

## IPCC WGIII AR5 Final Government Distribution - Comments on the Final Draft Summary for Policymakers

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44817	SPM					The fourth column seems to provide numbers for the cumulative CO2 emissions. Should these budgets be understood as "everything", i.e. in addition to CO2 also other GHG (i.e., CO2eq emission budgets), or are they the CO2 part of multigas budgets?
44816	SPM					Especially the right panel is very difficult to read.
43915	SPM					Thank you for the final draft. As usually at this point, special attention should be given to improving the clarity of the text for lay readers.
43916	SPM					It would be useful to clearly highlight the key messages of the SPM (the same way as was done in the WG1 report)
43917	SPM					As a general comment, we would like to note that it should be clarified in the text that that the approach used in the report is mainly global. Regional differences are reflected only in some cases.
43928	SPM					The term FOLU is very easily confused with AFOLU, especially when spoken out loud. The close resemblance of acronyms may be confusing to the reader as well. Therefore it would be better to instead tell what the category classified as "FOLU" really represents, ie. LUC and FM (as described in Ch.11.)
43721	SPM					<p>The Government of China would like to express its gratitude and appreciation to the Bureau members, co-chairs, coordinating lead authors, lead authors, contributing authors, review editors, and Technical Support Unit (TSU) of the Working Group III (WG III) of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) for their tremendous work in preparing the Final Draft Report, Technical Summary (TS), and the Final Draft Summary for Policymakers (SPM).</p> <p>The Government of China would like to present its comments on the SPM for the subsequent modification and review process, with a view to reflect the important conclusions of the scientific assessment in an accurate, objective, comprehensive and balanced manner.</p> <ol style="list-style-type: none"> <li>The SPM should elaborate further on Sustainable Development and Equity. Sustainable Development and Equity, as closely connected to climate change mitigation, are the central framing issues in the Final Draft Report but are not adequately reflected in the SPM. For example, the SPM does not touch upon the key dimensions of equity such as historical responsibility, national circumstances, development stage, respective capabilities and equitable rights to sustainable development, and the widely-recognized equity provisions and practices under the UNFCCC. It is suggested to further provide the above information according to the relevant content in the Final Draft Report.</li> <li>The SPM should present the overall picture of historical status in flows and stocks of greenhouse gases (GHGs) emissions and their drivers in a balanced and comprehensive manner. However, the SPM fails to provide the conclusions and information on stocks of global GHGs emissions and per capita emissions, but just highlights global GHGs flows of recent years in a selective manner. For example, Section 2 of the SPM merely emphasizes near-term emission status from 2000 to 2010 which is highly sensitive to its starting and ending years, but neglects more important long-term emission trends. In addition, the SPM only analyzes total accumulative amount of CO2 without considering the population factor. It is suggested to reflect global GHGs emissions of different time spans in a more comprehensive and balanced manner in the SPM that includes flows and stocks, total and per capita emissions, emission increases in absolute and relative terms, and global aggregation and regional distribution, in particular the information on historical per capita accumulative emissions in the RC5 region set.</li> <li>The country/region grouping methodology should be widely agreed upon and consistent in the SPM. The newly used classification approach in the SPM, determining country/region grouping by income levels, can be misleading for policymakers. As a matter of fact, the numbers and compositions of countries and average emission levels in different groups have been changing in relation to the fluctuation of income levels in different countries, which leads to incomparability between groups and eventually unreliable national/regional emission trends. On the contrary, the RC5, which is widely accepted and used in the Final Draft Report and previous assessments is highly suggested to be used throughout the SPM.</li> <li>The SPM should present the role, elements, and progress of international cooperation on climate change in a comprehensive, objective, and balanced manner. The UNFCCC and its Kyoto Protocol, as the primary channel, has undertaken tremendous actions that have already laid a firm foundation for ongoing and future international cooperation. In addition, financial support, technology transfer, and capacity-building as crucial elements to enhance international cooperation on climate change, together with the needs for equitable access to sustainable development and poverty eradication, are the key concerns of developing countries. Therefore, it is suggested to add related assessments accordingly in the SPM.</li> <li>The SPM should address finance issue in a comprehensive and objective manner. Finance, as a great concern of developing countries, is a critical element in international cooperation and international agreement on climate change. Public financial support from developed countries is extremely crucial for developing countries in combating global climate change. However, the SPM overstates the importance of private sector and lacks analysis on the role of public finance. In particular developed countries' obligations under UNFCCC to provide public finance for developing countries, the financial needs of</li> </ol>

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44827	SPM					The balance in this section does not mirror the importance of renewable energy for mitigation! You must improve the balance.
45324	SPM					The chapter covers AFOLU (N2O, CH4) not just carbon. Therefore projected trends on AFOLU (not just FOLU) would be useful.
45325	SPM					The AFOLU section does not mention reducing emissions intensity (Technical summary page 4, lines 37 - 41 "increasing production without a commensurate increase in emissions also reduces emission intensity, i.e. the GHG emissions per unit of product which could be delivered through sustainable intensification....Supply side options depend on the efficacy of land and livestock management [11.6, medium evidence; high agreement]). This is an important method of reducing emissions and needs to be reflected in the SPM.
43988	SPM	0				<p>Chap. 16( Cross-cutting Investment and Finance Issues )</p> <p>1- The discrepancy between the absence of a specific definition of the concept of investing in climate change and the estimated figures in the same chapter, which is estimated between 343-385 billion dollars.</p> <p>2- The widening gap between the estimate for total spending of up to 12%, a ratio of standard deviation is unacceptable(385-343)B\$.</p> <p>3- Blurred vision in the context of what has been spent on investment in the field of climate change in developing countries and the estimated value of 39 to 120 billion dollars what they include the fast track finance 2010-2012 or not , also the same remark No2 .</p> <p>4- On page 4, paragraph for the participation of the private sector by 74% in funding has not been clarified whether the funding through banks or institutions and private companies, as noted that the funding was through loans, the investor is the borrower and not the lender so the flows of private investment in the field of climate change endures-based investment and not the private sector lender.</p> <p>5- On page 10 has been noted that the total investment in CDM projects about 400 billion U.S. dollars, including 80 billion dollars for projects registered in 2011 and 195 billion dollars in 2012, while the report noted at page rr that what has been spent on projects of climate change in developing countries from 70 to 120 billion dollars in the same period of time , Thus, the report ruled out the possibility of investment in CDM projects from what has been the total spent on climate change projects and this give an indication of not giving the accuracy of the figures mentioned in the report.</p> <p>6- On page 13 was referring to the fast track finance to finance mitigation and adaptation projects with a total 30 billion U.S. dollars a year from 2010 to 2012 was set to 61% for mitigation and 18% to adaptation and 10% for REDD+ projects, without reference to what has been allocated to the proportion of the 12% remaining amount and also did not mention in the report, it is the countries that have benefited from this funding?, how to take advantage of this funding?, the quality of funded projects, which has, and the outcomes of these projects?</p>

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44253	SPM	0				<p>General:</p> <ul style="list-style-type: none"> <li>• Overall structure of SPM does not match in accordance with the structure of AR5 Assessment Report. For example SPM has not been structured as Framing, Pathways and Assessment of Policies.</li> <li>• 'Table of Contents' of SPM appears do not match with the structure of AR5 Assessment Report. For example Regional Cooperation &amp; Development is missing in Table of Content of SPM.</li> <li>• As stated in the forward statement from Co-Chairs 'to produce a balance and comprehensive report', SPM appears to be balanced.</li> </ul> <p>Key Issues:</p> <ul style="list-style-type: none"> <li>• Equity issue has not been discussed deeply. Equity issue has been mentioned only twice in SMP. Equity is linked with institutions and governance of climate policy (L35-36, P7) and equity in relational to effectiveness of cap-and-trade systems (L40 P26)</li> <li>• Sustainable development has appeared as a core issue in the framing of mitigation pathways (Content SPM.3). However sustainable development topic has been referenced in Cross-sectoral mitigation pathways (L19, P19) only in SPM without significant material.</li> <li>• Definition of sustainable development as given in L21 P7 appears too generalised.</li> <li>• Energy Access – energy access issue has not been discussed extensively. Energy access has been only discussed in L14-20 P27</li> <li>• Poverty – poverty issue has not been discussed in the SPM except energy/fuel poverty (L17, P22)</li> <li>• Food – food is only discussed in addressing mitigation, which is basically related to dietary change and reduction of food wastes (L5 P 19) and in L30-31 P23 (food supply chain and food production)</li> <li>• Other socio-economic impacts – socio economic aspects, socio economic projections, socio economic development are mentioned in TS. SPM does not have any discussion or reference on socio economic.</li> <li>• Transportation – transportation sector has been over emphasized in SPM. Even transport has been put in the top under SPM.3.2.3 Energy end-users sectors (on top of building and industry).</li> <li>• Response measures – Response Measures has not been mentioned or discussed in SPM and in TS.</li> <li>• Changing reference year results in preferential conclusions, it should be unified.</li> </ul>
43989	SPM	0				Economic analysis prevails over the other dimensions of sustainability (social and environmental). The report discusses in depth and quantitatively mitigation costs involved in the diffusion and the degree of implementation that different technologies can achieve under different scenarios. In a much lesser extent, it analyzes, but only qualitatively, the other dimensions of sustainability: social and environmental dimensions. Thus, dimensions of sustainable development are not analyzed on an equal basis.
43990	SPM	0				There is a significant disconnection between the analysis and identification of the causes that led to the current level of emissions and the policies and measures identified and analyzed in the report. Consumption of goods and services, as it is clear in the report, remains as the main underlying cause of emissions. However, this cause is analyzed only qualitatively in the space of solutions and its real importance is not reflected adequately.
45471	SPM	0				We consider the Figures to be an important part of the SPM. Providing headings for the figures and all individual panels will improve the comprehension and readability of the figures and panels.
44013	SPM	0				Canada strongly recommends that the format of the SPM be revised to make clear the main, high level messages that policymakers should remember from the SPM. Currently, the bolded statements are too numerous to facilitate effective communication with policymakers, and the SPM would benefit greatly from the introduction of "headline statements" for each main section or sub-section in order to draw together the key take-away messages. In order to ensure consistency across the AR5, we recommend that WGIII (as well as WGII) use a format similar to the headline statements used in the WGI report, as Canada found this to be a useful format for communicating the report. A consistent format across the WGs will also help in drawing together information for the Synthesis Report.
44014	SPM	0				Canada strongly recommends the addition of a Box to the SPM (using, as one source of information, Boxes TS.6 and TS.7) to introduce and explain the development of the scenarios used as the basis for the assessment of long-term mitigation pathways in section SPM3.1. This information is essential to helping the reader understand much of this SPM. In particular, for continuity across WGs, it is critical to understand how the RCPs relate to the scenario classes described in Table SPM.1. As currently drafted, Table SPM.1 is unclear in this regard. See detailed comments on Table SPM.1 for recommended improvements.

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44015	SPM	0				Canada recommends that the SPM provide further discussion on how mitigation of non-CO2 forcings contribute to climate change mitigation and how they interact with mitigation policies. Understanding this topic is very important to governments and it would be helpful to have information showing the extent to which the scenario literature has explored alternate scenarios for mitigation of non-CO2 forcings. The only information provided is in Fig SPM.11 where apparently non-CO2 GHGs stay at current levels out to 2100. This information could be discussed in the text.
44016	SPM	0				The treatment of uncertainty should be reviewed throughout the SPM. The opening sentences (in bold) of many paragraphs include calibrated uncertainty terms such as "high confidence", but many of these sentences would appear to be statements of fact, making a calibrated confidence assessment unnecessary. Including a confidence assessment in such circumstances has the effect of denaturing the interpretation of the calibrated terms such that they become less effective as a means of conveying the level of certainty or uncertainty when they are attached to statements that are truly less than certain. At the same time, the descriptions of the evidence supporting the bolded statements generally do not use calibrated terms, but here individual statements are often uncertain - and thus it would be useful to report the author's assessments of the level of certainty of many of these supporting statements. The descriptions supporting the high level statements also often contain numbers, which very frequently are reported without any sense of their uncertainty.
44017	SPM	0				There are references to both FOLU and AFOLU in the WGII SPM. While the difference between these two acronyms seems clear - one includes agriculture, the other not - what is not clear is why one is used in some places and the other in other places. At times they seem to be used as synonyms. Suggest the distinction and different use of these two terms requires a footnote where they are first introduced. If they are intended to refer to the same thing, then pick one term and use it consistently.
44018	SPM	0				We recommend that the SPM include discussion on carbon budgets associated with long term mitigation scenarios. Although information on carbon budgets is included in Table SPM.1, these budgets are not discussed anywhere else in the SPM. We think they should be as this would provide a direct link to a key conclusion of the WGI report that cumulative carbon emissions are a good predictor of global mean temperature change. Also, the WGIII SPM should be careful to clarify that the significance of the timing of peak emissions has to do with implications for post-peak rates of emission reductions. From a physical climate perspective, it is the cumulative sum of emissions, rather than peak emissions, that is critical.
44019	SPM	0				While there is very useful information in this SPM, the document would benefit greatly from editorial review prior to the approval session. In particular, we recommend that: (1) The language used in the SPM needs to be simplified further. There are many instances in which expressions and terms are used that non-academics or non-specialists find difficult to understand, and which might not translate easily across the 6 UN languages; and (2) The authors carefully consider which acronyms are required in the SPM, and which can be avoided. Acronyms that are used only once or a few times are best avoided because their introduction tends to make the text more difficult to read.
47073	SPM	0				In general we think the SPM does not serve its primary user group i.e. policy makers sufficiently. The draft contains many sentences that are not supportive of any policy decision, e.g. almost the entire chapter SPM.1 Introduction and framing does not provide information that is useful to policy makers. Sections contain platitudes, definitions and explanations of theoretical concepts. Many of these sections convey that policy decisions are value laden by definition, but policy makers are thoroughly aware of this.
47074	SPM	0				Many figures are unclear, or do not target the full range of useful insights. This, among others, concerns figures SPM.9, 10 and 11. We suggest pretesting these figures with laymen, to see if they can easily interpret the figures, as SPM figures should be. In most graphs emissions are expressed in CO2 eq., but some in CO2. This is confusing. We suggest to make them consistent in CO2 eq.
47075	SPM	0				Throughout the SPM, the uncertainty qualifiers exhibit inconsistencies in their application. In some conclusions only high confidence has been applied, while in others agreement and evidence are applied explicitly. There are also conclusions in which large uncertainty has been added explicitly with high confidence as uncertainly qualifier. The comments below will address some of these conclusions specifically. We suggest the authors check the text to remove these inconsistencies.
47076	SPM	0				The SPM would greatly improve its readability if general conclusions are highlighted, similar to the SPM of WGI. Preferably, the SPM starts with the main key findings and what is new relative to AR4. Further, many conclusions contain too extensive descriptions, taxing the readability of the SPM. We suggest the authors critically consider each description and shorten it, or delete it where it is not necessary for the storyline of the SPM.
47077	SPM	0				Some of the language is scientific jargon, which should be avoided rather than explained or replaced by policy jargon that is fully understood by the primary user group. We think many sentences should be deleted.

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47078	SPM	0				We suggest to manage the length of the SPM by only reflecting high confidence/high or medium agreement statements. Also repeating statements from other working groups should be avoided.
47079	SPM	0				<p>Our most pertinent comment on the SPM is that it lacks a clear storyline. In our view that storyline should be:</p> <ul style="list-style-type: none"> <li>* Per GDP GHG-reductions have been achieved across all sectors and geographical regions.</li> <li>* This is mainly due to energy saving and higher energy efficiency, a shift to fossil fuels with a lower carbon content per unit energy, a growing share of sustainable energy sources, reducing fugitive methane emissions, and a smaller contribution of ozone depleting substances and their substitutes to climate change.</li> <li>* Per GDP GHG-reductions have been made possible by development, large scale deployment and transfer of new technologies.</li> <li>* However, growth in GDP/capita and population growth have resulted in net increase in global GHG emissions.</li> <li>* International agreements and domestic policies have positively impacted on GHG emissions, but were so far unable to curb emissions sufficiently to confidently realize a transition to a carbon neutral global economy in time to limit global warming to 2°C.</li> <li>* This is also due to the fact that many other considerations than CC alone have to be taken into account in shaping policy and taking corporate decisions such as access to energy, energy security, valorization of natural resources, air quality, risk avoidance, economic development and competing opinions on the fair distribution of efforts.</li> <li>* Business as usual does not deliver the stabilization of greenhouse gas concentrations at low levels necessary to prevent dangerous impacts of climate change.</li> <li>* This requires a fundamental transformation of the energy supply system, including the long-term phase-out of unabated fossil fuel conversion technologies and their substitution by low-GHG alternatives.</li> <li>* Temporary use of capture and storage of CO2 from fossil fuel and nuclear energy may create sufficient time to realize this fundamental transformation.</li> <li>* In addition, enhanced removal of CO2 from the atmosphere by means of sequestration, or capture and storage in the underground of CO2 from bio fuels will be necessary, at least until GHG emissions are near zero and the atmospheric concentrations have returned to levels consistent with the aspired maximum global warming of 2 degrees Celsius.</li> <li>* The cost of these measures will add up to a few percent of GDP in 2050, but there are indications that benefits and avoided adaptation will outweigh these costs. Benefits will however only fully materialize over many decades.</li> <li>* Emission and technology pathways for specific geographic regions are available [based on chapter 6] that together will deliver the necessary emission reduction and can inform future international agreements.</li> <li>* Areas that will require particular attention as to not develop in substantial additional sources of greenhouse gas warming include aviation, emissions from dehydrated organic soils and standing biomass, rapidly developing economies and sectors, and substitutes of ozone depleting substances.</li> </ul>
47080	SPM	0				A statement on the gaps between committed emission limitations and pathways that limit to global warming to maximally 2°C is lacking (The emissions gap report 2013. UNEP, 2013). This report is cited in Chapter 13 (pages 35 and 65). We think such a statement is crucial to this SPM and underpins the urgency of taking action. A further statement based on this report should highlight that by postponing action, the total costs for managing climate change will rapidly increase.
47081	SPM	0				The use of weak operational verbs (can, may, could, might) in combination with rather high certainty and trust is widespread in this SPM. Like in page 24 lines 22 to 24: "The largest opportunities ... might be in rapidly urbanizing countries ... (robust evidence, high agreement)." Although the use of the verbs can be functional, we think the combinations with the uncertainty qualifiers needs to be carefully considered in every individual case.
45355	SPM	0				Unfortunately the concept of risk management has disappeared from the SPM albeit it was included in the earlier version of the SPM, has been identified as a key concept in the SPM of Working Group II and is also addressed in various chapters of the full report. It is strongly recommended to re-introduce that concept also in this SPM.

