include an explanation for the statement.	Rejected - The paragraph, here in the summary, explains the basic idea of a point addressed in considerable detail in the main text. No further action needed.
35504	1	4	6	4	8	Technically, AR3 (Burning Embers figure) listed this as 2C above 1990 levels - NOT above pre-industrial. While political agreements since then have invoked pre-industrial, it does not have grounding in science (i.e., IPCC). The authors should consider clarifying the text accordingly.	Taken into account - per our team discussion, the paragraph text on 2 degrees has been revised
35505	1	4	6	4	8	This statement seems to preclude the WG1 assessment and the virtually certain (99%+) is really not justified here. Please avoid calibrated uncertainty and claims that rely on the WG1 assessment (without appropriate cross-references). It also needs a perspective of over what time horizon the authors are referring to. From Chapter 11 WG1 the likelihood of exceeding 2C before 2050 is only : for some RCPs "by the mid twenty first century (2046-2065) the increase in global mean surface air temperature will exceed 1.5C, and unlikely that it will exceed 2C" (language pending final govt draft).	Taken into account - per our team discussion, the paragraph text on 2 degrees has been revised
35506	1	4	9	4	18	There are a large number of "virtually certain", "very likely" etc. statemnts that really cannot be justified by any uncertainty analysis presented/documentd here. In spite of all the certainty language, the section seems vague. The authors should revise the text accordingly.	Taken into account - uncertainty language throughout the chapter has been revised to be consistent with IPCC terminology
27406	1	4	9	4	11	Considering the nature of IAM, the fact that only fast international action using all mitigation options results in least cost is not very surprising.	Noted - this comment is hard to understand. The fundamental point isn't actually about the IAMs--it is about the structure of a problem with many sources and the need for aggressive concerted action to meet a fixed target. No further action needed.
27407	1	4	9	4	11	This sentence needs some clarification: What is meant by "practically feasible" as opposed to "feasible"? Is the goal achievable at higher cost (higher than least cost)? Does it mean, new cost-effective low emission technologies would have to be developed, or does it refer to existing technologies that would need to be made available?	Accepted - text revised as suggested
20687	1	4	1	1	8	Emissions 'embedded' in imports to main industrialised countries should be shown here or close by with an explanation of their significance. Lines 9-16 are too vague for this purpose.	Rejected - "embodied" emissions are shown in Figure 1.4
19655	1	4	15	4	15	"changes in human behaviour and consumption patterns" would read better than "human behaviour"	Accepted - text revised as suggested
19656	1	4	28	4	31	Future developments in energy prices, particularly oil prices and other fossil fuel prices also constitute a major source of socioeconomic uncertainty impacting emissions intensities that need to be explicitly singled-out and acknowledged	Taken into account - text revised: "Those uncertainties INCLUDE the development and deployment of technologies, PRICES FOR MAJOR PRIMARY ENERGY SOURCES, average..."
19653	1	4	7	4	7	I presume the goals of limiting to 1.5 or 2 degrees Celsius is made with reference to the year 2100 (relative to pre-industrial levels); if yes, then 2100 needs to be explicitly mentioned	Rejected - no, it is an equilibrium response with no explicit year. Text is OK.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19654	1	4	9	4	10	In my opinion the word "cost" is extremely controversial and can take many meanings when applied to the economics of climate change literature. Within the context of this paragraph I would recommend referring instead to "least investment cost" or "least upfront investment cost" rather than loosely to "least cost"	Rejected - Cost is the right word here. We are making a slightly different point which is about the conditions that lead to "least cost" outcomes where least cost means equalizing MAC (marginal abatement cost) throughout the world. Text is ok
29763	1	4	14	4	15	human behaviors? Isn't human behavior changes more accurate?	Taken into account - combined with comment 76. Text revised.
29690	1	4 of 48	1		2	We strongly propose that "as well as other responses such as geoengineering" be deleted. Geoengineering has not been shown to be a climate change response, let alone a response that could or should "engage broader national priorities." Given that geoengineering is highly speculative and controversial, and that there is a de facto moratorium on geoengineering activities at the UN CBD (Decision X/33), it is particularly inappropriate to advise that geoengineering engage broader national priorities.	Taken into account - the writing team has discussed this topic extensively. To be clear, we are not "advising" geoengineering, we are merely reporting on the literature. Also, the UN CBD is not a de facto moratorium. All that said, reference to geoengineering has been deleted (see comment 82).
29691	1	4 of 48	38		40	DELETE: "and possible deployment of geoengineering technologies as a last resort in case the dangers of extreme climate change appear quickly." "Last resort" and "extreme climate change" are unscientific, subjective terms whose meanings have not been commonly agreed. Furthermore, WGIII authors are well aware that there is a vast number of scholarly studies devoted to adaptation and mitigation compared to the minuscule number of studies devoted to geoengineering. Implying that adaptation, mitigation and geoengineering are all responses to climate change, as this sentence does, is completely unfounded. Given that there is acknowledged "low agreement" here, this reference to geoengineering should not appear in WGIII's introductory chapter.	Rejected - see comment 96 and 98
29692	1	4 of 48	40		42	DELETE: "In that context it is very likely that adaptation to climate change should be viewed as a complement to mitigation policies, not a substitute [1.4; high agreement, limited evidence]." REPLACE WITH: Adaptation to climate change is an unavoidable and necessary measure for countries affected by climate change, but should never be seen as a substitute for mitigation. Adaptation always has and always will play a larger role in the overall policy strategy of developing countries than mitigation has played or will play.	Rejected - proposed new text has policy prescriptive overtones. Original text better. No further action needed.
31583	1	42	36	42	37	This is a statement from the WTO President, and should not be treated as a reference.	Taken into account - combined with other comments
20441	1	43	13	43	13	To add: Möller, D, SONNE: solar-based man-made carbon cycle, and the carbon dioxide economy. Ambio 41, 413-419.	Noted - proposed action unclear. Doesn't indicate specifics on where to insert cite
35509	1	5	16	5	16	Why has the scale of the challenge grown so much since 2007? Because of rising costs of mitigation measures? Because of unprecedented growth in major emerging economies? Please explain.	Taken into account - revised text: "...since 2007 due to rapid growth of the world economy and the continued lack of much effort to control emissions. This trend raises questions..."