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45356	SPM	0				There seems to be room to further enhance the coherence between the SPM of Working Group II and Working Group III. An important example relates to the scenarios highlightes to describe our possible future: whereas WG II highlights in table SPM.1 the differences in limiting temperature change to 2 and 4 degrees C, table SPM.1 of WG II highlightes the differences between 1.5, 2 and 2.5 degrees C. Such in-coherence definitely limits the usefulness of the SPM considerable. Another significant example relates how policy options are addressed: whereas Working Group II highlights risk management and transformation as viable policy options to address the challenge of climate change, Working Group III highlights mitigation policies at various levels. The focus of WGII is clearly the preferred one because the first step is to identify the most promising policy before describing how it is implemented at various levels. From that perspective it is strongly recommended to better align the SPM of WGIII with the story-line developed by Working Group II. Another topic that should be better aligned with SPM from Workinng Group II relates to the issue of human interference with the Climate System and the role and limits of science.
45415	SPM	0				There are no clear high level statements, comparable to WG I SPM. Such statements should address whether or not there is still a chance to meet the two degrees goal. And if so, what the conditionalities are. Another issue relates to the need for change in the pattern of investments with a significant shift to investments in energy efficiency and renewables coupled with a decline of investments in fossil fuels.
45416	SPM	0				It is noted that the SPM does not address what is in particular new information compared to AR4 and what is different compared to AR 4.
45417	SPM	0				The SPM is quiete about peaking of global GHG emissions. Since the AR4 at the policy level this parameter has been widely discussed. It is strongly suggested to include such information also in this SPM. The full report includes some information that in order to meet the 2 degrees goal peaking must be by 2020 at the latest.
45418	SPM	0				The SPM is sometimes policy prescriptive - meaning, it wants to tell the policy makers what needs to be done - instead of proving policy neutral factual statements.
45419	SPM	0				The use of CO2eq is based on a very broad definition that makes it difficult to compare the figures. It is strongly suggested to be so specific that figures can be better compared. (e.g. are aerosols included or not - if so: what are the corresponding concentration/forcing levels).

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43716	SPM	0				<p>“Solar Radiation Management” (SRM) approach to counteracting GHG heating effect has not been even mentioned in the WG3 SPM, although this issue is discussed in Technical Summary and in Chapter 6 of the main WG3 report. It is expedient to give a short description of the approach and mention the major “pro and contra”.</p> <p>It would be useful also to present a set of stabilization measures:            1) Stabilization of GHG concentrations on the minimal achievable level by traditional mitigation options. This minimal level may be too high to guarantee compliance with the global warming target of <math>\Delta T &lt; 2^{\circ}\text{C}</math>;            2) Stage 2: Reduction of GHG concentrations by CDR (or negative emission) options to the level that ensure compliance with <math>\Delta T &lt; 2^{\circ}\text{C}</math> requirement;            3) However, if this rather long process (1 + 2) does not achieve the goal and the global limit <math>\Delta T &lt; 2^{\circ}\text{C}</math> still can be overshooted within certain time period than Solar Radiation Management (SRM) can help. SRM technique could be applied until mitigation and CDR methods reduce GHG concentrations to acceptable level. It is important that suitable CDR and SRM methods should be carefully tested well in advance to any broad application.</p> <p>Any statement regarding potential risks of the application of climate engineering technologies should be made on the basis of comparison with risks associated with ignoring of such technologies.</p> <p>It is important to emphasize in the SPM that afforestation and reforestation approach to reduction of CO<sub>2</sub> concentration in the atmosphere can be efficient only limited time period. Forest ecosystems inevitably will come to equilibrium between CO<sub>2</sub> uptake and its re-emission due to respiration and decomposition of dead organic material (when a newly planted forest reaches its maturity state). A newly planted forest can be a sink of atmospheric CO<sub>2</sub> during just about of a hundred years. Of course it is a way “to buy time”, but not an efficient as a permanent strategy.</p> <p>SPM (as well as TS and Chapter 6 of the Report) pays serious attention to the BECCS method to reduction of atmospheric CO<sub>2</sub> concentration. At the same time, it should be noted that until now there is no one full-scale installation which includes all stages of the method: bio-fuel growing, drying and seasonal storage, energy production, CO<sub>2</sub> capture from flue gases, CO<sub>2</sub> transportation and sequestration. Also it should be noted that bio-fuels cannot compete with traditional fossil fuels in heating value. This circumstance will seriously limit broad application of BECCS in coming decades. Besides, the BECCS technique produces direct competition with food production (competition for land). It is important in the context of population rise.</p> <p>It should be remembered that CDR options are inseparably linked with the necessity of CO<sub>2</sub> sequestration in terrestrial systems, in the ocean, in geological structures. Some estimates of sequestration potentials show that CDR options could be really efficient. There is some information about that in Technical Summary, but it is important to highlight and bring it to policy makers' attention.</p>
46995	SPM	0				<p>We thank the authors for their efforts in compiling this summary of the Working Group III contribution to the AR5. However, in order to improve the readability of the SPM to users, we suggest that the authors follow the format of the WGI report by providing key 'headline messages' and a more coherent narrative. The text also often requires clarification and simplification and it's very technical and lengthy in places. Furthermore, at times the text contains value judgments and subjective sentences, coverage of some issues is unbalanced and does not accurately represent the whole picture by including all relevant elements of consideration. Specific points are included in our comments below.</p>
44778	SPM	0				<p>The whole SPM would benefit from clearer indicated headline messages (cf. Working Group I contribution).</p>
44779	SPM	0				<p>The SPM refers in many places to "baseline scenarios". These are not explained in the SPM, which should be done, for example in the "Introduction and framing" section.</p>
44780	SPM	0				<p>More comparison to relevant AR4 findings would be useful. It could help to elucidate which of the assessment's findings are new knowledge, which provide further confirmation, which point to another direction than previous findings. (References which are made to AR4 findings are mainly in the Section SPM.4. The same could benefit also the other parts of the SPM.)</p>
44781	SPM	0				<p>There are few surprises, however there is an imbalance in respect of uncertainty and risk of catastrophic outcomes.</p>

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44782	SPM	0				The SPM is too much focussed on technocratic engineering and technical solutions, very little is towards how to get there.
44918	SPM	0				In several paragraphs along the SPM, there are references to opposing ideas (such as "benefits" and "adverse effects") on the sentence in bold, but only one of these ideas is explained and/or illustrated on the underlying text. For the sake of parallelism, perhaps these ideas could be better developed.
45913	SPM	0				Together with another SPM on adaptation, the SPM on mitigation may be the most important SPM for non-scientist readers. This is because they may want information on action, or how they can/should take decisions on actions. Therefore, it is very important that the entire SPM on mitigation is as concise as possible, and contains at little unnecessary data and concepts as possible. Whereas the draft is very good in general, it could be made a bit more concise, and less technical. Also, although I myself am a scientist and prefer to avoid policy-prescriptive text, the text on mitigation as not an entirely scientific subject should be a bit more specific as to what could be the actions that could be suggested for optimal/maximal mitigation.
44393	SPM	0				Spain considers that the SPM should follow the outline of the main report. Considering the significance of this report "mitigation", main messages should focus on mitigation potential and policies, measures and instruments. The IPCC Working Group III assesses all relevant options for mitigating climate change through limiting or preventing greenhouse gas emissions and enhancing activities that remove them from the atmosphere. The waste sector is poorly defined in the document. We would prefer seeing, in the SPM, sentences reflecting findings with medium confidence or higher and avoid reference with low agreement or low evidence.
44734	SPM	0				In all figure captions of the SPM, use the word "anthropogenic" when referring to emissions
45637	SPM	0				Many paras in Section SPM1 are very generic and text book styled information. This framing issues were known from TAR and AR4. SPM1 can be shortened.
45638	SPM	0				Mitigation aspects of non-CO2 gases are not covered adequately.
45639	SPM	0				Economic mitigation potential and cost-effectiveness of sectoral mitigation options is not adequately covered , though most important for policy makers.
45640	SPM	0				Many of the figures particularly in Section SPM3 are difficult for policy makers and maybe skipped by many of them, unless they are simplified.
45641	SPM	0				overall very comprehensively written, with clarity and focus .
45803	SPM	0			0	Commend all those who have contributed to the AR5 WGIII SPM and appreciate the untiring efforts of authors to try to deliver a quality final draft that is easily read and understandable for a diverse policymaker reader audience.
45804	SPM	0			0	We appreciate the explanatory text pieces for various mitigation options and assessment. The SPM as a whole is suggesting that one instrument or policy option is insufficient for dealing issues related to the climate problem comprehensively, thus several policies should be used as a package to address climate change effectively.
45805	SPM	0			0	Because SSPs could not be developed in time for the AR5 report as originally planned (c.f. TOWARDS NEW SCENARIOS FOR ANALYSIS OF EMISSIONS, CLIMATE CHANGE, IMPACTS, AND RESPONSE STRATEGIES), the work in AR5 has thus been based on different socioeconomic assumptions. If these assumptions are not clearly defined, it is difficult for policymakers to decide on a mitigation pathway for their country, and hence as is, the AR5 report is difficult to use. Having read the WGIII FD, we feel the strong need for SSP storylines which are yet in preparation, consistent across the AR5 reports. Therefore, once the SSPs are completed, we request that the AR5 WGIII report be reviewed with SSPs. The results of this review should be compiled into a report and disseminated to policymakers.
46776	SPM	0				The effort to summarize and synthesize the wealth of information of the chapters of the WGIII report into less than 30 concise pages containing the most relevant information for policy makers is highly appreciated. Our comments are meant to further improve the text.



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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
46777	SPM	0				<p>(This is a high priority comment of Germany) The SPM provides information on the technical feasibility and mitigation-related economic implications of staying below 2°C with a likely chance. However, this is done in a very scattered way at many places in the text. Please provide information on the 2°C limit in a clear and consistent way, preferably in one paragraph. Results that are relevant for the 2°C limit should not be grouped together with, but rather be set apart from results regarding higher concentration scenarios. Otherwise the policy relevance of the presented findings diminishes. Improving Table SPM.1 will also help to provide more clarity.</p> <p>Furthermore, it remains ambiguous to the reader which concentration levels are considered as being relevant for the 2°C limit. Table SPM.1 indicates that only concentration levels of 430-480 ppm (apparently consistent with RCP2.6) lead to a "likely" chance of staying below 2°C. This is consistent with the sentence on page 13, lines 15-16: "The majority of scenarios reaching long-term concentrations between 430 to 480 ppm CO<sub>2</sub>eq in 2100 are likely to keep temperature change below 2°C over the course of the century (...)." However, when referring to associated emission reductions, the text of the SPM often quotes a range of 430 to 530 ppm. For instance, the sentence on page 13, lines 32-34 reads: "Reaching atmospheric concentrations levels of 430 to 530 ppm CO<sub>2</sub>eq by 2100 will require large-scale changes of the global energy system as well as cuts in GHG emissions over the coming decades". Similar statements can be found e.g. on page 15 lines 3-5, page 16 line 29 etc. To the extent possible, please revise such statements throughout the entire section SPM.3.1 and 3.2, and in Figures SPM.10 and SPM.11, by referring to the relevant range of 430-480 ppm CO<sub>2</sub>eq. It should be clarified prominently in the text that this is the range associated with a likely chance of staying below 2°C.</p>
46778	SPM	0				<p>(This is a high priority comment of Germany) The SPM presents BECCS and CDR as technological solutions to achieve negative emissions. However, these technologies are not existing or not mature, and are associated with high or unknown risks. The feasibility, risks and negative side effects are often neglected in the SPM or not presented in an appropriate manner.</p> <ul style="list-style-type: none"> <li>- The SPM gives in many locations the wrong impression CDR technologies are already at hand and could be realised easily. The need for BECCS and/or CDR technologies for low emission scenarios is repeated many times, but the fact that these technologies are not yet available - and that some might never be - the high degree of uncertainty both for advantages (effectiveness, efficiency) and risks (negative side effects) are much less emphasized or even ignored (see e.g., TS, page 24, line 41).</li> <li>- The link between BECCS on the one hand and CDR techniques on the other should be clarified. The SPM gives the wrong impression that CDR defines mainly (or even only) CCS combined with bioenergy. In fact CDR covers a much wider set of approaches and technologies (e.g. additionally ocean fertilization) that differ greatly from BECCS.</li> </ul>
46779	SPM	0				<p>(This is a high priority comment of Germany) To facilitate readability and to increase usability of the SPM, it would be extremely helpful to highlight the most important statements of each section by giving "headline statements". This has been done by WG1 and has proven very useful.</p>
46780	SPM	0				The meaning of "default technology" is used in many places in the SPM, it should be clearly defined, when it is used for the first time.
46781	SPM	0				There is no depiction of current and projected emission trends per capita and per GDP according to regions or income-groups. This would be beneficial for evaluating priorities for international cooperation in climate mitigation as well as for identifying lessons and challenges that specific countries/regions may face.
46782	SPM	0				The information on transformation pathways presented by WG3 depends on the characteristics of models and scenarios they are calculated from. However, the conclusions from the models and scenarios remain elusive for policy makers as they are not presented in a transparent manner. Information about the underlying scenario and model approaches, their constraints and uncertainties, and the implications for the outcomes should be presented also in the SPM (possibly by a box on models structure and scenarios) but at least with a reference where this information can be found in the underlying report.
46783	SPM	0				Under UNFCCC, 1990 is the base year for reporting of national inventories of GHG emissions, and Parties have agreed to limit warming to below 2°C compared to pre-industrial levels. Therefore, information provided by WG3 on emissions reductions and related global temperature increase should be provided as far as possible compared to 1990 or to pre-industrial levels respectively, as appropriate. This would also ensure coherence across Working groups and increase comparability with prior IPCC assessments.
46784	SPM	0				Some parts of the SPM lack clear and concise high level messages. In several places, statements are self-evident; methodological concepts are mentioned, but the assessment, their implications, advantages and disadvantages are missing (e.g. page 7, lines 4-6). The text should be sharpened in order to be more useful for policy makers.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
46785	SPM	0				The SPM provides information on technological solutions to achieve low concentration levels. These technologies include nuclear energy and CCS. However, the feasibility, risks and negative side effects are often neglected or not presented in an appropriate manner. - The SPM presents nuclear power as a valuable mitigation option, or even suggests its increased future use, while high economic, social and environmental risks of nuclear power are not mentioned sufficiently. Furthermore, the relatively low costs of a nuclear phase-out is neglected. - The claim that CCS could reduce the life-cycle GHG emissions of fossil power plants is based on a few medium sized plants only.
45233	SPM	0				In general the SPM is well written but should focus more on the language that is useful to policymakers and communication of key findings e.g. more reference and comparison should be made to the internationally agreed 2C degrees goal.
45234	SPM	0				AFOLU/FOLU terminology not consistently applied. Stick to AFOLU to reduce uncertainty for reader.
45235	SPM	0				More statements on confidence/evidence may be required in a number of sections.
45236	SPM	0				The report should be more consistent in its use of country groupings if and when needed. Where groupings according to income are used, these should be clearly classified according to current UN definitions.
45237	SPM	0				Language and terminology overall needs to be more consistent, both within this document and also with the other working groups.
44330	SPM	0				The New Zealand Government thanks the WG3 authors and TSU for their hard work and congratulates them on the production of this draft.
44331	SPM	0				The figures are generally easy to understand and explanations very helpful, however some are not. If the figures cannot be redrafted, clear captions explaining what each graph represents and its significance would be helpful. Individual figures where this is desirable are noted below.
44698	SPM	0	0	0	0	Despite existing evidence, there is little mentioning of no-regret measures / economic net benefits of mitigation. The existence of such measure / net benefits should be explicitly discussed in separate paragraphs
44699	SPM	0	0	0	0	The SPM consistently mentions adverse side effects together with co-benefits (e.g. p. 7 line 14-19; p. 16-17; p. 26 line 5-15). This one-dimensional view is neither useful nor sensible, particularly since some measures will have many co-benefits but virtually no adverse effects, and vice versa. Preferably, different types of co-benefits would be treated individually and in separation from adverse effects
44725	SPM	0	0	0	0	Limiting mean global warming to 2C above pre-industrial levels implies that only a small fraction of fossil fuel reserves can be exploited [5.3.4.3, 7.4.1]. This is a key message currently absent from the SPM.
43624	SPM	0	0			There is lack of an overarching and integrating narrative throughout the SPM, which reads as a selection of disjointed points drawn from the underlying chapters. The SPM would benefit from a clearer connection between the trends we are seeing in emissions in terms of country/sector contributions, through to the progress and future feasibility of different response options.
43625	SPM	0	0			There is considerably more emphasis in this summary on presenting the scenarios showing projected emissions than on the sections discussing the actions that can be taken to mitigate climate change. The purpose of the document is to inform policy makers, who not only need to know the scale of the problem, but also need detail on measures that can be taken. Expansion of the sections on practical measures (especially in agriculture and forestry; and human settlements) is warranted.
43626	SPM	0	0			While we acknowledge that the document attempts to present a large amount of technical information in a brief format, at times the point of paragraphs/sentences is lost in the complexity of language used. Noting that this is a summary for policy makers, at a minimum all technical terms and acronyms need to be explained, likewise systems of classifications (e.g. of emission sectors). For brevity, this information could be placed in appendices and referenced in the main document. Ideally a bit more explanation and discussion of the key aspects of the document would assist in interpretation by a range of audiences.
43627	SPM	0	0			General comment on all Figures: Many of the figures are difficult to interpret as it is not clear what the take home message it supposed to be. Adding a heading to each of the Figures may help this.
44930	SPM	0	0	0	0	The Government of Belgium would like to express its appreciation for the very large amount of work that went into the WGIII contribution to the AR5, and this SPM. The comments made below are meant to further improve the text of the SPM, in order to make it more policy-relevant, while fully respecting the scientific assessment made in the underlying report.
44931	SPM	0	0	0	0	We suggest that name of the country of origin and affiliation of each author of the SPM be added after each name, as WGI and WGII have done for their SPM.
44932	SPM	0	0	0	0	It is important to ensure full consistency between this SPM and the AR5 contributions from the two other groups. In particular, we suggest a systematic verification of the consistency with WGI regarding issues related to climate model projections. This includes the relations between the probability to keep global warming under given levels, cumulative emissions and concentrations. Another issue that may benefit from a final check is the relation between radiative forcing estimates in WGI and equivalent CO2 concentrations in WGIII.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44933	SPM	0	0	0	0	To the extent possible, we would appreciate a more complete and specific description of the changes from AR4.
44934	SPM	0	0	0	0	If possible, we would appreciate an indication of specific research needs and gaps on knowledge in view of advising policymakers in the area of science policy as well as researchers.
44935	SPM	0	0	0	0	Key messages of highest relevance to policymakers needs to be highlighted. This is of utmost importance in the context of the preparation of a new international climate treaty (notably in relation to the required level of ambition of mitigation efforts, historical responsibility, regional differentiation of future emission pathways, equity, finance and investment). We would strongly welcome the presentation of those messages with highest policy relevance in headline statements at the beginning of each section (as in the SPM of AR5 WG1). These statements would be written so that, taken together, they provide a concise summary.
44936	SPM	0	0	0	0	Most of the figures are very difficult to read and understand. They frequently contain too much detailed information for a SPM (some details could probably be removed, paying attention to keeping all important information). A revision to facilitate reading by policymakers would be much appreciated.
44937	SPM	0	0	0	0	The WG3 SPM is expected to focus on societal and policy matters. Regarding emission scenarios, we expect this SPM to elaborate what precisely WG3 is adding to the selected RCPs. Mainly this demands clarity on what the (top down) models assume regarding societal and climate policy realities: for example, is there an appropriate representation of the actual diversity and dynamics in real societies?
44938	SPM	0	0	0	0	Numerical results in the SPM are predominantly forthcoming from top-down model runs. The SPM presents few numerical results from other studies or sources. Does this mean that the literature offers no numerical information except the one from top-down models?
44939	SPM	0	0	0	0	This SPM assigns a prominent place (and a lot of place and text) to the modeling exercises and results about pathways to 2050-2100. We have the following concerns related to this approach: 1) IPCC ARs are expected to assess the full literature in a balanced way, without priority. Thorough assessment of economic modeling and modeling exercises is difficult because assumptions and world views can be hidden in the code and default parameter values; 2) Some findings are presented as 'the model finds/states X or Y'; this tends to overlook the fact that findings and assessments are from modellers (human beings with particular ideologies and interests) 3) Many models are based on hypotheses that grossly simplify the real world, like economies in general equilibrium, perfect functioning carbon markets with a uniform global carbon price, etc.; 4) The models are largely derived and calibrated on the basis of the past and present structure, performance, and results of mainly wealthy industrialized (market) economies - those calibrations also deliver what is considered by modellers as 'realistic' parameter values; 5) To a large degree, future projections are more or less sophisticated extrapolations of the past and present, and may not be well suited to express the necessary "drastic and urgent changes" that transitions to low-carbon (energy) economies require; i.e. to what extent are the models robust enough to process disruptive societal and policy changes, and to assess the performance of societies in transition or societies transitioned to the very low-carbon status? We would like to encourage the authors to include as many relevant lines of evidence as possible in the revised SPM.
44940	SPM	0	0	0	0	All references to intervals between two years should be standardised. We suggest using "between y1 and y2" or "over y1-y2" instead of "in y2, as compared to y1" and other such phrasing.
44941	SPM	0	0	0	0	A large number of different concentrations levels (430, 450, 480, ...) and ranges (430-480, 430-530, 450-550, 430-580, ...) are used in the report. Please standardise these levels to the extent possible without reducing policy relevance (e.g. regarding concentration levels relevant to avoiding global warming beyond certain levels).
44942	SPM	0	0	0	0	To improve readability, please refrain from using a large number of different concentration levels, focusing instead on the most useful ones (the IPCC cannot be policy prescriptive, hence it needs to refer to different levels of ambition, but one should not use several numbers or ranges that are very close to each other, unless needed for policy relevance).
44943	SPM	0	0	0	0	The explanation that all forcings are included in the equivalent carbon dioxide concentrations, not just GHGs, is only provided on page 12 about present concentration. This is a key issue for the entire SPM, therefore we think that it should be explained upfront, in a paragraph that clearly relates to both present and future scenarios and considers both positive and negative forcings such as aerosols and land-use related albedo changes. Important aspects that could apply to many scenarios, such as reductions in aerosols emissions and their consequences, should also be summarised, taking uncertainties into account.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44944	SPM	0	0	0	0	Results obtained from top-down models are used throughout the SPM. Sometimes it is clear that it are outputs from model runs; at other occasions, it is not sufficiently clear. We suggest that when model results and other comments or results are mingled in a single statement or paragraph, attention is paid to make this clear.
46996	SPM	1	1	29	30	Noticeably missing from the SPM is information regarding the potential for reducing short-lived climate pollutants and the implications for limiting climate change. The SPM is also weak on evaluating the mitigation potential for the other GHGs: notably N2O, and CH4 (25 % of the GHGeq in 2010).
44700	SPM	1	24	1	34	The introduction suggests that international cooperation is important in two areas: 1) Definition and allocation of and responsibilities with regard to the atmosphere; 2) R&D. This appears too narrow as international cooperation in other areas, such as coordination of standards, also hold potential benefits.
44087	SPM	10				The two panels of the figure contain the same information, albeit with the segments arranged in a different order and a higher level of precision in the right-hand panel. Suggest deleting the right-hand-panel.
47103	SPM	10		10		The use of the terms "direct emissions" and "indirect emissions" in this context is confusing, and we suggest to change the titles of the panels to "emissions assigned to production" and "emissions assigned to consumption".
47014	SPM	10				SPM3: what is meant with +/- in the right panel figure?
44378	SPM	10				Unified decimal points are required between left and right of the figure SPM.3. Ex. Road 10% in left figure and road 10.17% of right figure.
44379	SPM	10				There are some others. To clarify its meaning, other needs to be changed to other energy supply, other transport and other building.
45269	SPM	10				The pie charts are not very clear. The right chart should have direct and indirect emissions from various sectors adjacent to one another rather than split. Ensure consistency of colour coding between left and right charts e.g. AFOLU should be shades of green in both (indirect buildings using green is confusing).
45270	SPM	10				There is no additional information contained in the right hand pie chart. It only confuses the information. Suggest deleting right hand graph.
45271	SPM	10				The term 'indirect emission' should be clarified.
43649	SPM	10	0			It is not clear why there are three categories labelled 'other'. Please clarify or combine.
43650	SPM	10	0			This figure is not easy to interpret in its current format. It may be improved with more labelling on the figure itself, such as indicating that the right hand side shows final use.
44268	SPM	10	1	10	2	Although the statement "Regional Patterns of GHG emissions" refers to regions, additional lines refer to sectors with very little regional references are given in SPM, which needs to be addressed.
44269	SPM	10	1	10	5	This statement lack comprehensive historical assessment and provides insight to an extremely short period of time. A comparison with corresponding historical trend such as emission patterns of past major economies is required for policy makers to grasp the broad analysis.
44076	SPM	10	1	10	5	Does this headline really require a confidence assessment? In contrast, the specific figures that are given are presumably uncertain, and thus it would be very useful if the text below the headline could give some indication of those uncertainties.
45373	SPM	10	1	10	21	It is unclear which greenhouse gases have been considered whereas the caption for figure SPM.2 clearly addresses only CO2. Part of the confusion is that only indirect CO2 emissions are pulled out according to the caption for figure SPM.3. It would be helpful if also the absolute total of GHG emissions corresponding to the split described in figure SPM.3 would be provided.
45137	SPM	10	1	10	5	No evidence is provided to support the text in bold. The rest of the paragraph mainly focuses on sectoral trends, and the impact that these have on regional trends is not clearly brought out. One option would be to have a paragraph on regional emissions here with a map to illustrate
45138	SPM	10	1	12	31	As a general observation, there is nothing here about how emissions in Higher Income countries have slowed, or even stopped rising, where there has been over the last 2 decades a very significant increase in emissions from middle income countries. Figure 1.4 should be presented in the SPM alongside figure SPM.1
46821	SPM	10	1	10	1	The highlighted statement "Regional patterns of GHG emissions are shifting along with changes in the world economy" is too generic. The underlying report contains much information about (de)carbonization trends, consumption and production patterns, emission intensities etc., which modulate the connection between economic growth and emissions. Because the rest of the paragraph only talks about emission growth, the top-level message strongly, though implicitly, suggests emissions growth is an unavoidable result of economic growth. That impression is simplistic and wrong and should be avoided. The paragraph needs to define precisely which elements of the "world economy" are responsible for shifts in regional GHG emissions and which of these elements cause opposite connections from others.

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43734	SPM	10	1	11	20	The country/region grouping approach based on income level was added after the second order draft of IPCC WGIII report, which is problematic. The income per capita of each country dynamically changes over time as well as the number of countries within the same group (for example, the number of high income countries and upper middle countries increased remarkably from 1970 to 2012 as well as the constituent country members within each group). Under this circumstance, it is inappropriate to describe historical emission trends of each income group based on the 2012 income classification of World Bank. Furthermore, most chapters (including transformation, sector and policy chapters) in the underlying report are based on the agreed region/country grouping method (RC5 or RC10). For consistency, it is suggested to use the RC5 throughout the SPM and modify corresponding descriptions (P10, L3-5; P10, L22-28; P11, L2).
44082	SPM	10	10	10	12	Suggest rephrasing as "When emissions from electricity and heat production are assigned to the sectors of final energy use (i.e., indirect emissions), the shares of the industry and buildings sectors ...". Also, suggest you can simply say "grow to 32% and 18% respectively"; it is not necessary to report the increment, nor is the comma after "18%" required. A further comment is to ask whether the percentages given in this paragraph are known well enough to allow reporting (without uncertainty ranges) to two digits.
43934	SPM	10	10	10	10	Please delete "from electricity and heat production".
45512	SPM	10	12	10	21	Figure SPM 3: I) This figure is illustrative. The figure should, however be checked for missing text and consistency. II) The figure should be given a short and descriptive title, e.g. "GHG emissions by sectors in 2010". III) It would be helpful if the colors match better between direct and indirect emissions. IV) Please consider to make a legend box. V) The category "others" is used several times. Please indicate which sector the emissions relate to, for example if emissions indicated with the colour dark lilac are "other transport" (i.e. air and sea) or if light yellow is "other industry". Since this figure is challenging to read and to relate to the text in the paragraph above, please consider to include the Figure TS.3 panels A and C, with the changes suggested above. VI) In line 19-20 emission data from AFOLU is described as: "... includes forest and peat fires and decay" in contradiction to the caption to Figure SPM.1 where it says "... represents forest and peat fires and decay". Please consider if you can use the same phrasing in both captions.
44488	SPM	10	12	10	12	Figure SPM.3: The right panel is very difficult to follow. Suggestions for improving the illustration include: (1) separate out "indirect buildings" into "indirect buildings: residential" and "indirect buildings: commercial"; (2) place direct and indirect emissions from the same sector next to each other for ease of visual comparison; (3) if possible, match the colors and legends between the left and the right panels.
44489	SPM	10	12	10	12	Figure SPM.3 is unclear in a few ways: (a) Caption identifies the figure as representing GHG emissions, but refers to CO2. Does the figure represent CO2 emissions or *all* GHG emissions?; (b) Both pies have three instances of the label "other" (two identically equaling 4%); the authors should either combine the "others" into one category or classify each "other" category by sector - "other (energy supply), other (transport), other (buildings)". (c) There is numerical disagreement between text (lines 9-12) and figure, regarding the industrial share of emissions: 21% (text, l. 9) vs. 18% (figure) without indirect emissions; 32% (text, l. 12) vs. 29% (figure) with direct emissions. Rightly or wrongly, the discrepancy is resolved, if 3 percentage points of "waste" are added to "industry". (d) A possible embellishment: Could be useful to indicate supply sector and demand sector aggregates - easily spanned/identified by arcs, since the corresponding slices are already arranged side-by-side.
44970	SPM	10	12	10	12	We calculated 28% for industry instead of 32%, using numbers from figure SPM.3. Please check again.
45424	SPM	10	13			The changes in some numbers are confusing. Readability of figure SPM3 could be increased : <ul style="list-style-type: none"> <li>* Make more explicit what the 3 "other" categories in the left figure stands for (transports, buildings,...)</li> <li>* keep same number of significant digits for all percentages</li> <li>* use intuitive color codes (indirect building in light green in the right figure is ill chosen).</li> </ul> Finally, in its present form, the usefulness of the right subfigure could be questioned considering that indirect emissions are still represented separately. It would help to have direct and indirect emissions of a given sector next to each other, at least.
45141	SPM	10	13	10	13	The terms 'Direct' and 'Indirect' emissions here are confusing as in chemistry terms, indirect emissions are emissions arising as a consequence of the transformation of one chemical into another. 'Source' and 'Consumption' emissions are far clearer. In either case, a call out box explaining the different between Direct/Source and Indirect/Consumption should be provided

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46825	SPM	10	13			Some suggestions for improvements of this useful figure SPM.3: 1) It is not clear why the category "other" exists three-times in both panels. This either should be summarized or specified. E.g. 'Other' below 'Residential': does it include services and public institutions and also energy related emissions from agriculture? 2) Please make it more transparent what exactly is allocated to 'Residential': Does this include direct space heating or only process heat? Does 'Building: Residential' in the pull out comprises total heat generation or only district heating? 3) The circle on the right side still has in the centre the category 'Electricity and Heat' but it should be 'Energy' and be moved out of the circle. Probably this category means own consumption of the energy sector but this remains unclear. 4) The use of decimal places should be consistent. In the left panel direct emissions have decimal places, indirect emissions don't. This is particularly confusing when comparing the left with the right panel. Please use one decimal place for the numbers in both circles. 5) The figure would be clearer, if the right panel would show the sum of direct and indirect emissions instead of presenting direct and indirect emissions separately.
43735	SPM	10	13	10	14	The classification for industry, transport and energy supply in figure SPM.3 are not consistent with the description in P10, L6-12. Three "Other" sectors in figure SPM.3 is misleading. It is suggested to revise accordingly.
47013	SPM	10	14			SPM3: The figure could be significantly improved. It should include titles that make clear the distinction between the left and right panels. In both panels, the category "other" appears twice in each figure with no indication of what they contain or why they are different. Would it be possible to separate Agriculture from Forest and other Land-use ? The caption talks about economic sectors which is not strictly true in some case. Where do the emissions from shipping and aviation go? The pull outs are useful. Finally, it's not clear how the numbers in the previous paragraph (p.10, l.6 to 12) are drawn from these figures.
43935	SPM	10	18	10	21	Please see comment on Figure SPM.1.
44407	SPM	10	19	10	19	In the Figure SPM.3. legend, we would suggest using directly the abbreviation "AFOLU" instead of specifying the extended term, because the terms AFOLU and FOLU have already been used several times previously in the document.
45506	SPM	10	2	10	3	"More than 75% of the 10Gt increase in annual GHG emissions..." This sentence is unclear - it could be read as if there has been an increase of 10Gt in every single year between 2000 and 2010. Please consider to rephrase to: "The annual GHG emissions have increased with 10 Gt CO <sub>2</sub> eq between 2000 and 2010, and more than 75 % of this increase was emitted by the energy supply (47%) and industry (30 %) sectors." in order to avoid confusion.
44078	SPM	10	2		5	This paragraph is a bit confusing, as it jumps between percentages and GtCO <sub>2</sub> e. Suggest that the final sentence be clarified, with 5.9 GtCO <sub>2</sub> e expressed as a percentage of the values in the first sentence.
44077	SPM	10	2	10	2	This should be 10GtCO <sub>2</sub> eq, presumably, if the authors are reporting on total GHG emissions (i.e. add "CO <sub>2</sub> eq" after "10Gt"). Also, it would be helpful to link this information to the first paragraph in Section SPM.2 on page 8 where trends in global GHG emissions are reported on. 2010 emissions are reported to be 49GtCO <sub>2</sub> eq; therefore, suggest first stating that from 2000 to 2010, global GHG emissions increased about 10GtCO <sub>2</sub> eq from XX to 49 GtCO <sub>2</sub> eq, then explaining (in a separate sentence) the major source contributions to this increase.
44702	SPM	10	22	10	28	The dichotomy between low/high income countries does not appear valid since countries are spread out in a range rather than in two groups (as also suggested in figures SPM.4 and SPM.5). At the very least, the heterogeneity within the groups should be described
45513	SPM	10	22	10	22	Please consider to add to this sentence: " ....unequal, both between countries and within income groups"
44083	SPM	10	22	10	22	This is fact, and thus a confidence assessment is not needed.
45375	SPM	10	22	10	28	The information about the variations in per capita emissions within income groups without further explanations on the underlying reasons is not helpful. Only for low-income countries the TS includes some explanation, but not for high income countries. This information should be included in the SPM.
45374	SPM	10	22	12	3	The classification of countries according to the per capita income is probably based on the regular assessments of the World Bank. As this assessment is updated on a yearly basis some clarification is needed about the year of assessment. In addition a description of this classification should be included in a box, identifying also the countries included in each group of countries.
44377	SPM	10	22	22	28	The comparison of emission levels of lower-income countries and higher-income countries is especially insightful for self-evaluation and target-setting on the national level. It would be helpful to examine these figures in relation to the mitigation efforts of each of the countries.
45673	SPM	10	22	10	22	The word 'in 2010' may be inserted between word 'emissions' and 'are'.
44490	SPM	10	22	10	22	The authors need to provide more clarity to this bolded statement - unequal by country? By region? By season? Also, is this CO <sub>2</sub> only or ALL GHG?