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
33018	1	5	2	5	5	Please make sure that the definition of mitigation mentioned here exactly matches what appears in the WG III Glossary. It would also be useful to reference the Glossary here.	Taken into account - text revised to say: "Mitigation" is the effort to control the fundamental human sources of climate change and their cumulative impacts, notably the emission of greenhouse gases (GHGs) and other pollutants, such as black carbon particles, that also affect the planet's energy balance. Mitigation also includes efforts to enhance the processes that remove GHGs from the atmosphere, known as sinks. Reference to glossary added
25505	1	5	28			"within which governments and various actors" - Here, the application of the term of "actors" may derived-different contextual meaning. According to the contextual meaning of the sentence, I would suggest "multiple actors" or "various actors in governance process" rather than dived "governments and various actors" because (1) government is an actor, (2) Addressing the climate issue has been a multiple actors engagement in economic and political context	Rejected - section has been rewritten and sentence is deleted. Suggestion is no longer relevant.
20754	1	5	29	5	28	I would change "climate issue" with "issue of climate change"	Rejected - section has been rewritten and sentence is deleted. Suggestion is no longer relevant.
19809	1	5	3	5	4	On this page we have two definitions of "mitigation" in the text and in FAQ 1.1 with different wording. I suggest delete the definition in lines 3-5 or use the same wording as in FAQ 1.1.	Taken into account - see response to #127
27410	1	5	32			Is this consistent with the Glossary?	Taken into account - see response to #127
27409	1	5	32	5	40	Please put the box either on top or bottom of the page and make it more visible through coloring etc..	Editorial – copyedit to be completed prior to publication
20431	1	5	33	5	39	It should be mentioned that anthropogenic interference with the climate takes place also by land use and land cover change that alter the surface albedo and other climate relevant surface parameters.	Rejected - That is true, but text here is accurate. No action needed.
20755	1	5	33	5	36	Didn't the IPCC AR4 define climate in a different way at the UNFCCC?	Taken into account - added text noting a difference in the definition between IPCC and UNFCCC and referred readers to the glossary for the IPCC definition
33019	1	5	33	5	40	Please make sure that the definition of mitigation mentioned here exactly matches what appears in the WG III Glossary - a definition that differs from that of the UNFCCC. It would also be important to note the differences between the UNFCCC definition of mitigation and the IPCC definition and any implications that this difference may have.	Taken into account - see response to #134 and #127
27411	1	5	33	5	36	The definition of climate change in UNFCCC (anthropogenic) is different from the definition in IPCC (natural and anthropogenic). This must be noted in the FAQ.	Taken into account - see response to #134 and #127
30731	1	5	37			Elaboration on "activity" would add to this response. As it stands, this response is very vague on what is climate change mitigation.	Taken into account - text revised: Climate Change Mitigation is a process through which policy makers initiate action to reduce emissions...

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19173	1	5	37	5	40	The problem is surely to study trends in atmospheric concentrations, not trends in emissions. The two are not necessarily related	Taken into account - combined with other comments
25293	1	5	38	5	40	The definition of Mitigation needs to align closely with the Ultimate Objective (Article 2) of the UNFCCC. Climate Change Mitigation not only includes activities that reduce emissions but also other activities that mitigates climate change, e.g. geo-engineering options including Solar Radiation Management (see SOD Chapter 6, Section 6.9, page 77-79).	Taken into account - see response to #134 and #127
22289	1	5	38	5	40	This is an inaccurate statement and reflection of Art. 2 UNFCCC. In order to accurately reflect the role of mitigation in relation to Art. 2 UNFCCC, it should read: "The ultimate goal of mitigation (as well as adaptation and other actions) under Art. 2 of the UNFCCC is "to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner." Accurately reflecting Art. 2 UNFCCC is important for the purpose of correctly framing the FAQ on mitigation in the context of not only the science but also the current international policy architecture on climate change.	Taken into account - see comment 130. Also text added to more closely reflect the Art 2. UNFCCC
20430	1	5	4	5	5	The aim of climate change mitigation is the reduction of GHG's emission, as established on page 5, line 37 of this draft. The planet's energy balance is affected by emission of GHGs but these GHGs should not be designated as "pollutants", absolutely. Unfortunately, the term "pollutants" is missing in the Glossary. I propose to use the definition of the US Environmental Protection Agency (EPA), where ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide, and lead are called as pollutants. "Pollutants" are defined as harmful to health, but not primarily as affecting the radiation balance. Another way would be to define special "climate pollutants", as done in section 1.2.1.5 of this draft (page 14).	Taken into account - combined with other comments. Text edited to say "GHGs and other pollutants"
19174	1	5	42	5	43	These are all political slogans Change and evolution is inevitable and unpredictable. You cannot "sustain" development. You can only adapt to what happens, often unexpectedly, Growth ought to be for the benefit of humans not just "green"	Noted, no action needed
35511	1	5	42	5	43	Green Economy and Green Growth are not synonymous with Sustainable Development (indeed, Chapter 4 does not even mention either Green Growth or Green Economy). Sustainable Development is three-dimensional (economic, social, environmental), whereas Green Economy is two-dimensional (economic, environment). Internationally, it is exceedingly controversial to attempt to conflate the two items. The authors should revise the text to say: "Sustainable development," "green growth," "green economy," and other terms represent new approaches that aim to harmonize economic growth with other goals such as environmental protection and justice.	Taken into account - paragraph has been rewritten and has incorporated parts of the commentor's suggestion
27412	1	5	42	5	43	So "sustainable development" is nothing more than a broadening of the concept of economic growth? Please correct.	Taken into account - paragraph has been rewritten. Comment no longer relevant

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22290	1	5	43	6	2	The sentence suggests that the concepts of "sustainable development", "green growth", "green economy" are varying approaches that are different from each other. This is inaccurate at least insofar as the multilaterally-agreed understanding of these terms are concerned. Para. 56 of the Rio+20 Outcome Document (see http://www.uncsd2012.org/content/documents/727The Future We Want 19 June 1230pm.pdf) stresses that there are different approaches, visions, and tools for achieving sustainable development, that "green economy" is one of the most important tools that are available, and how "green economy" should do so. Paras. 57 and 58 of the Rio+20 Outcome Document give further detail with respect to what the "green economy in the context of sustainable development and poverty eradication" should look like or be. In order for the sentence to be accurately reflective of the multilateral consensus on what the relationship between "sustainable development" and "green economy" should be, Paras. 56 to 58 of the Rio+20 Outcome Document should be reflected and cited.	Taken into account - section on sustainable development has been rewritten. Comment is no longer relevant
35508	1	5	8	5	8	The acronym should be spelled out and the authors should use the terminology used in the other WGs" "most climate pollutants, the well mixed greenhouse gases, have long...	Taken into account - IPCC and GHGs spelled out in first instance in ES. In the main text, IPCC is spelled out in the first instance in Intro and GHG is spelled out in FAQ 1.1
29764	1	5	11	5	12	"nations are increasingly inter-linked through global trade and economic competition", is it 'economic cooperation' or 'economic competition'?	Noted - economic competition is correct-- this is the fundamental idea of markets and trade. No further action needed.