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44491	SPM	10	22	10	24	How are *median* per capita emissions calculated? You need the entire probability distribution function to do this, no? So, this data is available for all countries? More appropriately, this should be stated as *mean* per capita emissions to account for non-normal distributions of per capita emissions in most countries. There are two sections from the underlying text that should be brought forward in place of this paragraph: Chapter 1, p. 29, lines 7-8 and/or lines 13-14 and Chapter 1, p. 21, lines 40-47.
44492	SPM	10	22	10	28	With such a large variation within income groups, it would be worth a sentence or two summarizing some of the underlying reasons here. Is it electricity source? Type of industry? Forestry and land use? This comment also relates to figure SPM.4, where the difference within group (esp. low income) are striking
44493	SPM	10	22	10	28	Unequal by what? country? income? latitude? The authors should clarify the text.
45142	SPM	10	22	10	22	The phrase "highly unequal" is perjorative and should be avoided.
45143	SPM	10	22	10	28	This paragraph feels vague and needs definitions for low, high etc income countries.
45272	SPM	10	22	10	28	This paragraph should better reflect the diversity of per capita emissions within income groups which potentially demonstrates progress in low carbon development that is possible now e.g. some European member states have per capita emissions comparable to the better performing middle income developing countries, while some developing countries have per capita emissions that are worse than OECD levels.
45273	SPM	10	22	10	28	Suggest outlining that agri-emissions are remaining stable/reasonably stable even in high income countries. Suggest describing that AFOLU emissions are associated with food demand as page 19 line 5 refers to impacts of dietary change.
43736	SPM	10	22	10	28	Statistically, the median value cannot be used as an indicator for interpreting data trends as it is merely a value at the midpoint of observed values, unlike the average value, which is obtained by adding several amounts together and then dividing this total by the number of amounts. Thus, it is suggested to use average (mean) values instead of median values, and use the RC5 instead of the income-based classifications approach. As the result, it is suggested to replace this paragraph with the following text in accordance with the underlying report (Ch5, P4, L33-16; P6, L5-6): "Per-capita emissions are highly unequal (high confidence). Global average per-capita GHG emissions have shown a stable trend over the last 40 years. This global average, however, masks the divergence that exists at the regional level; in 2010 per capita GHG emissions in OECD and EIT are between 1.9 and 2.7 times higher than per capita GHG emissions in LAM, MAF and Asia. The gap in per capita emissions between the top and bottom countries exceeds a factor of 50. " [1.3, 5.2, 5.3]
43653	SPM	10	23			Using terminology such as a % or a proportion would be clearer than the term '9 times lower'.
44272	SPM	10	25	10	26	In SPM, references are required to substantiate the statement 'for most low-income countries, the largest source of emissions is from AFOLU'. Information on emissions from AFOLU in high-income countries shall be given also.
45514	SPM	10	26	10	28	This sentence is difficult to understand. Does income group refer to countries, income groups within a country or groups within the world population as such? The use of percentile level is also difficult to understand in this context.
44084	SPM	10	26	10	26	Consider adding text here to comment that reductions in AFOLU emissions are the reason that per capita emissions in low-income countries are decreasing as shown in Figure SPM.4.
43654	SPM	10	26	10	28	A comma between 'groups' and 'with emissions' (i.e. 'groups, with emissions') would provide greater clarity.
47015	SPM	10	26	10	28	It should be clarified that these figures relate to COUNTRY income groups (i.e. by groups of countries with similar average per capita income), to avoid confusion with household or individual income groups (groups of individuals with similar income around the world, irrespective of which country they live in). Furthermore, it should be highlighted that there are large variations in income within countries. Therefore, we recommend that this is at the very least revised to "There are substantial variations in per capita emissions within country income groups, with emissions at the 10th percentile level more than double those at the 90th percentile level, and within individual countries." It would be valuable to policy makers to also include an overview of recent evidence in relation to emission trends of both individual income groups and individual countries, using publications such as Chakravarty et al. (2009), which is already quoted in Ch. 1, p.29, I.11.
45144	SPM	10	26	10	28	Is this sentence about per capita emissions referring to the global situation? It's not clear, but if it is, I don't think it helps the policy-maker. Suggest deletion.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
46826	SPM	10	26	10	28	<p>"There are substantial variations in per capita emissions within income groups with emissions at the 10th percentile level more than double those at the 90th percentile level." See also figure SPM.4</p> <p>1) What is the 10th percentile level? The richest 10%? Please use language that is easy to understand. In addition, 10th and 90th percentile are likely mistakenly reversed by authors.</p> <p>2) This statement understates the ranges of per capita emissions within income groups (with the 90th percentile 4 times larger than the 10% percentile for lower-middle income countries, and about 7 times for low income countries.</p> <p>3) Please mention the large overlap between income groups in order to avoid the impression that high per capita emissions are an entitlement, or a necessity for achieving high income.</p>
45425	SPM	10	27	10	28	<p>Possible typo in the order of number. Should the reader not read :</p> <p>« There are substantial variations in per capita emissions within income groups with emissions at the 90th percentile level more than double those at the 10th percentile level. » ?</p>
44085	SPM	10	27	10	28	<p>Suggest: (1) Replacing 'more than double' with 'less than half'. The per capita emissions must be higher for the 90th percentile than for the 10th percentile; (2) Replacing "income groups" with "high/low income countries" because otherwise it could refer to comparative income groups across countries (i.e. high income earners in different countries); (3) If the source of this statement is CH. 5 pg 42 Sec 5.3.5 lines 7-15, then this result only applies to high income countries, for which per capita emissions for the 10th and 90th percentile are given. No data are provided for the range in per capita emissions for low income countries as a group.</p>
43655	SPM	10	27			Should this be 'between income groups' rather than 'within income groups'?
43936	SPM	10	27	10	28	Please clarify the last sentence's point on percentiles by changing it to "...with emissions of the wealthiest 10% of the population more than double the emissions of the poorest 10% of the population".
44494	SPM	10	28	10	28	At the end of this sentence, the authors should insert "in all income groups" if it's true.
47016	SPM	10	29	11	5	This paragraph gives an incomplete picture of the situation which is discussed in the underlying report. Section 5.4 of Chapter 5 on international trade issues is relevant here and it is worth introducing the issue of carbon leakage which has attracted considerable scientific and public attention in recent years (Box 5.4, Ch.5).
45674	SPM	10	29	10	33	Complement AR5 authors for providing information on GHG emissions according to territorial and consumption based approaches.
44495	SPM	10	29	10	30	The authors should reflect the underlying text more accurately in this section. Specifically, Chapter 1, p. 10, lines 19-25 should be used to start the paragraph: "ALONGSIDE A GROWING SHARE OF GLOBAL WEALTH, a growing share...". This is supported by Figure 1.1 of Chapter 1 (p. 9) which shows that annual GDP growth rates have steadily declined over the past three decades in high-income countries, while they've increased in all other countries.
44496	SPM	10	29	10	33	This is an incomplete and unbalanced discussion; it does not reflect the fact that economic benefits accrue to the manufacturing party in the trade. Rather, it only presents disbenefits of emissions. Territorial emissions are outside the control of the importing party; emissions are - in good part - a reflection of the choice of fuel mix involved in the production of a product; this choice is made in the jurisdiction in which production occurs. It is essential that these facts be included, or this element of the text should not be elevated to the SPM.
45145	SPM	10	29	11	5	It is important that this section is explicit that this trend is driven by globalisation rather than by climate policy (given the common misconception that this is a consequence of/intention of climate policy)
45146	SPM	10	29	11	5	This characterisation of international trade as a source of CO2 emissions is extremely unhelpful and partial, as there is no information presented on financial flows from high income to lower income countries, nor any information presented on the degree to which these trade flows have led to economic growth and poverty reduction globally.
45507	SPM	10	3	10	3	We think that the term "energy supply" should be briefly explained, since it is frequently used in the consecutive text. Does it mean "electricity and heat production" (ref. line 10 and Figure SPM. 3)? A further explanation is also requested to clearly distinguish between related terms like "energy sector". Otherwise, the terms could be defined in Annex I Glossary.
45508	SPM	10	3	10	4	"5.9 GtCO <sub>2</sub> eq...": It is unclear what sector this is related to, since two sectors are mentioned in the previous sentence. One option could be to say "of the increase of these two sectors", instead of "sectoral increas", if that is correct. The term "upper-middle income countries" can be interpreted as a single category (the category below upper income countries) or upper income countries and middle income countries combined. Please clarify.



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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
45515	SPM	10	30	10	33	Please rephrase this sentence e.g. to read: "Since AR4 emission estimates have been improved. Territorial emission estimates is based on the UNFCCC accounting principles and establishes the Parties responsibility for the emissions of GHG. Consumption-based emission estimates can supplement "territorial" emission estimates by illustrating the importance of international trade." Rationale: Consumption-based emissions should be presented as a supplement in this SPM, because it has not the same status as the established "territorial concept that reflects the countries responsibilities (it also introduces additional uncertainty). Countries of final consumption normally would also have very limited instruments to influence emissions outside its own territory (in contrast to territorial emissions, where legal and economic instruments may be applied).
47017	SPM	10	30	10	33	See previous comment for p. 9, l.12-13. Please add information regarding the uncertainties and assumptions associated with these data sets.
45147	SPM	10	30	10	30	"(medium evidence ; high agreement)" - This formulation of evidence/agreement is not applied to other statements in the SPM. Whatever formation is chosen should be applied consistently
44086	SPM	10	31	10	31	It is not clear what the terms "territorial" and "consumption-based" mean in this context. Suggest defining. This issue also applies to Figure SPM.5.
44749	SPM	10	31	10	31	Mention the methodologies and their reliability for the attribution of the "consumtion-based" emission estimates?
44273	SPM	10	33	11	2	On "share of CO2 emissions from industry", an explicit discussion on embodied-emission has not been presented in SPM. Such information on products and services shall be presented in SPM
47018	SPM	10	33	10	33	A growing share': this needs to be substantiated with numbers, are we talking about 1 % , 10 % , 50 % ....?
47019	SPM	10	33	11	2	The use of such broad regional groupings (e.g. "developing", "developed", annex 1, non-annex 1) does not provide useful information to policy makers. It would be informative to provide information on major economies to avoid making sweeping generalisations and loss of detail.
44971	SPM	10	33	11	1	"a growing share of CO2 emissions ... is released in the production of goods and services exported". It would be better if the value of that share was quantified.
45274	SPM	10	33	11	2	Regarding the sentence beginning "A growing share...", it is not clear what the basis or evidence for this statement is. Reference to underlying analysis which supports this statement is required.
44079	SPM	10	4			Per Canada's overall comments on the SPM, it would be helpful to consistently use a single classification of countries, rather than the multiple different classifications that are currently used. Here on page 10, the SPM refers to upper-middle income countries, and elsewhere the SPM makes distinctions between countries based on OECD membership, Annex-I membership, level of development and income level (HIC, UMC, LMC, LIC as in Figures SPM.4 and SPM.5) making it difficult to draw out consistent messages for a given group of countries. Suggest the authors consider whether a more consistent approach is possible, or providing further explanation to readers to help in understanding and comparing information.
43651	SPM	10	4			There are a number of references to income grouped countries (i.e. high income, upper middle income, low middle income etc); however these groups are not identified in the Summary for Policymakers. Please provide a reference as to where to find definitions of these groups.
44486	SPM	10	4	10	4	What countries are included in "upper middle income countries"? Enumerating all of them in the SPM is impractical, but a footnote or reference to the Glossary is warranted.
46822	SPM	10	4			Please define low, middle, upper-middle, high income countries in a footnote as this classification is used in several places in the text. Explain the overlap and difference with the classification used in Figure SPM.2.
45671	SPM	10	5	10	5	The word 'been highest' may be Deleted.
45672	SPM	10	5	10	5	The line 'taken place in other sector the growth of GHG emission has been in the range of 3%-11%' may be added after the word 'highest'.
44271	SPM	10	6	10	12	why using 2010 figures only while other trends explained over the period of time
44270	SPM	10	6	10	6	using the word dominated is exaggeration to the figures , dominance indicates overwhelming percentage
45510	SPM	10	6	10	12	The text in line 6 to 12 should be better aligned with figure SPM.3, both with respect to terms and (sub-) classification. We also find ut difficult to relate some of the percentages mentioned in the text to the percentages in the figure (for example: How do the 35% emissions in energy supply relate to the 25% from electricity and heat (where are the missing 10% allocated?))
45509	SPM	10	6	10	6	AFOLU should be spelled out, since it's mentioned for the first time in the SPM. AFOLU should also be better defined in Annex I Glossary.
44080	SPM	10	6	10	6	As per other comments, here AFOLU is used, whereas previous figures used FOLU - this needs to be better explained in the SPM.
43984	SPM	10	6		13	It might be misleading to present emissions by sectors at a global level because it might suggest which sector any given country needs to mitigate from, when these emissions by sector could be completely different by region or on a developed country/developing country basis. These differentiations may offer clearer guidelines.
44487	SPM	10	6	10	12	Please define the acronym here.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
46823	SPM	10	6	10	21	In the context of GHG emissions from different sectors, data should be given on the share of non-CO2-emissions for the different sectors. E.g. it should be stated that more than 80% of the emissions in the agriculture subsector are non-CO2 emissions (see chapter 5.3.5.4 of the underlying report). In addition, please explain "indirect emissions" when it is first used. The expression is first used in line 7, but explained only in line 10.
44341	SPM	10	6			The acronym AFOLU should be spelt out at its first use.
44081	SPM	10	7	10	8	It would be helpful if the headline could describe what is meant by "indirect emissions". Related to this, are emissions associated with building construction (direct, and indirect, including from cement production) allocated to the buildings sector, or to industry? Suggest clarifying.
43933	SPM	10	7	10	7	Please add "from electricity and heat production" after "in importance if indirect emissions..."
45139	SPM	10	7	10	8	"industry and building gain considerably in importance if indirect emissions are accounted for" is unclear. Does it mean "If emissions from the energy supply sector are allocated to the sectors using the energy, industry and buildings become more important, accounting for half of global GHG emissions.?"
45511	SPM	10	8	10	8	It would be helpful to have the figure of the global emissions in 2010 in mind when reading the pages 10 to 12. We therefor suggest to include in the beginning of the sentence: " Of the 49 Gt CO2eq emissions in 2010, 35 % was released in the energy supply sector, 24 % in AFOLU, ...."
43652	SPM	10	8			It is not easy to recognise the numbers given in the text, with those in Figure SPM.3. I.e. 'In 2010, 35% of GHG emissions were released in the energy supply sector, 24% in AFOLU etc.'
46824	SPM	10	8	10	21	The correlation of this data with the figures in SPM.3 seems to be somewhat unclear. It is e.g. stated here that 35% of GHG emissions are released in the "energy supply sector", while SPM.3 states 25% on its left panel for "electricity and heat." It should be made clearer if, and if how, the data in these lines and the figures of SPM.3 correspond to each other.
44805	SPM	10	9	10	12	The text speaks of 21% share for industry. Figure SPM.3, left hand side, has 18% for industry. Unclear or discrepancy? Also in the right hand side of the figure, the percentages clearly marked for industry do not add up to the 32% in the text. Do some of the other categories also sort under "industry"?
45140	SPM	10	9			It's not clear where the figure "14% in transport" is derived from. The left panel of Figure SPM.3 shows "road" and "transport" totalling 10.3%, and the right panel shows "Indirect transport" and "road" totalling 10.47%.
43996	SPM	10	1	10	5	It is requested not to single out countries or group of countries or, otherwise, add a reference to each category (HIC, UMC, LMC and LIC).
43997	SPM	10				Some values reported in p. 10 (lines 8-9) are not readable in Fig. SPM.3 (left panel). These include: 35% in the energy supply, 21% in industry and 14% in transport. Further specification of the three categories denominated "Other" may help to better visualize the apportionment of energy supply, industry and transport.
45833	SPM	10				Figure SPM.3 is confusing because there are a number of percentage of "Other". Please make it clear that each "Other" has been classified in any sector.
45828	SPM	10	1	10	5	Perhaps "SECTORAL AND" should be added at the beginning of the first line of this paragraph as it may be confusing for some readers that the first line starts solely with "REGIONAL" while the paragraph refers to/discusses the sectoral increase in annual GHG emissions.
45831	SPM	10	22	10	28	It is not clear why only "per-capita" is addressed here. From the fairness viewpoint, other indicators such as per-GDP should also be incorporated.
45832	SPM	10	24	10	26	Given that the sentence does not discuss per capita emissions, wonder if the sentence beginning with "For high-income countries, ..." would be better placed in the first bullet (after sentence on P10 line 3-5) or alternatively be moved to the second bullet which discusses the sectoral distribution of emissions.
43461	SPM	10	4	10	4	It would be appropriate to state the actual regions by name(s) where these upper-middle income countries are located so as to emphasize the statement provided in line 1 of the same page.
45829	SPM	10	4	10	4	Scope and definition of HIC, UMC LMC and LIC should be clearly indicated so that all readers could recognize the countries/regions included in each category.
45830	SPM	10	8	10	9	Would appreciate clarification of each sector on the following description; "In 2010, 35% of GHG emissions were released in the energy supply sector, 24% in AFOLU, 21% in industry, 14% in transport and 6% in buildings". For example, there is description of "35% of GHG emissions were released in the energy supply sector", but there is not single sector that releases 35% of GHG emissions in Figure SPM.3. Since this applies equally to other percentages, policy makers confused.
44396	SPM	10	23	10	26	Include a clear definition of the current status of low, middle and high income countries, as this status could change in the future.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44397	SPM	10	29	11	5	These two methods are not equality studied and the literature for consumption methods is just emerging and increases the uncertainties. Both the territorial UNFCCC and the consumption methods should be defined and the uncertainties should be reflected "There is increased uncertainty in consumption-based emission estimates"
44395	SPM	10	4	10	4	In order to give more clarity a definition of upper-middle income countries should be included.
44720	SPM	11				The dotted and solid lines are not clearly seen.
47104	SPM	11				We think there is both repetition of information and other relevant information still lacking in Figures SPM.4 and SPM.5. We suggest to delete the right panel of SPM.4 and choose between mean and median in the middle panel, because this all this distributional information is to difficult for policy makers to digest. We also suggest to newly include a panel for GHG emissions per GDP (preferably PPP). Finally we suggest to include SPM.5 as a fourth panel in SPM.4 and give it a consistent lay-out.
47020	SPM	11				SPM4: Would it be possible to define (or provide reference) what is meant with High income, etc countries. A range of US\$/capita would probably substantiate this?
47021	SPM	11				SPM4: A brief sentence should be devoted to why the uncertainty of LIC is so disproportionately large
47022	SPM	11				SPM5: Figure needs to improved because the dashed and solid lines are not easily visible.
44806	SPM	11				Please check the panel to the right. It looks a bit strange. The shadings are lacking in some cases and the median is in some cases placed on the border between the different percentiles, which could be right but should be checked.(vertical databar would seem to end at the 75th percentile mark (the bar does not extend beyond with a lighter colour). At the lower end, the bar does extend to 10th percentile. Is this intentional?
44807	SPM	11				It is quite difficult to see the solid and the dotted lines.
44380	SPM	11				Bottom solid line in LMC needs to be changed to dotted line like Figure 1.5 in p.24 in Chapter 1.
45675	SPM	11				Which countries are included in HIC, UMC, LMC and LIC. What is the rationale for grouping countries according these 4 strata.
43937	SPM	11				Please make the dotted lines stronger
45277	SPM	11				This figure needs to be graphically clearer. The weight or width of the lines (territorial vs. consumption) needs to heavier/thicker so that it is clearer that the shaded area represents the difference between the two trends.
45276	SPM	11				The country groupings in this figure are not consistent with other groupings used in the report. Groupings should be clarified as to what standard was used e.g. UN classification?
43656	SPM	11	0			The solid and dotted lines in this figure are very difficult to discern.
44750	SPM	11	1	11	1	Does the use of the word "combustion" means that the SPM is referring only to industrial products excluding those related to agriculture and forestry?
44497	SPM	11	1	11	2	It seems counter-intuitive to equate "developing countries" with "upper middle income countries" and further reinforces the need to provide the reader with definitions of each categorization - whether in a footnote, the glossary or elsewhere.
44502	SPM	11	14	11	14	Figure SPM.5: (a) There is a biased representation of inter-regional flows, with no acknowledgement of balancing trends, e.g., economic benefits and revenues from the export of goods. (b) The figure is graphically of poor quality - dotted/solid bounds are unclear.
45518	SPM	11	15	11	15	Figure SPM 5: In the figure it is impossible to differentiate the solid line (representing territorial emissions) from the dotted line (representing consumption based emissions). Please consider to present the figure as it is done in Figure 5.14.
45517	SPM	11	15	12	3	Figure SPM.5. Please consider how consumption based emission estimates are presented alongside territorial emission estimates in this report. Issues both relating to data quality and allocation of responsibility for mitigation between countries as established by the UNFCCC should be relevant.
44093	SPM	11	15	11	15	Suggest avoiding using these acronyms on these figures and instead providing a legend that contains words, such as High, Upper Middle, Lower Middle and Low. When verbalized, "HIC" and "LIC" are similar to other English words.
44094	SPM	11	15	11	15	It would be useful to include an assessment of uncertainties (i.e., how confident are the authors in their evaluation of the sign and/or magnitude of the differences?).
44095	SPM	11	15	11	15	It is difficult to distinguish between the solid and dotted lines. Suggest the lines be drawn in a different colour to make them more evident. Perhaps a contrasting colour could be used for the shading - e.g., black solid and dashed curves, plus coloured shading. Drawing the shading first, so that the lines appear on top of rather than beneath the shading, would also help.
44751	SPM	11	15			This figure presents a number of problems that the SPM does not address, among which: 1) Lack of clarity on the methodologies used for the estimate of emissions' transfers 2) The uncertainties associated with the estimates of the transfers 3) Conditions related to technologies and practices under which the goods transferred are produced. Therefore we propose to reconsider the way the figure is drawn.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44503	SPM	11	15	11	15	The term "net importer of emissions" is confusing. The HICs consume goods manufactured elsewhere, so haven't they actually EXPORTED their emissions? The terminology seems exactly backwards. Similarly, "net exporters of embodied emissions" is obscure and confusing language.
44972	SPM	11	15			It is hard to distinguish the full and the dotted lines.
46830	SPM	11	15			Dotted lines are hard to see. You may use slightly different colours or make dotted lines bolder to better differentiate from shaded areas. Please exchange "territorial" with "production-based" in the legend.
45430	SPM	11	16			The solid and dotted line are not enough visible on the figure and need improvement.
45429	SPM	11	16			At the beginning of page 11 (lines 2 to 5), it is said that : « Total annual industrial CO2 emissions from the non-Annex I group now exceed those of the Annex I group using territorial and consumption accounting methods, but per-capita emissions are still markedly higher in the Annex I group. » Would such a grouping (A1/NA1), not help the reader in complement of figure SPM.5 in which HIC continue to have a higher share of consumption based emissions than UMC, LMC and LIC in 2010 ? As an aside, light colors for the net transfer could improve the readability of that figure, in which consumption and territorial emissions (dotted and solid lines) can hardly been distinguish without taking into account the color code for net transfers.
45377	SPM	11	16	12	3	The distinction between territorial and consumption based emissions does not become very visible.
44752	SPM	11	16	12	3	For the same reasons as those presented in the previous comment, the figure caption has to be reconsidered.
45149	SPM	11	16			"economic regions" are not actually regions in the usual sense of the word and the phrase is not in the glossary or Annex 2. A better term would be "World Bank Income classifications"? Also not clear how this analysis captures counties that move between these income classifications - is this the history based on the current classifications?
44096	SPM	11	17	11	17	Figure SPM.5 figure and caption: What does the word "territory" mean in this figure? Suggest explaining further.
45426	SPM	11	2	11	5	At the beginning of page 11 (lines 2 to 5), it is said that : « Total annual industrial CO2 emissions from the non-Annex I group now exceed those of the Annex I group using territorial and consumption accounting methods, but per-capita emissions are still markedly higher in the Annex I group. » Would such a grouping (A1/NA1), not help the reader in complement of figure SPM.5 in which HIC continue to have a higher share of consumption based emissions than UMC, LMC and LIC in 2010 ? As an aside, light colors for the net transfer could improve the readability of that figure, in which consumption and territorial emissions (dotted and solid lines) can hardly been distinguish without taking into account the color code for net transfers.
44088	SPM	11	2	11	3	If possible, it would be helpful to consistently use a single classification of countries, rather than the multiple different classifications that are currently used. Here on page 10, the SPM refers to upper-middle income countries, and elsewhere the SPM makes distinctions between countries based on OECD membership, Annex-I membership, level of development and income level (HIC, UMC, LMC, LIC as in Figures SPM.4 and SPM.5) making it difficult to draw out consistent messages for a given group of countries. Suggest the authors consider whether a more consistent approach is possible, or providing further explanation to readers to help in understanding and comparing information.
44878	SPM	11	2	11	5	This is where the use of different criteria for agregating groups of countries has been most confusing and misleading. The whole paragraph refers to the difference between "territorial" and "consumption based" emissions between HIC, UMC, LMC and LIC (Figure SPM.5). As a result, the claim that non-annex I (mostly non-HIC) emissions now exceed annex I (mostly HIC) emissions "both using territorial and consumption accounting methods" is directly contradicted by Figure SPM.5, where the sum of emmissions allocated to consumption of UMC (~11,5), LMC (~4) and LIC (~0,5) do not add up to the HIC consumption line (~17,5). Delete from line 2 "Total annual industrial CO2" to line 5 "...group [1.3, 5.3]". Replace by "Per capita emmissions are makedly higher in HIC countries, using both territorial and consumption accounting methods, in spite of the growth of emmissions from middle income countreis in the last decade.".

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
43737	SPM	11	2	11	5	According to Chapter 5 of underlying report, the "industrial CO2" mentioned here should be referred to as "CO2 emission from fossil fuel combustion and industrial process", it is suggested to revise accordingly. In order to fully reflect consumption-based CO2 emissions, it is suggested to add the following text at the end of this paragraph (see Ch5, P5, L5-7 and P31, L12-15): "In the OECD-1990 region, territorial CO2 emissions slightly decreased between 2000 and 2010, but consumption-based CO2 emissions increased by 5% (robust evidence, high agreement). In most developed countries, both consumption-related emissions and GDP are growing. The OECD territorial per capita emissions declined over 1990-2010, while consumption-based emissions increased. By 2010, per capita territorial emissions for OECD countries are 3 times those for Asian countries, but per capita consumption-related emissions differ by a factor of 5." In addition, considering the huge uncertainty of consumption-based CO2 emission estimates and its relation to "the model setting, the data quality and other related technical issues" as described in Section 5.3.2 of underlying report, it is thus suggested to mention the relevant uncertainties at the end of this paragraph.
44697	SPM	11	25	11	27	CHAPTER 16, P. 11, LINES 25-27: As written, this is an inaccurate statement and needs to be revised. First of all, "climate finance" has not really been defined under the UNFCCC. Second of all, if this is referring to specific Annex II commitments under the UNFCCC, we include finance provided and mobilized, so the reference should at least state "climate finance is funding provided to and mobilized by Annex II Parties". The authors needs to revise the text to accurately reflect this.
45427	SPM	11	3	11	3	The text mentions Annex I and non-Annex I groups whereas the figures show HIC, UMC, LMC, LIC. Is it possible to relate the two ?
43657	SPM	11	3			There should be a reference to Annex 1 and non-Annex 1 countries - perhaps in the Technical Summary?
44877	SPM	11	3	11	3	The word "now" does not present an objective and precise perception of the timeframe considered.
44498	SPM	11	3	11	5	The statement regarding per capita emissions being "markedly higher" in the Annex I group is not consistent with Figure 1.8(c), which shows that many non-Annex I nations (including South Africa, Brazil, China, Saudi Arabia, Indonesia, etc.) have per capita emissions on par with Annex I countries. As a result, the second part of this sentence needs to be deleted.
44342	SPM	11	3			The use of non-Annex I and Annex I needs some explanation i.e. Annex I countries are those listed in Annex I of the UNFCCC, and non-Annex I countries are those that are not.
45148	SPM	11	4	11	4	"markedly" is pejorative and should be deleted
45275	SPM	11	4	11	5	The phrase beginning "but per-capita" is not a balanced analysis. Language should reflect that per capita emissions in a number of emerging and developing countries exceed developed country per-capita emissions, and confidence limits
44499	SPM	11	5	11	5	Figure SPM.4: Mean and median of what? Presumably reviewed studies? The authors should include the n (number of data points) as well.
44500	SPM	11	5	11	5	Figure SPM.4: Reliance on the per-capita emissions metric constitutes regionally biased selectivity. The authors should balance the text by also representing regional GHG intensity trends (see, e.g., Chapter 7, p. 14, l. 7-8).
43738	SPM	11	5	11	20	Figure SPM.4 and Figure SPM.5 are based on the income-based classification approach. There are concerns about this method (see comments NO.13). It is suggested to use RC5 classification approach and replace Figure SPM.4 and Figure SPM.5 with Figure 5.2 and Figure 5.14 respectively.
45428	SPM	11	6			SPM4 could be clarified by telling at which date (2010? ) countries and groups of countries are made. The total number of countries has evolved over the 40 year period considered (as well as their appartenance to LIC, LMC,...)
45516	SPM	11	6	11	14	Figure SPM. 4. Please consider rephrasing the caption accompanying this figure, for clarification. I) The Figure should be given a short and descriptive title, e.g. "Trends in GHG emissions by economic regions". II) Please consider providing illustrations based on the standard RC5 regions, as done in Figure 5.2, as these categories are more familiar to policymakers. And, for the identification of countries to economic regions please provide a reference to Annex II.2, Table A.II.8. or Table A.II.9 at the end of the caption. Consider to replace this figure with Figure 5.2 as it is easier to understand. III) In the panel in the middle, both mean and median per capita emissions are provided, please explain the different meaning of these two categories in the figure caption, or choose one of either, to simplify. For example, insert the relevant sentences from TS page 14, line 7-10.
44089	SPM	11	6	11	6	Figure SPM.4, left and right panels: Suggest avoiding using these acronyms on these figures and instead providing a legend that contains words, such as High, Upper Middle, Lower Middle and Low. When verbalized, "HIC" and "LIC" are similar to other English words. A similar comment is also included for Figure SPM.5

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44090	SPM	11	6	11	6	Figure SPM.4, middle panel: The graph is a bit difficult to interpret owing to the large number of lines and the presence of both a mean and median for each group of countries. Rather than showing mean and median per capita emissions in each group of countries, the authors could just show the per capita emissions over the group of countries as a whole (i.e. total emissions divided by the total population of the group of countries concerned). This would be a single number, and would not be influenced by the distribution of population among individual countries in each group.
44091	SPM	11	6	11	6	Fight SPM.4, right panel: This legend is confusing because the labels in the upper row are cryptic, the mark for the mean is not shown as a line, and because the colours that are used in the legend refer to only one income group. Consider revising or removing.
44501	SPM	11	6	11	6	Is "regional" trends meant to be trends broken down by countries that have been grouped according to income, not geographical proximity. If that's right, then "regional" is a misleading description. It's not clear what is meant by mean and median among countries? Also a clear legend would really help the reader.
46827	SPM	11	6			We suggest some improvements of this important figure: Left panel: Lines are difficult to distinguish, please improve, see inset of Figure 1.4. which is clear. Middle and right panel: Add information on the calculation of the mean and the median to the caption and comment on their differences in the text (why this large difference?). The vertical axis of the two panels should have the same length and start at the same place on the page. Legend: the line for the median should be finer as in the figure.
44092	SPM	11	7			Figure SPM.4 caption, line 7: Suggest revising to state "Regional trends in GHG emissions..."
43987	SPM	11	7			The figure SPM .4 according to figures 1.4 and 1.8: it would be interesting a correlated figure between Gross Domestic Product and the GHG emissions per economic region (HIC, UMC, LMC and LIC).
45376	SPM	11	7	11	7	Given the fluctuations in the medium values for the per capita emissions it is suggested to only include in the figure the median values. The right panel should only remain if further explanation for the significant skewed distributions is provided in the text.
46829	SPM	11	7			Please add "-emissions" and write "Regional trends in GHG-emissions per economic..."
46828	SPM	11	7	11	14	Please give a reference where the list of countries included in the different groups (HIC, UMC, LMC, LIC) can be found.
43998	SPM	11				Graphic unclear. Clarifying requested. The dotted lines are not perceived correctly.
45836	SPM	11				Suggest that the lines of Allocation (Both Territorial and Consumption) be presented in a clearer way so as to differentiate between the two types of allocation.
45837	SPM	11				Note on Uncertainty about MRIO datasets, regarding which assessment this part is based on, from the body text Ch5 (5.3.3.2.) should be added to Figure SPM5 notes for accurate understanding of the consumption based emission.  **Note on Uncertainty - There is increased uncertainty in consumption-based emission estimates. MRIO datasets combine data from different data sets, often large and incoherent; as a result, uncertainties arise in relation to calibration, balancing and harmonisation, use of different time periods, different currencies, different country classifications, levels of disaggregation, inflation, and raw data errors (Lenzen et al., 2004, 2010; Peters, 2007; Weber and Matthews, 2008; Peters et al., 31 2012). Production-based emissions data are a key input to the MRIO models that can vary for some countries significantly between databases (Peters et al., 2012)
45834	SPM	11		11		Suggest scope and definition of HIC, UMC LMC and LIC to be clearly indicated as described in body text Chapter 1, so that all readers could recognize the countries/regions included in each category.
45835	SPM	11		11		Suggest scope and definition of HIC, UMC LMC and LIC to be clearly indicated as described in body text Chapter 1, so that all readers could recognize the countries/regions included in each category.
45635	SPM	11		11		The right-hand panel of this chart does not display a p25/p75 bar for the UMCs. In addition, it is surprising that the p10/p90 bar is so narrow.
44721	SPM	12				It would be helpful if the 0-line was marked more clearly.
47108	SPM	12				This figure takes too much time to comprehend. Perhaps the fix would be to show the change in each component and the total separately.
44808	SPM	12	1	13	2	Why" in the context of sustainable development" here and not in Section 4 (p 25 line 1) or 4.2 (p 28 line 1)?
45151	SPM	12	10	12	10	"the decline" should be replaced by "improvements"
44100	SPM	12	11	12	12	We assume this should state "...while the importance of population growth has remained roughly steady". Suggest reviewing.