30730	1	5	21			Does the reference to volume mean this chapter or the WGIII contribution? Suggest clarifying.	Rejected - volume means all chapters. No further action needed.
26495	1	5	28	5	28	to change the part of the sentence reading "...the economic and political context within which governments..." to "...the economic, social and political context including high unemployment and working poverty within which governments..."	Rejected - The suggested text adds too much detail that makes the sentence clumsy. Also, governments are in very different circumstances. No action needed.
25507	1	5				Concerning the topic with the context of the section, would like to suggest "Sustainable Development: Applications and Goals"	Taken into account - section on sustainable development has been rewritten and per team discussion made more concise
35510	1	5	26			This section on sustainable development should not be the first thing presented in a report on mitigation. The reader expects a report on mitigation to open with a discussion of issues directly related to mitigation. If mitigation also is part of a broader policy agenda (sustainable development), great. But that should come at the end, not at the beginning, of Section 1.2. Thus, subsection 1.2.1.1 should be moved to the last sub-item (1.2.1.6) where it fits more logically and makes more sense.	Rejected - IPCC gave the authors the section headings as part of our mandate. It does make sense to start with what societies want and not put fundamental goals at the end. No action needed.
26305	1	5	42	6	3	"sustainable development" is not a synonym to "green growth" (OECD) nor to "green economy" (UNEP) concepts. In fact, in the Rio + 20 outcome, green economy is considered as one way, among others, to achieve sustainable development. In this sense, it is not acceptable to treat the three expressions at the same conceptual level. See "The future we want" paragraph 56. More than 290 quotations for "sustainable development", 23 for "green economy" and no quotations for "green growth" in the whole text	Taken into account - the section on sustainable development is revised. The relationship between green growth and sd is made more clearly and concisely

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19659	1	5	42	7	16	Overall comment for section 1.2.1.1 on Sustainable Development and other Goals: As it stands, my view is that this section is very weak in terms of explicitly discussing sustainable development objectives and how these fit in with the goal of reducing GHG emissions. In other words, concrete examples are needed on how for instance reduction in energy intensity in China has contributed to sustainable development in terms of local pollution, health impacts, more jobs etc. The same applies to the examples given from India, EU and US - yes, there have been developments in renewable energy initiatives and investments but the issue in this section should be how had this had an impact in effect on income disparities, equity, empowerment, jobs, local health, local pollution and other sustainable development impacts other than developments in emissions and installed renewable capacity per se. Without such concrete examples, the discussion on climate change mitigation - sustainable development interactions would remain poor.	Taken into account - the section on sustainable development is revised. The relationship between green growth and sd is made more clearly and concisely
40539	1	5	41			It is valuable to discuss the mitigation in a context of sustainable development[?] and would like to support the chapter as Japanese government.	Noted, thank you. No further action needed.
31714	1	5	2	5	2	Add: Working Group 3 of the IPCC is charged with assessing scientific research RESULTS related to the mitigation of climate change.	Rejected - text is fine as written. We talk about assessing "scientific research". In English construction "results" is implicit. No action needed.
24423	1	54	25	54	27	I don't think politically negotiated mitigation targets, such as the 2 degree target, are determine by what is feasible and affordable in terms of the pace of technological diffusion. See 6.3., which shows that rapid emission reductions would be needed, often several times the rate than experienced historically in order to reach ambitious targets.	Noted - no action needed
31387	1	6	1	6	21	Explanations of the treatment of certainty, evidence and confidence should be easy to find in the Report. Please consider to include a Box about this in this Chapter.	Taken into account - these two paragraphs have largely been rewritten. Reference to confidence and uncertainty language no longer needed here.
35513	1	6	13	6	22	The case of China is presented as "good news" here, and it is. But, China's experience also embodies the scope of the global mitigation challenge, and this point needs to be emphasized, as well. Despite leading the world in the rate of clean-energy technology deployment, China is also leading the world in the rate of emissions growth. China's emissions are growing at unprecedented rates, despite its rate of clean-energy technology adoption. This argues that technological change in energy production may not be enough, and we need to work hard on the consumption side of the problem as well. The text here is misleading as it also needs to state that CO2 emissions still went up by XX%, otherwise it can be read as though China reduced emissions. This point should be reflected in the text.	Taken into account - this section has been rewritten for more balance
30057	1	6	16			(... achievement) (which year???)	Rejected - text is ok as is. The text refers to the period of 2006-2010 from the previous sentence. The implication to 2010 is clear. No further action needed.
19810	1	6	17			Please define carbon intensity as used here. The glossary offers several possible definitions.	Text added: (emissions per unit of energy)

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35514	1	6	19	6	20	Is this really mitigation if this installed capacity is not grid-connected / actually generating useable energy? China is getting better and connecting their renewable investments to the grid, but there are "lifecycle" challenges beyond mere deployment (i.e., connectivity) that deserve discussion	Rejected - this section has been rewritten. We are reporting on the best information available. Some is not grid connected, but overall china is improving and the wind industry is becoming more normal. Agreed that there are lots of issues here, but this is just a summary. No further action needed.
35512	1	6	2	6	2	Should sustainable resources be in this list?	Rejected - text is ok--phrase "such as" indicates it is not an exhaustive list. No further action needed.
23210	1	6	23	6	26	Could be moved to third sentence in paragraph above (after deleting "other") then have the suggested bullet list	Rejected - text could be organized in several ways. It is fine here. No action needed.
30058	1	6	25			(many) elimination	Accepted - text revised as suggested
35515	1	6	25	6	30	It's worth mentioning the U.S. Department of Energy's SunShot Initiative which has the same objective of making solar energy competitive with traditional fuels (http://www1.eere.energy.gov/solar/sunshot/)	Rejected - too much detail for the summary. This section has been revised for clarity and conciseness. After extensive team discussion, we think we now have the right balance.
20433	1	6	30	6	30	Germany has decided a fundamental transformation of its energy system by a step-by-step back out of nuclear energy production until 2020, but accelerated renewable energy supply and more efficient conversion and utilization of energy. This way, GHG emissions should be reduced by 40% by 2020 compared to 1990 and by 80% to 95% by 2050 (Annual Report 2012).	Rejected - The comment offers too much detail for the summary. We have revised this section for clarity and conciseness and have expanded the discussion on the EU generally
35516	1	6	30	6	30	What happened (or will happen) to India's total CO2 as a result of this action; how big a percent of CO2 is the solar capacity?	Rejected - too much detail for the summary. This section has been revised for clarity and conciseness. After extensive team discussion, we think we now have the right balance.
21566	1	6	31	6	35	The EU has done far more than the implementation of the ETS. It has developed and implemented a roadmap with emissions targets to reach its commitments to two phases of the Kyoto Protocol, including targets for renewable energy share, energy efficiency and reductions in emissions in the LULUCF sector.	Taken into account - This section has been revised for clarity and conciseness. The discussion on EU has been expanded
35517	1	6	31	6	40	The review of U.S. policy misses a very large change in U.S. Climate Policy. In Massachusetts v/s EPA, the U.S. Supreme Court decided that current U.S. law requires it to regulate GHG emissions. The EPA has issued draft regulations to reduce GHG's. The U.S. has also implemented a new emissions reporting program for the industrial sector, which will provide emissions information that help the U.S. avoid many of the pitfalls of the early stages of the EU-ETS. Also, Canadian provinces have also issued performance standards for GHG emissions. There is a lot more progress than presented here, and the authors should reflect these advances accordingly.	Rejected - too much detail for the summary. This section has been revised for clarity and conciseness. After extensive team discussion, we think we now have the right balance.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27413	1	6	34	6	35	An update of the sentence "Since AR4 the EU has expanded the ETS to cover aviation" may be necessary (due to "Stopping the clock").	Accepted - text added "within the EU territory". [all airlines had the choice of either only intro-EU flights or all flights from/to EU; all adopted for the latter, only 1 Chinese airline refuses to comply with both]
35518	1	6	36	6	37	When discussing major mitigation steps in this paragraph, it would be valuable to specifically highlight the California AB 32 program to reduce GHGs that went into effect this year. Worth singling out due to both scope and size: 1) California is world's 8th largest economy 2) It's the nation's first economy-wide cap-and-trade program for GHGs that will cover electricity generation and large industrial sources. Second phase will incorporate oil, diesel, and natural gas providers. It aims to reduce emissions to 1990 levels by 2020.	Rejected - too much detail for the summary. This section has been revised for clarity and conciseness. After extensive team discussion, we think we now have the right balance.
35519	1	6	36	6	37	The authors may also want to note that many states have RPS programs that are driving renewable growth	Rejected - too much detail for the summary. This section has been revised for clarity and conciseness. After extensive team discussion, we think we now have the right balance.
24536	1	6	37	6	40	Accuracy - Australia does not have a carbon tax scheme (see language in Chapter 13 page 44, lines 23-24). Please amend to clarify that Australia's carbon price is implemented through a fixed-price ETS that switches to a floating price, capped ETS on 1 July 2015. It is incorrect to describe either iteration of this mechanism as a carbon tax.	Rejected - This section has been rewritten. The example of Australia has been deleted from this section. Comment no longer relevant.
20432	1	6	4	6	5	Climate change due to fossil fuel burning is connected with other key environmental challenges of sustainable development, as exhausting resources for further energy production and raw material economy.	Noted - suggested action is unclear. no action needed.
19811	1	6	45			This section is about changes since AR4. Using an example from 2005 is inappropriate.	Rejected - this section has been rewritten and the sentence has been deleted. Comment is no longer relevant.
30733	1	6	46	6	47	The sentence on line 46 says that "It remains difficult , however, to disentangle the role of policies from other factors that affect incentives for deforestation." It may be helpful to have an example or two of these other factors	Rejected - this section has been rewritten and the sentence has been deleted. Comment is no longer relevant.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
24537	1	6	49	7	2	The suggestion that developing country emissions will rise as economies converge may be oversimplified. For example, if a country has an energy wasteful middle and upper class, the reductions in their emissions may offset the emission growth of poorer groups, especially as their development may be based on low emission solutions and their emission of a range of GHGs may be reduced by shifting from open fires and inefficient technologies. For example, Goldenberg et al (1987) showed that the developing world could attain mid 1970s European standards of living with very little increase in GHGs if they adopted 1980s energy efficient technologies. Suggested change: '...will rise unless strong policy response supports low and zero emission development strategies' Citation: Goldenberg, J., Johansson, T.B., Reddy, A.K.N. and Williams, R.H. (1987). Energy for a sustainable world. World Resources Institute, September 1987. (http://pdf.wri.org/energyforsustainableworld_bw.pdf)	Rejected - The comment may be correct but so far there are ZERO examples of this from large countries and the original Goldenberg work is quite dated. While this is a theoretical possibility the standard view among analysts is exactly the opposite for BAU trajectories. No action needed.
30732	1	6	9	6	22	This paragraph starts with "all countries in varied ways have made great efforts..." but then used only China as a case in point. This paragraph may hold more weight if at least two examples from different countries are listed.	Rejected - This section has been rewritten for clarity and conciseness. After the team discussion, we think we have found the right balance
21565	1	6	9	6	40	This section needs to be more balanced. There is a lot of detail on China compared with the rest of the world. Although the intensity efforts made in China are important, they need to be presented in context of their growing emissions. In contrast, the efforts made by the EU and other industrialised countries to reduce emissions are only briefly presented yet have led to actual decreases in emissions. The balance of information needs to be redressed to reflect these efforts.	Rejected - This section has been rewritten for clarity and conciseness. After the team discussion, we think we have found the right balance
23209	1	6	9	6	47	China has been given emphasis as it reads. (May cause political comments). Maybe just list countries in bullet point format.	Rejected - This section has been rewritten for clarity and conciseness. After the team discussion, we think we have found the right balance
30056	1	6	9			(All) replace for Most	Rejected - point taken, but this section has been rewritten and the sentence has been deleted. Comment no longer relevant
25506	1	6	9			"All countries", this is an exaggerated generalization. Rather than saying "All countries", I would suggest to insert "most of countries"	Rejected - point taken, but this section has been rewritten and the sentence has been deleted. Comment no longer relevant
24535	1	6	9	6	10	The use of "great" in this sentence is overstated, especially given its combination with reference to "all" countries. It is very difficult to demonstrate that all countries have made great effort, especially since these efforts are not yet on track to put us on the path to meet the 2-degree goal (as confirmed in later parts of this chapter). The other aspect of this sentence references "addressing climate change". Given the world is not yet on track to likely meet the 2 degree goal, "addressing" could be better replaced by "responding to" to avoid a perception that the world is currently addressing the problem to a significant degree.	Taken into account - text revised: "great" is removed; "responding to" inserted
19658	1	6	15	6	15	Emissions per unit of GDP is carbon intensity or emissions intensity and not quite the same as energy intensity	Taken into account - Text has been rewritten and the point on energy intensity vs. carbon intensity has been clarified.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
29765	1	6	16	6	22	source of reference for data, should be government data instead of expert articles	Rejected - referencing expert articles is ok-especially since the articles are analytical of raw government reports. No further action needed.