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44810	SPM	12	11	12	11	Stating economic growth as the main driver of emissions may lead to the erroneous conclusion that growth must slow/reverse to reduce emissions. Increased consumption of energy services that are provided through burning fossil fuels is what drives emissions. Not economic growth per se.
45521	SPM	12	12	12	13	The phrase "energy intensity" might be confused with "energy efficiency" and the difference in sign (+ or -) used for these two phrases might be confusing. Because of this, we propose that the word "declined" could be substituted by "improved", and "decline" with "improvement".
44101	SPM	12	12	12	14	It would be helpful to provide a confidence assessment for this statement concerning the offsetting effects due to declining energy intensity and increasing population.
44102	SPM	12	13	12	14	Suggest adding "the effect of" such that the end of the sentence reads "...that is nearly the same magnitude as the effect of growth in population."
44103	SPM	12	14	12	16	Is this statement about the reversal of patterns well enough supported by the available evidence that a confidence assessment is not needed (i.e., can this be treated as a fact)? Also, consider whether this statement would be better placed in the section about energy supply, rather than here.
45937	SPM	12	14			that is nearly of the same magnitude as growth in population. ~ that is nearly of the same magnitude as INCREASE OF EMISSIONS DUE TO growth in population.
45279	SPM	12	14	12	16	The sentence beginning "Between 2000 and 2010, ..." is an important piece of information for policymakers and needs appropriate emphasis. This sentence should be the bolded heading of the paragraph.
44506	SPM	12	15	12	15	The authors need to specify to which countries this statement applies - certainly not high-income countries (i.e., the increased use of coal relative to other energy sources between 2000 and 2010).
44675	SPM	12	16	12	22	CHAPTER 2, P. 12 LINES 16-22: While revised from the previous version of the report, this text is still flat out wrong: "From the perspective of countries rather than individuals or groups of individuals, the developed countries bear much of the causal responsibility for climate change because of their historical emissions. Furthermore, many developed countries are expected to suffer relatively modest physical damage and some are even expected to realize benefits from future climate change (see Tol, 2002a; b). On the other hand, many developing countries bear less causal responsibility, but they could suffer significant physical damage from climate change (IPCC, 2007 WG II AR4 SPM)" UNEP, IEA and other organizations have repeatedly shown that cumulative emissions (1751-2010) from developing countries are nearly equal to that of developed countries and will surpass those from developed countries by 2020 under almost any projection. This refutes the first part of this sentence. Regarding the second part of the sentence, the SPM of AR4's WG2 does not make this assertion. Indeed, most developed countries have massive and expansive coastal infrastructure including economically important ports, so the physical damage could be equally if not more significant in developed countries. In light of this contention, this text should be removed altogether.
44685	SPM	12	16	12	22	CHAPTER 3, P. 12, LINES 16-22: The statement that, "developed countries bear much of the causal responsibility for climate change because of their historical emissions" is biased and factually incorrect, given that developing country cumulative emissions during 1850-2010 make up 48% of global GHG emissions (with developed country emissions accounting for the remaining 52%) (den Elzen et al. 2013 Climatic Change). Another way of making a similar point would be to say that countries' historic emissions help determine their causal responsibility for climate change, without making the developed vs. developing country distinction.
44276	SPM	12	17	12	18	statement shall be moved at the top of the section as it discusses full radiative forcing
45432	SPM	12	17	12	26	It would be useful to elaborate more about the upper bound of emissions scenarios. « Atmospheric concentrations in baseline scenarios collected for this assessment (scenarios without explicit additional efforts to constrain emissions) [...] and reach CO <sub>2</sub> eq concentration levels between 750 to more than 1300 ppm CO <sub>2</sub> eq by 2100. » How well informed on recoverable fossil fuels and cost of recovery the scenarios predicting emissions like RCP8.5 are ? Especially, are the emissions corresponding to the continuation of RCP8.5 up to 2300 used by the WG1 reasonable considering the existing literature ? This is not discussed in the summaries of the IPCC and would have to.
45522	SPM	12	17	12	18	We suggest that you consider to rephrase the sentence with "Without explicit efforts to reduce GHG emissions, the atmospheric concentration are expected to exceed 450 ppm CO <sub>2</sub> eq by 2030 and reach between 750 to more than 1300 ppm CO <sub>2</sub> eq by 2100 despite major improvements in energy supply and end-use technologies". Rationale: The numbers in the body of the paragraph are important information and should be reflected in bold.

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44105	SPM	12	17		26	The paragraph includes useful information but does not fully explain/address the bolded heading. Suggest reviewing and consider adjusting one or the other.
44104	SPM	12	17	12	26	This is the first mention in the SPM of scenarios. As per Canada's overall comment, it is recommended that a Box be introduced into the SPM to explain how these scenarios were generated and how they relate to the RCPs.
45636	SPM	12	17	12	26	This paragraph refers to ppm concentrations for "full radiative forcing including greenhouse gasses, halogenated gasses, tropospheric ozone, aerosols, and albedo change." For the layman, the ppm concentration equivalent of albedo change is a confusing concept. A review of section 6.3.1 in the main document reveals that an equivalence has been established between several different models that take into consideration different subsets of the spectrum of radiative forcing agents. The simplification required for the SPM has left out many steps and we would recommend that this drafting be revisited.
45678	SPM	12	17	12	18	Please incorporate and explain the projections for land use emissions under baseline scenario and in particular deforestation trends and drivers.
43938	SPM	12	17	12	26	This paragraph seems to be out of place. Shouldn't it be in Section SPM.3 "Mitigation pathways..."
44975	SPM	12	17	12	17	Please clarify the wording "Without explicit efforts to reduce GHG emissions" : could it be reformulated as "without climate policy" ? (additional climate policy ?)
44974	SPM	12	17	12	18	What is meant by "the fundamental drivers of emissions growth are expected to persist" is unclear : if this means population, economic growth, and carbon intensity, this should be made clear, as well as what is meant by « expected to persist ». We do not understand how the "persistence" of these drivers is the consequence of "the absence of explicit efforts to reduce GHG emissions" : would climate policy curb population and/or economic growth that would not be affected by other policies ? What about societal changes due to broader concerns ?
45523	SPM	12	19	12	26	This section introduces the term radiative forcing in this SPM. Please consider explaining this term, and also consider rephrasing the last sentence of this section, for clarification, what represents full radiative forcing.
44106	SPM	12	19	12	21	This is the first time that CO <sub>2</sub> eq atmospheric concentrations have been given in this SPM. Previously CO <sub>2</sub> eq emissions were described, and it was noted that these were calculated on the basis of GWPs (page 8, In 4-7). Non-expert readers may assume that CO <sub>2</sub> eq concentrations are calculated in the same way using GWPs. We think these are calculated using the radiative forcings of the gases, perhaps using simplified formulations for radiative forcing. This should be stated either in the text ('CO <sub>2</sub> eq concentrations are calculated on the basis of the radiative forcing of the corresponding mixture of greenhouse gases') or in a footnote.
47107	SPM	12	19	12	20	The term baseline scenarios and their relation with the RCPs is not clear, but essential to understand the meaning of this conclusion. We leave it to the authors to provide a suitable overview, perhaps in an additional box. Nowhere in the SPM key variables such as RCPs are explained.
45379	SPM	12	19	12	19	It is suggested to improve clarity: Atmospheric concentrations of greenhouse gases in baseline emission scenarios ....
44977	SPM	12	19	12	21	It is important to clarify the differences between AR4 and AR5. What is regarded "baselines" in AR5 is not the same as in AR4. The range shown on figure SPM.7 is substantially different from the ranges shown in both AR4 and TAR (AR4 concluded that there was little change). AR4 section 3.2.2.1 explains that it includes 3 types of studies (extrapolation, such as EMF-21, probabilistic approach, and "storylines" such as SRES). By the time of AR4, scenarios similar to RCP 4.5 were regarded as potential "no explicit climate policy" scenarios, at the lower end of the "no-mitigation" scenarios, in the SRES A1T and B1 families. In AR5, the lower end of baselines appears to be near RCP6. This suggests that the main explanation is a change in how authors view baselines, ie. that AR5 authors would not have regarded SRES A1T and B1 as baselines. AR4 explicitly explained that some authors do regard the contribution of non-climate sustainable development objectives as a potentially important contributor to lower emissions. AR5 authors appear to disagree. It is essential to clarify this change.
44976	SPM	12	19	12	26	The explanation that all forcings are included, not just GHGs, is only provided at the end of this paragraph. We think that it is a key issue to understand the entire paragraph, therefore we would like to ask for moving the last sentence ("These represent full radiative forcing...") at the beginning of the paragraph (after the bold statement). In addition, further explanation on the inclusion of forcings other than GHGs should be given somewhere in the report, both for the present and the future.
44507	SPM	12	20	12	26	For policy relevance, the authors should state the concurrent transient (and equilibrium) climate response associated with each of these concentration levels.
44811	SPM	12	21	12	23	The sentence "This corresponds to about the range of forcing between the RCP 6.0 and RCP 8.5 pathways by 2100, with the majority falling below the latter." needs clarification. If they falls between 6.0 and 8.5, all must be below 8.5 so there is something we don't understand here.



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44508	SPM	12	21	12	23	"This corresponds to about the range - with the majority falling below the latter" is an unusual way to describe a set of concentration scenarios. Why not just give the 10% - 90% range?
44978	SPM	12	21	12	23	What is meant by "with the majority falling below the latter" ? If all scenarios are about between RCP 6 and 8.5, the majority is necessarily below RCP 8.5 ? Please remove or clarify.
45280	SPM	12	21	12	23	RCPs are not an easy concept for policymakers. This should be referred back to temperature levels.
45524	SPM	12	22	12	22	The term RCP should be explained, or a reference should be made.
43658	SPM	12	22			Suggest defining RCP (i.e. Representative Concentration Pathways). Additionally, it would be helpful to introduce the scenarios as this is an important concept for the report. At a minimum, referring to Box 1 in the Working Group I SPM would be useful.
44812	SPM	12	22	12	22	"RCP 6.0" and "RCP 8.5" should be explained.
44509	SPM	12	22	12	22	RCP should be defined, or if not needed, omitted from an SPM
44510	SPM	12	22	12	23	It is unclear what "with the majority falling below the latter" refers to. The authors should revise or delete the text.
46835	SPM	12	22			The concept of RCPs has not yet been explained. We recommend to add a footnote: "For the Fifth Assessment Report of IPCC, the scientific community has defined a set of four new scenarios, denoted Representative Concentration Pathways (RCPs, see Glossary). They are identified by their approximate total radiative forcing in year 2100 relative to 1750: 2.6 W m <sup>-2</sup> for RCP2.6, 4.5 W m <sup>-2</sup> for RCP4.5, 6.0 W m <sup>-2</sup> for RCP6.0 and 8.5 W m <sup>-2</sup> for RCP8.5. These four RCPs include one mitigation scenario leading to a very low forcing level (RCP2.6), two stabilization scenarios (RCP4.5 and RCP6), and one scenario with very high greenhouse gas emissions (RCP8.5). The RCPs can thus represent a range of 21st century climate policies, as compared with the no-climate-policy of the Special Report on Emissions Scenarios (SRES) used in the Third Assessment Report and the Fourth Assessment Report. For RCP6.0 and RCP8.5, radiative forcing does not peak by year 2100; for RCP2.6 it peaks and declines; and for RCP4.5 it stabilizes by 2100. See chapter XX." Please note that the proposed text is cited from the WG1 Box SPM.1.
44343	SPM	12	22			The RCP pathways need more explanation. Suggest at the end of the sentence a reference is made to Table SPM 1.
44107	SPM	12	23	12	23	Suggest replacing "the latter" with "RCP 8.5" for clarity.
45380	SPM	12	23	12	24	The following wording is suggested: Based on calculations consistent with those used for the above assessment of scenarios, atmospheric CO <sub>2</sub> eq concentrations .....
44979	SPM	12	23	12	26	Based on the underlying report, we understand that the value of 400 ppm CO <sub>2</sub> -eq in 2010 is a result from the MAGICC model and that it is used for consistency with future projections. We think that it is very important to clarify this in the SPM, because it might be very confusing to the readers. We computed the equivalent CO <sub>2</sub> concentration that corresponds to the assessment of radiative forcing in AR5 WGI, figure SPM.5 : the result is 438 ppm CO <sub>2</sub> -eq (including all forcings except solar and volcanos, based on the definition of equivalent CO <sub>2</sub> and using the RF of CO <sub>2</sub> from WGI figure SPM.5 to get a consistent result in spite of the changes in the definition of RF in WGI). As figure WGI SPM.5 is presumably the best current estimate of RFs, hence CO <sub>2</sub> -eq concentrations, the fact that the number provided here is different should be explained. Furthermore, it is almost certain that 400 ppm is within the uncertainty range that could be derived from WGI figure WGI SPM.5. Therefore, we believe that this uncertainty range should be provided (it was done in the SPM of AR4 WGIII). We think that it is also useful to provide the CO <sub>2</sub> -eq for GHGs only (without aerosols, land-use albedo, etc., and with all relevant numbers : WGI with uncertainty range, WGIII MAGICC)
46836	SPM	12	23	12	24	Sentence unclear: Where is the link between atmospheric CO <sub>2</sub> eq concentrations and the scenario evidence?
45281	SPM	12	23	12	26	The last two sentences should be deleted as they are not relevant to the preceding material of the paragraph. They are also unclear.
45679	SPM	12	24			can you please quote when the CO <sub>2</sub> concentration alone exceeded 400ppm in the atmosphere, surprising it is not included.
45433	SPM	12	25	12	26	"These represent" could be clarified e.g. : "the forcing values presented in this paragraph represent" It should also be clearer to the reader whether it is the only time in the all summary where "full radiative forcing including greenhouse gases, halogenated gases, tropospheric ozone, aerosols and albedo change" are considered. If so (ie if none of the figure given latter in pages 13 onward take aerosols forcing into account,...) the long life GHG share of the forcing should be systematically given for the figures given between lines 20 and 24 (to ease the comparison with the other §).
45525	SPM	12	25	12	26	Please consider to rephrase to "These represent full radiative forcing including greenhouse gases, including halogenated gases, tropospheric...." Rationale: The halogenated gases are also GHG.

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45527	SPM	12	27	12	27	Figure SPM.6: Some proposals to improve readability: I) The Figure should be given a short and descriptive title. II) The 0-line that separates between positive and negative decadal changes in emissions should be given stronger contrast to the background than the other horizontal lines. III) Corresponding symbols in each of the coloured bars that represent the different drivers might be useful. IV) The numbering on both the axis needs to be larger, and the x-axis legend "Period" should be moved below the actual axis numbers (1971-1980, 1981-1990, etc.). Also consider to replace "(in Gt of CO2)" by "(Gt CO2)" in the y-axis legend. V) It would be helpful if the value of "Total Change" could be included in the figure for instance close to the triangle symbol, since this relevant number is not included in the body text.
45526	SPM	12	27	12	31	Figure SPM 6: The increase in carbon intensity compared to previous decades should be highlighted in the text. It is mentioned on page 12, lines 14-16 that increased use of coal relative to other energy sources has reversed a long-standing pattern of decarbonization of energy supply, but this could be further highlighted with reference to the figure. This figure is further difficult to understand, especially how "Population" can be compared to for instance "GDP per capita", or is it meant Population as a driver and GDP as a driver? Please clarify in figure caption.
44108	SPM	12	27	12	27	Is it possible to include estimates of the uncertainties that are inherent in this decomposition?
44511	SPM	12	27	12	27	Figure SPM.6: In the legend, "Carbon" should be replaced with "CO2" because it does not include methane and, therefore, CO2 is more accurate.
46837	SPM	12	27			The unit at the label should be "Total CO2 emissions (Gt/decade)", consistent with Figure SPM.5.
44109	SPM	12	28	12	28	Figure SPM.6 caption: Suggest it might be helpful to start the caption by writing that global CO2 emissions are the product of the world population, GDP per capita, energy intensity and carbon intensity.
46838	SPM	12	28	12	31	The figure would be much more useful with some more information: 1) Please add the sentence from the caption of Figure 1.7 at the end of line 28: "The bar segments show the changes associated with each factor alone, holding the respective other factors constant." 2) In line 29, please write "... (blue), economic growth in GDP per capita (red),..."
45434	SPM	12	30	12	30	measures' should be 'measured'
45378	SPM	12	30	12	30	Editorial suggestion: Changes are measured in ...
46839	SPM	12	31			The reference should be to Figure 1.7, not 1.6.
45431	SPM	12	4	12	8	It would be useful to indicate which share of the population the 10 mentioned countries represent (likely a large share with India and China in that group) - resp. the time-weighted share of the population for the cumulative emissions over 1750 to 2010.
44097	SPM	12	4	12	5	Does this headline really require a confidence assessment or would this be considered fact? Also, since the statement does not need to be conditioned on analysis approach, suggest deleting the preamble "Regardless of the perspective taken".
47105	SPM	12	4	12	8	This statement is not robust for all GHGs. The groups of countries with at least 70 % BRAM: of what? depends on whether all GHGs, only CO2 or CO2 (excl. LULUCF) is considered. The figure should give the information for all GHGs exclusively or at least additionally.
47023	SPM	12	4	12	4	How would this statement be when the basket of GHGs is considered. It would be valuable to have this information here.
44809	SPM	12	4	12	8	This paragraph could perhaps be removed.
45936	SPM	12	4	12	4	I think that, in a globalized world, "countries" may not be the best, or at least the only, basis of concluding who is more responsible for emissions etc. (For example, rich and poor people; regions within and between countries; or multinational companies could be used as groups.) I suggest to at least mention that the current use of countries as categories are but one possible approaches, and other categorizations might be useful to identify mitigation policies and measures.
45676	SPM	12	4	12	5	Please mention the share of the two topmost GHG emitters, if you donot want to mention the names of the countries just provide the share of the two dominant countries.
44504	SPM	12	4	12	8	Since the statement covers 1750 through 2010, the authors should note the much altered (and still changing) composition of the major-emitting country group - the developing world having overtaken historically higher developed country emissions, and the "small number of countries account[ing] for a large share of global CO2 emissions".
44505	SPM	12	4	12	8	The authors should not limit this discussion to CO2, but should revise the numbers to include *all* GHG.