26496	1	6	3	6	3	Suggest to include among references (ILO, 2012) in relation to the documentation of efforts to harmonize economic growth with goals of job decent work creation and social inclusion. Source: International Institute for Labour Studies (2012), Working towards sustainable development: Opportunities for decent work and social inclusion in a green economy (Geneva, ILO, 2012)	Accepted - suggested reference added
26306	1	6	49	7	2	It is stated: "(...), suggesting that as economies converge that emissions will rise." I suppose it is intended to say "(...), suggesting that as economies converges their emissions will rise."	Rejected - the original grammar is correct. No action is needed.
19657	1	6	7	6	7	Since you are referring to "social sciences" in this paragraph I would avoid using here the term "externalities" as it is typically linked to only economics and not other social sciences, and even within economics it is mostly associated to new classical economic thinking. I would suggest using instead "the many positive and negative social and environmental implications..." instead of the standards economics "externalities" jargon.	Rejected - Externalities is correct here. No further action needed.
23212	1	7				Need to expand to mention methane, nitrous oxide and briefly explain sources. First sentence is really only CO2 not "GHGs". Whole box needs rewording to say GHGs come from many sources; main one is CO2 coming mainly from FF combustion, deforestation and some industry processes; other including CH4, N2O come from agric. etc	Taken into account - section redrafted to include non-CO2 FF sources, which are about 1/3 of global total GHG emissions.
20756	1	7	12			I think the answer should be improved by explaining which GHGs are emitter by what source (e.g., industry, agriculture, farming, land use)	Taken into account - section redrafted to include non-CO2 FF sources, which are about 1/3 of global total GHG emissions.
19175	1	7	12	7	16	It is the atmospheric concentrations that matter, and current measurements ignore as "Noise" the real concentrations.	Rejected - the comment is incorrect. No further action is needed.
27414	1	7	12			This is a very simplistic answer, please refine.	Taken into account - section redrafted to include non-CO2 FF sources, which are about 1/3 of global total GHG emissions.
35522	1	7	13	7	16	Fossil fuel exploration, extraction and delivery also releases GHG - not just "conversion" - may be large source of CO2-CH4. The text should be revised to reflect this.	Taken into account - text has been revised to reflect the comment

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35218	1	7	18	22	28	<p>This chapter underestimates the impacts of global economic crisis on developing countries. As shown in Figure 1.1, the developing world also suffered from the crisis, especially at the initial stage of the crisis. Despite the economic rebound of some major developing countries due to governments' stimulus packages, the economic growth rate of most emerging economies has declined since August 2012 (United Nations 2010; Akyuz 2012; Belke etc. 2013). Related parts in this chapter should be revised accordingly, which include: lines 28-37 on page 7; lines 9-17 on page 8; lines 3-9 on page 9; lines 25-28 on page 22.</p> <p>Reference: Akyuz, Yilmaz (2012) "The Staggering Rise of the South." Research paper no. 44, Geneva: The South Centre. March 2012, available at http://www.southcentre.org/index.php?option=com_content&view=article&id=1691%3Athe-staggering-rise-of-the-south&catid=142%3Aglobal-financial-and-economic-crisis&Itemid=67&lang=en . Belke A., Bordon I.G. and Volz U. 2013. Effects of Global Liquidity on Commodity and Food Prices. World Development Vol. 44, pp. 31–43. United Nations (2010) World Economic Situation and Prospects 2009: Update as of mid-2009. United Nations publication Sales No. Sales No. E.10.II.C.2, available at http://www.un.org/en/development/desa/policy/wesp/wesp_archive/2010wesp.pdf .</p>	<p>Taken into account - text revised, added sentences with Reference to the World Economic outlook - April 2013. The reference suggested by the reviewer either corroborate the existing text or deal with other links such as global liquidity and food prices - imported for the LDC but beyond the scope of this chapter</p>
23211	1	7	2			"per capita" emissions	Accepted - text revised as suggested
35520	1	7	2	7	2	What is meant by the term "converge" in this context; is this standard usage?	Noted, yes--quite standard. No further action needed.
31570	1	7	28	22	28	This chapter underestimate the impact of economic crisis on developing countries and needs to be modified.	Taken into account - The text in this section has been revised. Added sentences with Reference to the World Economic outlook - April 2013 (IMF).
25294	1	7	28	7	37	The description of world macroeconomic dynamics needs improvement. Financial crisis has affected economic growth also in the developing countries. The protectionist policies have affect the trade across developed and developing countries. The trade of of clean energy technologies is affected significantly by the tariff barriers imposed by developed countries.	Taken into account - The text in this section has been revised. Added sentences with Reference to the World Economic outlook - April 2013 (IMF).

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22291	1	7	28	7	37	These two paragraphs inaccurately show that the economies of developed and developing countries had essentially decoupled from each other such that the financial crisis in developed countries did not affect developing countries very much. This is incorrect. Developing countries have not decoupled their economies from developed countries as can be seen in Figure 1.1, in which the rise and fall of developing country growth rates essentially mirrored the rise and fall of developed country growth rates, and the strong growth of developing countries during the period 2000-2009 was due to exceptionally favourable global economic conditions that had been shaped by developed country economic policies rather than as a result of improvements in the underlying economic fundamentals of developing countries. See Yilmaz Akyuz, The Staggering Rise of the South (South Centre Research Paper 44, March 2012), at http://www.southcentre.org/index.php?option=com_content&view=article&id=1691%3Athe-staggering-rise-of-the-south&lang=en . The latest Global Economic Prospects (2013) publication of the World Bank (see pages 19-21 of the report, at http://siteresources.worldbank.org/INTPROSPECTS/Resources/334934-1322593305595/8287139-1358278153255/GEP13AFinalFullReport_.pdf), issued in January 2013, indicate this continuing linkage between developed and developing country economies.	Taken into account - The text in this section has been revised. Added sentences with Reference to the World Economic outlook - April 2013 (IMF).
24538	1	7	33	7	35	Sentence is unclear. Suggest splitting into two: 'Figure 1.1 reveals that developing countries were generally not directly affected by the melt-down of financial institutions in the industrialized world. However, the contagion of recessions centred on the OECD has spread, especially to countries with small, open and export-oriented economies.'	Accepted - text revised as suggested. Text may still be revised pending figure revisions.
35524	1	7	36	7	36	ODA for climate actually increased significantly during this period. As such, the sentence should be revised to something like: "The global financial crisis has also affected... ODA (IMF, 2009, 2011) except in the area of climate change where ODA for climate mitigation and adaptation increased substantially during the same period."	Accepted - ODA for mitigation declined in 2011 see 2013 OECD DAC statistics on climate-related aid. Text revised to reflect the increase and decline, as suggested
21567	1	7	4	7	6	This sentence needs to be expanded or removed. The challenge of high upfront costs for developing countries is real, but it needs to be put in context of the Green Fund and balanced against other priorities such as the impact of fuel price volatility on energy security.	Taken into account - combined with comment 204
33959	1	7	5			"may" is "many"	Taken into account - combined with other comments.
30734	1	7	5	7	6	Suggest revising sentence - it is missing some words.	Taken into account - combined with other comments.
35521	1	7	5	7	5	The authors should include "and developed" at the end of this line. While there are very different reasons why low-C technologies pose a challenge to developing vs developed countries, it's inaccurate to say that only developing countries face challenges in deploying low-C technologies.	Taken into account - revised text: "In the face of other investment needs, high...challenge to most countries."
26497	1	7	5	7	5	"high upfront investment cost of may technologies" should read "many technologies"	Accepted - text revised as suggested
26499	1	7	5	7	5	"high upfront investment cost of may technologies" should read "many technologies"	Accepted - text revised as suggested
29766	1	7	5	7	6	may low carbon technologies', should be 'many low carbon technologies'. Pls remove the extra '.' at end of the sentence	Accepted - text revised as suggested

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
35523	1	7	17	7	19	What is the purpose of this discussion? The authors should either add a sentence describing why this is being discussed at this point in the Chapter, move it to a place where it "fits" better, or delete.	Rejected - If this comment is referring to the whole of section 1.2.1.2, this section exists because arguably the single biggest change since AR4 is the change in macroeconomic situation, which has affected terms of trade, political willingness to adopt rules, etc. For an alternative view see #187. no further action needed.
19344	1	7	17			More research and data in China should be mentioned or considered, as China exported much products with "embodied" emissions	Rejected - The discussion on China may actually be over-represented in this chapter. Material on embodied emissions is discussed later in the chapter. No action needed here.
26498	1	7	18	9	35	The presentation of the world macroeconomic situation completed overlooks the employment crisis prevalent in many parts of the world, notably industrialised countries with impact on government priorities.	Taken into account - Sentence added: The crisis also had substantial effects on unemployment across most of the major economies and had many other effects as well, such as on public budgets.
26307	1	7	19	7	22	it is stated: "The crisis which spread rapidly in the fall of 2008 (...)". This a northern hemisphere expression, not valid for the southern hemisphere where the crisis also spread at the same time. May I suggest to state: "(...) in the second half of 2008 (...)"	Accepted - text revised as suggested
19660	1	7	22	7	22	The financial crisis had a particular severe effect not only on banks but also on government budgets, public coffers, household savings and SMEs...	Taken into account - combined with other comment (#184)
24539	1	7				This section is valuable and provides important commentary- suggest it should be kept if shortening the chapter	Noted, thank you. No further action needed.
33124	1	74	87			The problem with counting extensive grazing land is not merely that the conversion will typically involve a carbon debt but that it will also result in a reduction in food production. Grazing land, for odd reasons, is often taken for granted, particularly extensive grazing land. But studies project vast increases in meat and milk consumption and production by 2050, and much of that meat and milk production is supposed to occur on grazing land. An assessment of the data behind the most recent FAO agricultural projection for 2050 [Alexandratos 2012] indicates that production of milk and meat on grazing land is expected to increase by roughly 70%. For that to occur without extensive further clearing of forests and savannas, this wetter, extensive grazing land would have to be greatly intensified. In that regard, even poorly managed grazing land is already "spoken for" if the world is to meet food needs without extensive deforestation.	Rejected - comment does not apply to ch 1

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
22292	1	8		8		The country groupings contained in this Figure 1.1 in which G-20 membership is used as a grouping criterion are not consistent with the traditional country groupings used by IPCC (which are either UNFCCC Annex I (e.g. OECD 1990 countries and Economies in Transition) and non-Annex I (e.g. Asia, Middle East and Africa (MAF or AFM), Latin America (LAM)) countries). Figure 1.1 should either be deleted or else changed in order to reflect the traditional IPCC country categories or groupings rather than create new ones which are not even recognized as such in the UNFCCC regime. Providing for consistent country groupings within and across chapters will also allow for more scientifically rigorous comparability among country groupings. Figure 1.1 should be replaced, instead, by Figure 5.2.1 from Chapter 5, as Figure 5.2.1 is consistent with traditional IPCC practice in relation to country groupings.	Taken into account - figures have been redrawn
35222	1	8	1	28	5	The "Economy-based aggregation" grouping method for countries is only used in top panels of Figure 1.1, 1.4 and Figure 1.5, but not in other chapters. In order to keep consistency among chapters, it is suggested to use the agreed country grouping method (RCP 5). However, the current definition of RCP5 needs further revision. For specific comments please refer to comments on Annex 2.	Taken into account - figures have been redrawn
35526	1	8	1			Which nations are in each grouping? Using different country categorizations throughout the text is confusing without some sort of annex, footnote, etc. listing who is in which category. This could also be provided in the AnnexII.	Taken into account - figures have been redrawn
35525	1	8	1	8	1	The % is typical, but the absolute is what matters to climate - smaller percents now are bigger than larger percents in past. The text should be revised to reflect this fact and reality more accurately.	Taken into account - figures has been redrawn for clarity
23213	1	8	10			Delete "such as for oil"	Taken into account - we are keeping the text in order to provide an illustration of the point. Text revised to say "such as for oil and most metals"
27416	1	8	14	8	16	What does it mean exactly? Do you want to say that a transformational change is easier if you can convince your country with economic arguments and energy security? It would be good to clarify this.	Rejected - The text says that when change in one domain is linked to things that people care about in other domains that it is easier to mobilize the political support needed for change. This is what we mean. No further action needed.
27415	1	8	2	8	8	The figure caption lacks three explanations of the key.	Rejected - Explanation is given in caption in the version available. All figure captions will be rewritten pending figure revisions
24379	1	8	9	8	10	It is suggested to revise the sentence as:" The continued growth of developing economies, the impacts of international money market, as well as geopolitical tensions appeared in some areas pushed global commodity prices, such as for oil, to high level, which have quickly rebounded after the crisis. Reference:Hamilton, J. D. (2008). Understanding crude oil prices (No. w14492). National Bureau of Economic Research; Stevans, L., & Sessions, D. (2008). Speculation, futures prices, and the Us real price of crude oil. American Journal of Social and Management Science, 1, 13-23; Adrangi, B., Chatrath, A., Dhanda, K. K., & Raffiee, K. (2001). Chaos in oil prices? Evidence from futures markets. Energy Economics, 23(4), 405-425."	Rejected - Our text is fine. Also, the suggested cite to Jim Hamilton's work (he is great, but the 2008 paper) and everything else here is BEFORE the financial crisis. Unclear on the reason for the suggested change. No further action needed.