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44973	SPM	12	4	12	8	The policy relevance of this section is doubtful. Some 'countries' (like China, India, USA, Russia) are rather sub-continent, consisting of many (quite diverse) states or provinces. By their sheer size, they are important GHG emitters. Every state or province faces similar challenges and opportunities as other 'countries' (of a few million people) face. Policies have to address the ultimate sources of emissions (households, car-owners, companies, etc.), whatever the level of aggregation of subsets of polluters. The physical reality of the billions of emission sources indicate that it is more relevant to use GHG emissions/capita than total emission volumes, when separate or aggregate emission sources are analyzed.
45150	SPM	12	4	12	8	Which countries? Can they be listed
45278	SPM	12	4	12	6	These two sentences could be merged into one shorter sentence.
44274	SPM	12	5	12	7	Emissions from AFOLU and other sectors shall also be discussed in SPM to avoid bias towards fossil fuels
45519	SPM	12	5	12	8	Please consider to include the relevant part(s) of Figure 1.8 b) here to illustrate the text from page 5 to 8.
44098	SPM	12	5	12	6	It is recommended that the authors be consistent with the presentation of the information in the underlying chapter about the small number of countries contributing to a large share of global CO2 emissions. It is not clear why the SPM presents findings for 70% of emissions (10 countries) as the reference percentage, when the underlying chapter (Chapter 1, pg 28, lines 7-8 and Fig 1.8 Panels A and B) makes a clear distinction between those countries responsible for 75% of emissions (20 countries) vs. all other countries contributing the remaining 25%? Maintaining consistency with the underlying chapter is recommended.
47106	SPM	12	5	21	6	We suggest to specify these countries.
44753	SPM	12	5	12	5	Mention these countries (e.g. in a footnote).
46831	SPM	12	5	12	8	These statements on the ten countries accounting for the largest share of emissions are not directly cited from chapter 1.3 of the underlying report. Please provide a more detailed reference and add a reference to Figure 1.8, which has been included in the previous draft of the SPM.
43739	SPM	12	5	12	6	The "ten countries" here include group of countries (see Ch1, P3, L42-44). It is suggested to modify as "ten countries and group of countries". In addition, in order to provide a whole picture for policy makers, it is suggested to add descriptions of population and GDP share of the "ten countries and group of countries". The current sentence is suggested to modify as following: "In 2010, ten countries and group of countries with global population share of X% and GDP share of Y%, accounted for about 70% of CO2 emissions from fossil fuel combustion and industrial processes." The exact values of X and Y in the proposed sentence could be kindly given by TSU or review editors.
44099	SPM	12	6		8	The final sentence of this paragraph is confusing to read, as several separate pieces of information are present. Suggest splitting the sentence into two sentences.
44879	SPM	12	6	12	6	The reference to "similarly small" is vague.
44275	SPM	12	9	12	10	The statement focusing on fossil fuels emission is biased in nature; emission from other sectors such as buildings and AFOLU should be included
45520	SPM	12	9	12	10	The phrase "energy intensity" might be confused with "energy efficiency" and the difference in sign (+ or -) used for these two phrases might be confusing. Because of this, we propose that the word "decline" could be substituted by "improvement".
47025	SPM	12	9	12	16	It would be good to have some information on decoupling of emissions from economic growth here.
47024	SPM	12	9	12	9	Suggest to double check the high confidence level in population growth as one of the main driver. China was the largest growing CO2 emitter in the last decade- yet without population growth. How robust is this information?
47026	SPM	12	9	26	27	It would be useful for understanding drivers to decompose this information into numbers and trends for major economies.
44880	SPM	12	9	12	16	The fact that the decline of the energy intensity output has declined to "nearly the same magnitude as growth in population" should be in bold at the beginning of the sentence.
45677	SPM	12	9	12	9	The word 'global fossil fuel CO2' may be replaced by the word 'GHG'.
46832	SPM	12	9	12	16	This is very important information.
43740	SPM	12	9	12	16	This paragraph only reflects the results of Kaya decomposition. But according to chapter 5 of the underlying report, drivers for CO2 emission are far more than the four factors of Kaya decomposition (see section 5.3). Not only economic growth rate, other factors such as consumption patterns and structure change can also influence emissions. Kaya decomposition could not provide explanation for such situation. It is thus suggested to add descriptions about drivers according to TS, P18, L8-15; Ch5, ES, P6, L9-26, L33-17. In addition, Figure SPM.6 is originated from Figure 1.7 of the underlying report instead of from Figure 1.6, it is suggested to modify accordingly.

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46833	SPM	12	17	12	26	The paragraph does not explain the consequences of these emission concentrations regarding degree Celsius changes. Many readers will likely understand the severity of degree changes better than concentration levels. Therefore at least a reference to Table SPM1 should be made.
46834	SPM	12	22	12	23	Please rephrase "with the majority falling below the latter". The term "falling below" is misleading in this context. Please add "of scenarios" after "majority".
43999	SPM	12	4	12	8	It should be clarified that although ten countries are responsible for most of the CO2 emissions, the impacts and consequences generated by these affect all countries.
43462	SPM	12	5	12	8	The countries referred to here should be indicated by their names.
45940	SPM	13		14		There is far too much information here, partly redundant. Redundancy is partly present in repeating the same emission ranges in the text (in these two pages but also in others), relative to Figure SMP.7 and Table SPM.1. This table includes a huge amount of data that may be incomprehensible for most readers of this SPM. The third column does not have a title. In Columns 4-5, "cumulative emissions" should be used instead of "budget" that is largely unexplained. In this table again, figures only make sense if assumed cumulative emissions are compared to the capacity of the air to absorb emissions. Therefore, I suggest to highlight cumulative emissions, and other characteristics of related scenario(s) that will not surpass this absorption capacity. Finally, it is only this capacity that should be repeated, where it is absolutely necessary, in any subsequent text, and always refer back to this capacity. This is especially important with respect to the rate of emission reduction required (e.g. in percent), which does not only depend on the rate of emissions at the end of a period, but also the pathway through that period. What does matter in the long run is the total (or cumulative) emissions, and this should be reflected in the required reduction rate (see e.g. Figure SPM 10 on page 18).
44349	SPM	13				It would be helpful to include or integrate information on peak temperature corresponding to these emissions pathways, not just the temperature at 2100.
44703	SPM	13	1	13	2	Working group III's focus is on mitigation as such, rather than on mitigation "in the context of sustainable development"
47031	SPM	13	1	15	32	It is important that information is provided to policy makers on emissions reductions, peak year etc. for major economies (not regional groupings which is too broad). There is an enormous amount of valuable information on pathways in the underlying report but unfortunately this is not captured sufficiently in the SPM. We therefore suggest that a table is added to Section SPM.3 which lists peak years and emissions reduction relative to 1990 for 430-530ppm and 530-650ppm for the major economies. Note also that Table 6.4 in the underlying report is actually less informative than the previous draft version of Chapter 6. For example, a peak year 2020 for the OECD for the most ambitious scenario seems counterintuitive and it is also an example of where an aggregate such as the OECD is not informative for policy makers in their respective countries.
44512	SPM	13	1	13	2	Similar to section SPM.2, it would be useful to insert a short paragraph between SPM.3 and SPM.3.1 to clarify which gases are included in the analysis of mitigation pathways.
46854	SPM	13	1	17		Please add information on the regional emission reductions and peak year of emissions for different scenarios, see e.g. chapter 6, table 6.4.
46843	SPM	13	1	17	13	Parties to the UNFCCC have decided at COP16 to consider whether the long-term global goal should be strengthened to 1.5 °C based on the outcome of the 2013-15 review. Therefore, the technical feasibility and economic implications of a 1.5C-limit should be discussed in order to inform the international climate policy debate.
44281	SPM	13	10	13	10	It's not visible from Figure SPM 7 or noted in the section on how socio-economic and institutional assumptions were taken into account.
44280	SPM	13	10	13	12	This conclusion lacks two key elements: 1. This statement also need to bring back the balance offered in TS, therefore INSERT the following After the "...left panel." : [the policy approaches used to achieve mitigation within and across countries, the treatment of land use, and the manner in which mitigation is meshed with other policy objectives such as sustainable development. A society's development pathway – with its particular socioeconomic, political, cultural and technological features – enables and constrains the prospects for mitigation.] from TS 3.1.1 2. There is a need to clarify the uncertainty of the scenario in order to provide accurate information to policy makers: therefor, INSERT the following sentence at the end of the conclusion from chapter 6 that is [The scenario literature does not systematically explore the full range of uncertainty surrounding development pathways and possible evolution of key drivers such as population, technology, and resources.] Chapter 6

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45435	SPM	13	13	13	14	"Limiting peak atmospheric concentrations over the course of the century – not only reaching long-term concentration levels – is critical for limiting temperature change" In its present form, it could be argued that such a statement does not have a place in the summary of WG3 of AR5 (and that is rather correspond to an issue to be dealt by the WG1). It should be rewritten, for instance :" Among the scenarios considered as plausible in the literature, only small overshoots are considered : in other word, the peak atmospheric concentrations of GHG over the course of the century is largely constraining the concentrations levels that will occur by the end of the XXIst century".
45530	SPM	13	13	13	14	Please consider to replace the bold sentence with the next sentence in the para starting with "The majority.....", and put this sentence in bold. You should also consider to rephrase the sentence in order to start with "Reaching long-term concentrations ...", and put "the majority of scenarios" at the end of the sentence. Please also consider if "are associated with" could be deleted or replaced by more precise wording. Please also consider to rephrase the sentence that in the draft is from line 13-14 to read "Both limiting long term concentration levels and peak atmospheric concentrations over the course of the century, is critical for limiting temperature change".
44114	SPM	13	13	13	23	This is an important paragraph, but we are concerned the text, as written, might be interpreted as conflicting with findings of IPCC WGI that emphasized that it is the cumulative total of carbon emissions rather than any particular pathway that most influences global temperature change. Here, peak concentration is emphasized as being critical but the reason why is not explained. Presumably, it is because the peak level influences the required rate of emissions reductions post-peak, and so has more to do with the models or scenarios being able to generate realistic rates of emissions reductions, than with the physical climate system's response to emissions. Suggest this should be explained.
47110	SPM	13	13	13	14	The bolded section is not easy to understand, and we suggest to change it as follows: "Keeping GHG concentrations at maximally 450 ppm CO2-eq. is no longer likely feasible, and retaining anthropogenic warming to maximally 2°C requires the net removal of CO2 from the atmosphere in order to decline the concentration after a peak of upto 515 ppm CO2-eq. around the year 2050".
47027	SPM	13	13	13	23	Explain how the WG1 information is used to come to this 2 degree and 1.5 degree targets.
44813	SPM	13	13	13	23	Would it help to have a figure/graph with concentrations (and not only emissions)? Be more clear about WHEN emissions need to peak.
44519	SPM	13	13	13	23	The authors should be clear in their use and intent of "temperature" vs "temperature increase" and authors should note that these are average global increases. some info should be added land vs ocean and distributional/regional impacts--.
44984	SPM	13	13	13	14	The concept of "peaking concentrations" is new in a SPM, as it was not widely discussed by the time of AR4. Some readers might confuse it with "peaking emissions". Could you consider explaining that peaking concentrations is something that only happens in specific circumstances (large emission reductions), and would provide less warming than a stabilisation at the peak level ? This appears needed because the current text only explains the negative aspect of peaking (= that reaching the long term concentration without peaking would cause less warming), while there might be a positive aspect if peaking can be achieved.
45154	SPM	13	13	13	14	The sentence in bold would have more impact if rearranged to say "To limit temperature change, it is essential both to limit peak concentrations and to reach long-term concentration goals."
46846	SPM	13	13	13	23	Very good paragraph which definitely explains which impact an increase of the CO2 concentration over 480 ppm would have on the temperature.
45283	SPM	13	13			It should be specified that it is GHG concentrations referred to here.
45286	SPM	13	13	13	18	This is an important message for policymakers.
47111	SPM	13	15	13	16	These findings seem inconsistent with those by WGI concerning RCP2.6. WGI SPM states that it is unlikely that the temperature will exceed 2 degrees with medium confidence. We also suggest to mention which RCPs are related to the CO2 levels.
45680	SPM	13	15	13	33	Multiple long term concentration scenarios are presented in SPM3.1-430 to 480 ppm, 430-580 ppm, 430-530 ppm CO2 eq by 2100. Is it possible to harmonize such close ranged scenarios? It will be confusing to differentiate between such close ranged scenarios.

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44985	SPM	13	15	13	18	Please rephrase those sentences for more clarity: Does the first sentence mean that scenarios in the range 430 to 480 ppm in 2100 AND peaking below 515 ppm are likely to keep the global warming below 2°C ? (as it is, the sentence does not imply this consequence, it only says that a majority of scenarios has all 3 properties - this does not seem sufficiently informative). Why is it "the majority of scenarios" here, while we see no mention of that in table SPM.1, which suggests that the statement applies to all scenarios ? The table SPM.1 even refers to the "total range", thus we do not understand. Are the two expressions "over the course of this century" needed ? For the first sentence ("below 2°C over the course of the century"), would temperature increase thereafter ?
44344	SPM	13	15	13	32	Several ranges of CO2eq in 2100 are used in this section (430-480 ppm, 430-530 ppm, 430-580 ppm). The significance of each group of scenarios should be made clear.
44754	SPM	13	16	13	16	Write: "... to keep global surface temperature change below 2°C relative to the average from year 1850 to 1900 and are associated ..."
45155	SPM	13	16	13	16	Instead of "over the course of the century" it should say "compared to pre-industrial". We have to turn to Table SPM.1 to learn that the temperature targets discussed are relative to preindustrial - this should be clearly stated in the text.
46847	SPM	13	16			We propose to follow the footnote-approach of SPM WG1 (footnote #1 and #2) and to adapt the references respectively, see also comment on page 6, line13.
45284	SPM	13	16			Specify that this is the 2 degree goal i.e. temperature increase relative to pre-industrial levels rather than just over the century.
44345	SPM	13	16			It is important to define what period the 2 degree change is relative to (pre-industrial?)
44115	SPM	13	17			To improve the connection between the two sentences here, suggest changing the second sentence to read "Scenarios that peak beyond 580ppm...", so that the comparison to the peaking below 515ppm in the previous sentence is more explicit.
44520	SPM	13	17	13	17	Doesn't it depend on how long this peak (of 515 ppm) lasts? A peak of 5 years is not the same as a peak of 50 years. Moreover, stating this to the single ppm gives a false sense of certainty given the wide range of around transient climate sensitivity as found in the WG1 report.
44521	SPM	13	17	13	18	Exceed 580 ppm? for how long? A year? A decade?
44881	SPM	13	18	13	18	It should read "...to keep temperature increase below 2°C".
45938	SPM	13	18			are unlikely to keep temperatures below ~ are unlikely to keep temperature CHANGE below
46848	SPM	13	18	13	23	Information on these low-carbon studies should also be added to Table SPM.1 on page 14 because of their high political relevance.
45285	SPM	13	18			Specify that this is the 2 degree goal i.e. temperature increase relative to pre-industrial levels rather than just over the century.
44282	SPM	13	20	13	23	This statement is biased towards low-energy demand in order to address climate change mitigation. AFOLU and other emission-intensive sectors shall also be mentioned here. Chapter 6 looks into more sectors.
45531	SPM	13	20	13	20	Substitution of "The scenarios" with "These scenarios" will make the sentence easier to link to the preceding sentence.
47112	SPM	13	20	13	23	The CO2 levels related to the RCPs do not fully coincide with those in WGI. Please note that the referenced Box TS.6 reveals different CO2 levels for each RCP than in the SPM of WGI. Note that Box TS.6 refers to WGI chapters 6.4 and 12.4. However nowhere in WGI chapter 6.4 and 12.4 the CO2 levels have been mentioned.
44814	SPM	13	20	13	20	Does "The scenarios" here refer to the studies on 1.5 degrees or less? If so, "These" may improve the clarity.
44522	SPM	13	20	13	20	The authors should revise the text to read, "The scenarios THAT WOULD LIMIT WARMING TO 2C assume..."
44523	SPM	13	22	13	22	It seems as though "mitigation technologies" refers to supply technologies, rather than reduced "demand". The authors should clarify the text (adding "supply" descriptor), given the report separates supply and demand sectors, throughout.
45532	SPM	13	24	13	27	Please consider to start the para with a rephrased version of the second sentence, and put in bold: "Less mitigation in the near term leads to concentration overshoot and requires more rapid and deeper emission reductions in the longrun."
44116	SPM	13	24	13	26	This bolded sentence emphasizes pathways of atmospheric CO2eq levels and yet Figure SPM.7, both the left and right hand panel show pathways of emissions. This is confusing for the reader. We recommend rephrasing this bolded sentence to make a statement about the timing of peak emissions rather than peak concentrations. Alternatively, a separate paragraph could present results related to emissions pathways leaving this one to speak to concentration pathways. In that case, it would be helpful to include an illustration of concentration pathways.