20688	1	8	9	8	10	to accelerate SOUND mitigation efforts ... SOUND mitigation efforts	Noted - comment does not refer to any text in our chapter.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
19661	1	8		8		In order to ensure consistency between trends depicted in Figures 1.1 and 1.2, I would suggest to expand the right panel of Figure 1.1 on annual growth rates of real GDP to cover the period 1970-2010 instead of 2000-2010. In addition, it would be interesting to add a line in the text explaining the opposing trend recorded by IC-Other red bar in left panel for 1990-2000 (i.e. why there has been a negative real GDP growth for this decade for this group of countries - or is there a mistake in the chart?)	Rejected - Section deals with post AR4 developments. This is too much detail for the points we are making here.
32605	1	9				Based on quick read I have only a few comments and one substantive addition to suggest. That suggestion would seem naturally to fall as a sixth bullet under this list of implications of the macroeconomic situation. The crisis and enduring recession has fundamentally changed the economics of investment. Investment is increasingly seen as a key to resumed economic growth. At least in much of the OECD, governments have very limited capacity to spend due to debt, but the converse of this is the accumulation of vast private savings, particularly in the institutional investors (pension funds, etc). Yet with government interest rates at historic lows they can only earn around 2% rate of return from their traditional "safe houses". Energy infrastructure - and particularly low carbon energy infrastructure, given high capital but extremely low running costs - is an attractive proposition in these conditions. See report by the UK House of Lords, EU Select Committee, "No country is an energy island: harnessing energy investment for growth", Published 2nd May 2013; and the associated evidence testimonies by Martin Wolf (Chief Economics Correspondent of the Financial Times), and Dimitri Zhengelis (LSE).	Taken into account - added paragraph, adopting the concept of "never waste a crisis"
24540	1	9	1	9	1	Suggest replacing the word 'germane' with 'relevant' to simplify language for all readers	Rejected - Germane is fine. Relevant is a word with no obvious directionality. Germane implies a bit more directionality. No further action needed.
27417	1	9	1	9	2	Please add a bullet point on the direct effects of the economic crisis on GHG emissions. Otherwise one gets the impression that the economic crisis has only resulted in emission increases.	Taken into account - combined with other comments.
35527	1	9	10	9	15	The text here states: "Second, much of this shift has arisen in the context of globalization in investment and trade, leading to higher emissions that are "embedded" in traded goods and services, suggesting the need for additional or complementary accounting systems that reflect the ultimate consumption of manufacturing goods that cause emissions rather than just the geographical place where emissions occurred during manufacturing (Houser et al. 2008; Davis and Caldeira 2010; Peters, 14 Davis, and Andrew 2012; Peters et al. 2011)." The document does not consider the net wealth embedded in the sale of trade goods that could be used to offset or implement emission control strategies in the countries that produced the goods and services. Are the authors aware of any economic research that provides a balanced approach towards consumption and wealth generation associated with carbon producing trade goods? If there is not literature, the authors should explicitly state that it is not available. If it is available, it needs to be cited with the balance of both sides being reflected in the text. Additionally, this idea of "CO2 imports/exports" shows up in other chapter (e.g. Chapter 5 - as well as in the SPM and TS); so consistent revisions should be applied by respective author teams	Rejected - The point being made is really narrow, which is that if there is an externality that is not internalized that one should find a way to internalize it. In this case, the externality arises in international trade. We use the word "suggesting" to indicate that it isn't a slam dunk that one would adjust trade rules. All that said, you are seeing a ton of people who are big time free traders coming to this view--most recently, Krugman and Nordhaus. Plus the political scientists who see this as essential to wiring the politics properly--victor, Keohane, etc. No further action needed.
40541	1	9	10	9	14	In chapter 5, it is reported that the embedded CO2 in exports can be estimated 5-19%. (Chapt.5, P42, L32-35) Please cite this result to roughly show the approximate amount of carbon leakage.	Taken into account - cite to chapter 5 added

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
27418	1	9	11	9	15	Accounting questions should not be dealt with in this scientific report. WGIII report should refrain to discuss such political questions. Stop sentence after the word "services" and delete the rest.	Rejected - the literature cited, in fact, does exactly this analysis. It is policy analytic, not policy prescriptive. No further action needed.
35528	1	9	21	9	21	Is not mitigation also a very long-term horizon (given long life of CO2)?	Rejected - this is an important point, but the bullet item says exactly this--that climate is a long term problem (by implication because of the long lifetime of the chief pollutant). No further action needed.
21569	1	9	23	9	23	Note that the statement that energy efficiency is reduced during economic slowdown is not supported by Peters et al. (2012), Nature Climate Change, 2, 2-4	Taken into account - text revised. After the Bowen et al cite, added "but for alternative views see Peters et al 2012."
35529	1	9	24	9	29	If the sentence in lines 24-26 is true, then how can the sentence in lines 26-29 also be true? Additionally, the assertion in lines 26-29 is far too policy-prescriptive for the IPCC which is mandated to be policy-relevant and NOT policy-prescriptive.	Taken into account - text revised, deleted 'exchanges of technology'
40542	1	9	26	9	29	This sentence deals with technology transfer including "south-south" initiatives. If this is true, we have to recognize that the part of "Southern" countries already have a different role among developing countries. Necessity of taking mitigation measures corresponding with the changing world landscape has been increasing.	Taken into account - we have simplified. See response to #228.
40540	1	9	3	9	4	Emerging economies are now playing important role in the global economy, and thus they are also important in terms of climate change context. Therefore, it is better to establish a new category,[?]such as "Developing countries of G20 members (G20-DC)" or "emerging economies" for reasonable analysis of current and future GHG emissions and mitigation policy.	Rejected - we have no elegant term and thus use what is already widely used "emerging economies." No further action needed.
22294	1	9	3	9	8	This is inaccurate because it is premised on the inaccurate "decoupling" theory. The statement "the expectation that in a globalized world economy capital resources will shift to emerging economies where they can be used with greatest marginal productivity" is also controversial, as it can be shown and has been shown that net flows of capital under globalization in fact goes to developed countries rather than to emerging economies. See Yilmaz Akyuz, The Staggering Rise of the South (South Centre Research Paper 44, March 2012), at http://www.southcentre.org/index.php?option=com_content&view=article&id=1691%3Athe-staggering-rise-of-the-south&lang=en	Rejected - comment is not to the point. No action needed
23214	1	9	33			"energy crops" or "biomass energy crops"	Rejected - 'bioenergy' is fine here
24542	1	9	37	9	39	Using the term 'energy services' limits consideration of options. They are really services for which energy is one input, for example: 'virtual' travel can dramatically reduce the energy cost of physical travel; and avoiding a need to heat a building by insulating it eliminates or dramatically reduces the amount of energy needed. Suggested citations: Alan K. Pears, Imagining Australia's energy services futures, Futures, Volume 39, Issues 2-3, March-April 2007, Pages 253-271, ISSN 0016-3287, 10.1016/j.futures.2006.01.012. Cullen, JM and Allwood, JM (2010) The efficient use of energy: tracing the global flow of energy from fuel to service. Energy Policy, 38. pp. 75-81. ISSN 0301-4215 (this paper shows the energy losses at all stages of the energy system, and shows energy is an input to useful services such as motion, light, sound etc. via conversion technologies)	Rejected - energy services is exactly the right term. No further action needed.

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35530	1	9	37	9	42	These statements are not accurate. The purpose of energy is to "provide affordable energy services to fuel economic and social development, WHILE ALSO preserving the value of essential environmental services and alleviating physical security issues". One of our energy problems is that we do not fully define what energy services are. Thus, the economic valuations that guide our decision making (e.g. LCOE) are inaccurate, leading to sub-optimum choices. The authors should more clearly and fully incorporate externalities such as the cost of lost environmental services (due to energy development) and energy security costs into this discussion.	Rejected - Text is OK; adding more complex qualifiers and conditions will make a large text that is hard to understand. No further action needed.
27419	1	9	37	9	39	In liberalized, privatized energy markets, the purpose of energy systems is not "to provide affordable energy services to fuel economic and social development" but to create profit for the owners of the energy systems.	Taken into account - text revised to say "affordable energy services that can fuel..."
24543	1	9	41	9	41	This suggests energy prices strongly affect choices. Apart from large energy intensive industries, there is little evidence to support this because elasticities are poor. Suggest amend: '...many factors, such as access to information, status, access to technology, culture, price and performance...' Further citations: Price Responsiveness in the AEO2003 NEMS Residential and Commercial Buildings Sector Models' by Steven H. Wade at ftp://ftp.eia.doe.gov/forecasting/analysispaper/buildings.pdf (shows poor elasticity of response to price) Shove (2003). Comfort, Cleanliness and Convenience: The Social Organization of Normality. Bloomsbury Academic, 2003 - Business & Economics (shows that trends in energy use are very complex, and to focus just on price underestimates the range of policies needed to influence it - which is why a carbon price is just one element of an effective policy response) Garnaut, R. (2011). Update Paper 1: Weighing the costs and benefits of climate change action. Garnaut Climate Change Review Update 2011, released 3 February 2011, http://www.garnautreview.org.au/update-2011/update-papers/up1-key-points.html (has good discussion of barriers to change that limit the effectiveness of pricing)	Accepted - text revised to say "many factors, such as access to information, status, access to technology, culture, price and performance..." and added cite to Garnaut 2011.
27420	1	9	42	9	42	What is meant by "pollution"?	Taken into account - combined with other comments
35531	1	9	44	9	45	This is not true for natural gas (which doesn't have the "global" market like oil) and coal which have been relatively stable and relatively low. The statement should be revised to reflect the fact that it largely relates to oil.	Rejected - the comment is incorrect. Oil-linked gas contracts--the norm in the world although likely to come unraveled soon in Europe-- have shot up in value, and that is reflected in spot gas trades. And ditto for coal where spot prices are quite volatile and base prices have risen substantially--witness china and india. No action needed
24541	1	9	8	9	9	Not clear whether growth in emissions has been a global trend or whether this is relating to the emerging economies being discussed in this paragraph. Two options for amendment: 1) (If referring to a global growth in emissions) - 'With that shift has been a consequent shift in the growth of greenhouse gas emissions worldwide.' OR 2) (if referring to emissions in emerging economies only) 'With that shift has been a consequent shift in the growth of greenhouse gas emissions in these emerging economies'	Accepted - text revised as suggested in option 2

Expert and Government Review Comments on the IPCC WGIII AR5 Second Order Draft – Chapter 1

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
21568	1	9	8	9	9	The growth in greenhouse gas emissions arising from a shift to emerging economies is in part caused by a more intensive use of coal in the share of global emissions. This is an important consequence that could be mentioned here.	Rejected - this is a very brief text that is focusing on one factor--economic growth. Later in the chapter we talk about recarbonization. No further action needed.
22293	1	9	8	9	8	The Lamy 2011 reference is not scientific literature. It refers instead to a speech given by the WTO Director General, in which the speech reflected his personal views on the global trading system and its future. It cannot be considered as an official policy statement or agreed outcome of the WTO as an organization. It cannot hence be considered as scientific literature.	Taken into account - Cite to Lamy deleted. Also changed "where" to "if" and added "commensurate with associated risks"
31572	1	9	22	9	29	1.Lacking reference; 2.It is suggested to change the 3rd sentence to: This "technology transfer" may include "South-South" exchanges of technology although a central role remains for "North-South" technology transfer as part of international agreements on climate change and other topics.	Rejected - Unclear on what the commenter is suggesting be changed and also the reason for the change. See response to #228 for same topic.
31571	1	9	3	9	9	The wording in this section needs to be modified in order to be consistent with L28-37 on page 7	Rejected - language is consistent with pg 7. Also see comment 193
30170	1	9	3	9	48	It may be worth mentioning the short term global reduction in emissions as things that are "germane" to the challenges of climate change mitigation. Otherwise this section is an excellent summary of the consequences of the stock market crash for emissions.	Taken into account - sentence added to the end of the fourth point: Economic slowdown has also slowed the growth in emissions in many countries.
33020	1	9				In general the links to Chapter 7 sections could be improved in this section. For example, where individual technologies (CCS, RE, Nuclear) are discussed, refer to the specific discussions in Chapter 7.	Taken into account - several cross-refs to Chapter 7 added. There are lots of references to GEA in this section already
25508	1	9				The context of this section also discussing the contemporary trends of the energy production process in several countries, especially the dynamics in nuclear energy production, would like to suggest to revise the title as " The Availability, Cost, Performance and Trends of Energy Systems"	Rejected - title is fine as is. Adding more words just makes it harder to comprehend. No further action needed.
34498	1	ALL				Calculating Europe as a single country to estimate emissions may not be acceptable to others	Rejected - Europe has declared this to be a topic of EU competence and thus is not controversial to treat EU as a single unit.