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44117	SPM	13	24	13	26	As stated, this seems to be a statement of fact, describing the scenarios (many scenarios have the characteristics that are described). If this is the case, then a confidence assessment doesn't seem necessary. We suspect the intent is to convey the results of the assessment of the scenarios in terms of requirements for the timing of peak emissions and emission reductions thereafter, if overshooting the target concentration is allowed. Suggest rephrasing this sentence to be clearer about this.
43986	SPM	13	24			Atmospheric concentrations peaking needs to be defined as closely as possible. To say that they need to peak "in the 21st century" is a truism.
44815	SPM	13	24	13	31	Section 1 discussed ethics. Is relying on CDR ethical? (also need to define CDR).
45156	SPM	13	24	13	25	This sentence is not helpful to the policy-maker. It should be deleted. The following sentence starting with "Concentration overshoot allows" is the key message here and should be highlighted.
46849	SPM	13	24	15	12	The text and the scenario in Figure 7 (page 14) give the wrong impression that CDR technologies are already at hand and could be realised easily. But for CDR there is still a higher degree of uncertainty both for chances (effectiveness and efficiency) and risks (negative side effects). Moreover CDR covers a broad set of approaches and technologies that differ greatly from one another. This should be added to avoid exaggerated expectations for CDR. Negative emissions could possibly be obtained from SRM and CDR, here, only CDR is mentioned. Please provide an explanation for this. (See also our general comment on CDR above.)
44524	SPM	13	25	13	25	Should the "580 ppm" here be "480 ppm" to be consistent with the previous paragraph and continue the discussion around 2C?
44118	SPM	13	26	13	31	While the reader is referred to Figure SPM.7 in support of this paragraph, it is hard to link the text to the information in Fig SPM.7 given that the overshoot concentrations are not shown in the Figure, and there is no mention in the text of the difference between the scenarios with CDR less than or greater than 20GtCO <sub>2</sub> /yr. The text says most scenarios with overshoot >35-50 ppm have negative emissions but this seems to correspond mainly with the green lines in Figure SPM.7 and not the brown band. Please clarify. Also, this is the first instance CDR is used and it should be briefly identified/explained. It would be helpful if some context could be given for readers to understand the scale/scope of implementation of CDR required to provide emissions reductions greater than 20GtCO <sub>2</sub> /yr.
47028	SPM	13	26	13	27	"Concentration overshoot allows relatively less mitigation in the near term...". "Allows" may not be the correct word in this sentence/context.
45939	SPM	13	26	13	28	the use of term "overshoot" could be avoided in the SPM
44525	SPM	13	26	13	26	What part of the bolded text in lines 24 - 25 does "high confidence" apply to?
45157	SPM	13	26	13	26	Define concentration overshoot
45287	SPM	13	26	13	27	The sentence beginning "concentration overshoot allows..." is an important message for policymakers. Suggesting moving it up to be the first sentence of this paragraph so that it receives appropriate emphasis.
44346	SPM	13	26			Please define 'overshoot' when it is first used
44727	SPM	13	27	13	31	Add caution, that CDR technologies have not been applied yet at large scale, and evidence is still mixed whether CDR technologies are essential for achieving very low greenhouse gas concentration goals. [6.3.2.2].
43659	SPM	13	27	13	27	Replacing 'involves' with 'requires' would be more to policy makers, as it provides more guidance.
45158	SPM	13	27	13	27	replace the word "involves" with "requires"
44283	SPM	13	28	13	28	Definition of CDR technology is missing in SPM
45436	SPM	13	28	13	28	Please define CDR when first used.
44722	SPM	13	28	13	28	CDR should be spelled out at the first mentioning in the SPM
45533	SPM	13	28	13	28	We believe the projects with negative emissions mostly are connected to forestry or BECCS, and not the CDR in general. Hence, the term CDR could be misleading. If you decide to use CDR, this should be spelled out at the first time this is used.
47113	SPM	13	28	13	28	Please define CDR.
43718	SPM	13	28			"CDR" appears, but the abbreviation was not be previously explained. "CDR" is considered here as an independent option, but not as a part of mitigation approach.
43661	SPM	13	28	13	28	The acronym CDR (Carbon Dioxide Removal) should be spelt out in full at the first instance.
47029	SPM	13	28	13	28	Please replace "CDR" with "techniques to remove carbon dioxide" as some people may not be familiar with this abbreviation.
44882	SPM	13	28	13	28	Since this is the first mention of the term "CDR", there should be an explanation of what the acronym stands for.
44381	SPM	13	28	13	28	CDR technologies → CDR (Carbon dioxide removal) technologies. (∴ First appearance)
45681	SPM	13	28			Can you please explain CDR term when it first appears and give examples of what it includes?
43939	SPM	13	28	13	28	Please define CDR

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44526	SPM	13	28	13	28	This is the first time "CDR" appears, so the authors need to define it here - or at least spell it out.
44527	SPM	13	28	13	28	It would be helpful to provide examples of major CDR technologies when the term is first introduced.
44986	SPM	13	28	13	28	"CDR technologies": please write "Carbon dioxide removal" in full. Policy makers not likely to know what CDR means
45159	SPM	13	28	13	28	CDR acronym is not defined in the SPM and should be here
45288	SPM	13	28	13	28	CDR is not a well-known acronym and so may not be useful for policymakers.
44347	SPM	13	28			This is the first time the acronym CDR is used. Please also provide an expansion (Carbon Dioxide Removal) for the benefit of the non-expert reader.
43662	SPM	13	29	13	31	Should provide a brief explanation of the CDR technologies. These are described in the appropriate chapters, but a brief definition will allow a more informed reading and understanding of Figure SPM.7 in the Summary for Policymakers.
44528	SPM	13	29	13	29	This statement refers to the need for negative emissions, but it does not state by when this would need to happen. The authors should clarify this point.
45160	SPM	13	29	13	31	The sentence starting "These scenarios are associated ..." is unnecessary; remove it and add to previous sentence "...but the potential of these technologies is very uncertain."
45382	SPM	13	3	13	12	It is noted that more than 300 scenarios have not been assessed (or about 25%). This raises the need to explain the rationale that guided the selection of the scenarios that have actually been assessed. Some clarification should be included in the SPM, e.g. in a footnote. The footnote might read: In this assessment only scenarios based on integrated models with sufficient sectoral and geographic resolution to understand the evolution of key processes such as energy systems or land systems have been included.
44284	SPM	13	32	13	34	This statement on "large-scale energy system" is biased towards large-scale energy systems, other sectors such as industry and AFOLU shall be discussed here.
45437	SPM	13	32	13	33	Why scenarios at 530 ppm? Earlier, the range is 430 ppm to 580 ppm.
45534	SPM	13	32	13	32	Please consider to replace "Reaching" with "Stabilising". Rationale: For Policy-makers it is important what is needed to stabilise atmospheric concentrations.
45535	SPM	13	32	13	34	Suggest the following slightly changed wording; "Stabilizing atmospheric concentrations levels of 430 to 530 ppm CO <sub>2</sub> eq by 2100 will require large scale changes in the global energy system and other measures to obtain substantial cuts in GHG emissions over the coming decades." Rationale: For policy-makers it is important what is needed to stabilise atmospheric concentration. And the sentence can easily be perceived that both changes in the global energy system and cuts in GHG emissions are necessary. However the cuts in GHG emissions should be the result of different measures including changes in the energy system.
44119	SPM	13	32	13	34	The phrasing of this sentence is awkward and it seems to imply that large scale changes in energy systems are independent of cuts in GHG emissions. Suggest rewording to say "Limiting atmospheric concentration levels to 430 to 530 ppm CO <sub>2</sub> eq by 2100 will require substantial cuts in GHG emissions over the next few decades in turn requiring large scale changes of the global energy system." Table SPM.1 should be added as a reference to this paragraph as the table shows the % change in CO <sub>2</sub> eq emissions by 2050. Also suggest reordering the sentences in the remainder of the paragraph so that the GHG emission reductions are discussed first followed by the implications for changes in energy systems.
44529	SPM	13	32	13	32	As in the previous paragraph, should the "530ppm" be "480ppm" to be consistent with earlier text and maintain discussion around 2C. It's unclear the motivation for talking initially about a 430-480ppm range (lines 13-23), then a 430-580ppm range (lines 24-31), then a 430-530ppm range (lines 32-39). Please clarify the text accordingly.
44530	SPM	13	32	13	34	What does "as well as cuts in GHG emissions" mean here? e.g. deforestation? ag/industrial/etc? Please clarify.
45161	SPM	13	32	13	39	what is the significance of the range 430 to 530? It hasn't been mentioned previously and it needs explaining here; this will also help explain right-hand panel of Fig SPM.7 which also refers to this range and it is mentioned again on page 15. It can be inferred from table SPM 1 but it should be clearly spelt out in the text. Is this the range within which 2100 concentrations must be kept to more likely than not stay below 2.5 degrees? There is no global view on 2.5 degrees, though there was agreement at Cancun to keep temperature rise below 2 degrees, so it is not clear that highlighting 2.5 degrees as a target to aim for is helpful or within the IPCC remit



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46851	SPM	13	32	13	39	The SPM is so far silent in relation to the important and policy-relevant information for long-term emissions beyond 2050. Thus, we ask to add the following headline message from Technical Summary, page 43, line 23-26 to the end of that SPM-paragraph: "The stabilization of greenhouse gas concentrations at low levels requires a fundamental transformation of the energy supply system, including the long-term phase-out of unabated fossil fuel conversion technologies and their substitution by low-GHG alternatives (robust evidence, high agreement)".
45289	SPM	13	32	13	39	This paragraph contains important messages for policy makers. Consider giving it greater emphasis.
44348	SPM	13	32			We suggest replacing "will" in this sentence by "would", to clearly make this a conditional statement in line with the IPCC mandate to be policy relevant but not policy specific.
44728	SPM	13	34	13	39	This does not communicate the scale of the change needed clearly enough. It would be helpful to reflect in the SPM the clear language on eventual fossil fuel phase out and zero emissions in TS 3.2.2 p.43 l.23-28: "The stabilization of greenhouse gas concentrations at low levels requires a fundamental transformation of the energy supply system, including the long-term phase-out of unabated fossil fuel conversion technologies and their substitution by low-GHG alternatives (robust evidence, high agreement). Concentrations of CO <sub>2</sub> in the atmosphere can only be stabilized if global (net) CO <sub>2</sub> emissions peak and decline toward zero in the long term. Improving the energy efficiencies of fossil power plants and/or the shift from coal to gas will not by itself be sufficient to achieve this."
45438	SPM	13	35	13	36	avoiding to speak of "zero- and low-carbon energy supply" and just of "low-carbon energy supply" would seem more correct (using life cycle assessment, none of the existing energy supply - presented in the rest of the phrase- lead to zero emissions).
44723	SPM	13	36	13	36	CSS should be spelled out at the first mention in the SPM (it is done later p.20, l.35)
44120	SPM	13	36	13	36	Recommend defining "CCS".
43663	SPM	13	36			The acronym CCS (Carbon Capture and Storage) should be spelt out in full at the first instance.
44755	SPM	13	36	13	36	Does CCS refer only to fossil energy or are there other scenarios with e.g. renewables and CCS?
45682	SPM	13	36	13	36	(with or without CCS) may be added in place of 'with CCS'.
44531	SPM	13	36	13	36	This would be a prime place to highlight hydropower. Why has it been excluded from the SPM?
44987	SPM	13	36	13	36	Please write "CCS" in full.
45439	SPM	13	37	13	37	what does '[about 17%]' refer to?
45536	SPM	13	37	13	37	The quantification is important, but it is not clear what the "[about 17%]" refers to. Please consider to clarify this.
44121	SPM	13	37	13	39	Regarding this statement that "The majority of scenarios in which concentrations remain below 530 ppm CO <sub>2</sub> -eq through the 21st century are associated with GHG emissions reductions between 40% to 70% compared to 2010": (1) Suggest being clear that the statement is referring to "global GHG emissions reductions"; (2) This statement is not consistent with how the concentration scenarios and reductions are illustrated in the underlying chapter. It is difficult to determine how the reductions were calculated. The tables and figures referred to in the section (Figure 7.9 and Table 6.2) are not clear as how where the "40% to 70%" derives from. Suggest reviewing and revising to better explain.
45383	SPM	13	37	13	37	It is suggested to clarify the text in [about 17%] as follows: [the share of zero- and low-carbon energy supply from renewables in 2010 was 17%].
47030	SPM	13	37	13	39	Please provide emissions reductions relative to 1990.
44532	SPM	13	37	13	37	It's unclear whether the 17% number in brackets here refers to 2050 or 2010. Please clarify.
44533	SPM	13	37	13	37	Why is Figure SPM.9 listed in the text before Figure SPM.8. The numbering of the figures should be switched if the order of the text is retained.
46853	SPM	13	37	13	37	Please add in the brackets: "in 2010" behind "17%". Rationale: It is rather unclear what the subclause "[about 17%]" means in the context.
46852	SPM	13	37	13	39	Please give also numbers for reductions compared to 1990.
45440	SPM	13	39	13	39	The range given for GHG emission reductions 40 to 70% by 2050 differs from numbers given in Table SPM.1 (43-60) which is confusing.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
47114	SPM	13	39	13	39	If CC is to be restricted to maximally 2°, the (unabated) fossil fuel technologies need to be phased out to get global emissions eventually to zero. This is new language from IPCC, and having it highlighted in the SPM sends a very useful signal to actors at all levels. We propose the following language: "The stabilization of greenhouse gas concentrations at low levels requires a fundamental transformation of the energy supply system, including the long-term phase-out of unabated fossil fuel conversion technologies and their substitution by low-GHG alternatives (robust evidence, high agreement). Concentrations of CO2 in the atmosphere can only be stabilized if global (net) CO2 emissions peak and decline toward zero in the long term. Improving the energy efficiencies of fossil power plants and/or the shift from coal to gas will not by itself be sufficient to achieve this. Low GHG energy supply technologies are found to be necessary if this goal is to be achieved. (Figure TS.19). [7.5.1, 7.8.1, 7.11]"
44382	SPM	13	39	13	39	reductions between 40% to 70% → reductions between 40% to 60% (∴ no exceedance of 530ppm CO2eq in table SPM.1)
44279	SPM	13	4	13	4	This conclusion must start with the following to reflect the fact that there is no size that fits all as recognized in the literature: INSERT before the beginning of the statement [There is no single pathway to stabilize greenhouse gas concentrations at any level; instead, the] TS3.1.1 Chapter then continue with the current title "mitigation scenarios..."
45529	SPM	13	4	13	7	This is a very important conclusion and we support that this statement is put in bold text.
44110	SPM	13	4	13	5	The phrasing "would allow the world's societies to follow" is inappropriate wording. Recommend rephrasing to say "would put the world's societies on..."
44111	SPM	13	4	13	7	The headline statement is long, and presumably the assessed confidence level applies only to the main statement, and not the parenthetical bit that appears after the semicolon on line 7. Perhaps the statement could be made more concise by using a fixed range of year 2100 concentrations (450-750 ppm CO2eq) rather than the fuzzy range that is given (from less than 450 to more than 750). Would the use of a fixed range allow a higher confidence statement? If so, the additional information that options exist on either side of that range could then be added as a secondary statement that is assessed at a different level of confidence.
43985	SPM	13	4			Change "options" for "alternatives"
47109	SPM	13	4	13	7	ppms and RCPs are jargon terms that should not be used in the bolded section, or at least be accompanied with the most likely equilibrium temperature rise they are consistent with. We suggest to reword this sentence to: "Technical and behavioural options exist that would allow to curb GHG emissions so that global average temperature will peak between 2°C (around 2100, 450 ppm CO2-eq. and RCP 2.6), and 4°C (around 2300, 750 ppm CO2-eq. and RCP 6.0)."
44516	SPM	13	4	13	12	Are the scenarios really about technology and behavior or technology and policy? Does the last sentence mean that the scenario community is not interested in less than 430ppm, or that it's infeasible?
44515	SPM	13	4	13	4	Insert, "Mitigation scenarios INCLUDED IN THIS ASSESSMENT point to ..."
45153	SPM	13	4			The overall message here is confusing, with a profusion of numbers and probabilities. Table SPM.1 should be introduced earlier, and much of the text here should be removed - it is easier to extract the detail from the table
45152	SPM	13	4	13	7	This is a tremendously uninspiring statement with which to open this section. A far more concise, policy relevant and impactful finding should be presented here in a 'call out' box (see comment 1 above). Probably something along the lines of "Mitigation scenarios consistent with keeping the increase in global temperature to 2 degrees or less are still achievable"
44113	SPM	13	6	13	6	The reference to mitigation pathways projecting atmospheric concentrations between 450 and 750 ppm CO2eq is hard to reconcile with Figure SPM.7 and Table SPM.1 as there are scenarios with atmospheric CO2eq larger than the upper bound of 750ppm given there. Perhaps this has to do with which scenarios are classified as "mitigation scenarios" and which as "baseline scenarios" but this information is not readily available to the reader of the SPM as it is not included in either Figure SPM.7 or Table SPM.1. Please clarify the 450-750 ppm range specified in this paragraph.
45282	SPM	13	6	13	7	RCPs are a difficult concept for policymakers. The sentence should refer to probable temperature ranges instead especially regarding consistency with the 2 degrees goal.
44517	SPM	13	7	13	7	What part of the bolded text in lines 4 - 7 does "high confidence" apply to? Please clarify.
44518	SPM	13	7	13	8	It's unclear what basis was used to extract the 900 scenarios from the full suite of 1200 scenarios. The authors could either remove the text in parentheses or explain why they only used 900 scenarios.
46844	SPM	13	7	13	8	A statement on the level of confidence in the scenario results would be very useful. It can be assumed that confidence depends on the number of studies per scenario, but also on the models used.
45381	SPM	13	8	13	8	The following wording is suggested: (from more than 1200 scenarios).

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
46845	SPM	13	8			A reference to Box TS.6 would be very helpful, please add.
46850	SPM	13	28	13	28	CDR technologies should be explained somewhere in the SPM, including a discussion on feasibility and risks. Especially, please mention that availability and scale are uncertain (see TS page 24 line 41). A cross-reference to BECCS should be made. (See also our general comment on CDR above.)
43705	SPM	13				It is important to include here among the main key points of the section the following aspects: i)
45528	SPM	13	1	24	33	SPM. 3. In the introduction to this chapter, please consider illustrating (for example with a new figure) cumulative historical GHG emissions as a share of the total permissible emissions limiting global warming below 2 degrees, answering the question "What share of the total GHG emissions allowed has already been emitted, if we wish it to be likely that global average surface temperature increase is limited below 2 degrees Celsius in 2100?".
44981	SPM	13	1			The first category of scenarios, which relates to 430 – 480 ppm CO <sub>2</sub> eq in 2100, is especially important to policymakers because it is likely to satisfy the 2°C target used in negotiations, and may be relevant for 1.5°C as well. However, many statements from section SPM.3 only relates to the wider range 430 - 530 ppm CO <sub>2</sub> eq. For policy relevance, it is important to clarify the properties of scenarios in the range 430 - 480 in as many cases as possible.
44982	SPM	13	1			Section SPM.3: Could you check that the information presented in this section on mitigation pathways is fully consistent with- and complementary to the information on carbon budgets contained in sections E7 and E8 of the SPM of WG1 ? A link should be established more clearly between emissions scenarios, cumulative CO <sub>2</sub> emissions and the related climate stabilization (Table SPM.1 should be made more accessible to policy-makers)
44983	SPM	13	1			Section SPM.3: the title announces a treatment "in the context of sustainable development". This raises two questions : 1) does the IPCC concludes that mitigation can only take place in a broader context of sustainable development ? 2) while there is some consideration of co-benefits in this section, we do not find an explicit attention to the interlinkages between mitigation and broader sustainable development aspects. Could you summarise the potential for sustainable development to contribute to limit climate change and the associated risks?
46855	SPM	13				Please include Figure 6.29. This figure provide crucial policy-relevant information on regional emission allocations.
46840	SPM	13	1	17	13	In WG1, CO <sub>2</sub> emission units are given in [GtC], sometimes supplemented by those in [GtCO <sub>2</sub> ], see footnote 12 of WG1-SPM. Please provide a similar footnote informing about the conversion factor between the two. This would greatly increase usability of the WG3 report.
46841	SPM	13	1	17	13	(This is a high priority comment of Germany) Section 3.1 and Table SPM.1 (column 6) provide only global numbers for emissions reductions by 2050. To ensure the policy relevance of this information, a separate table is necessary that relates global numbers with regional numbers. Such data have been assessed for the creation of Figure 6.29 in chapter 6. The new Table SPM.2 would present these data as follows: Column #1: As in Table SPM.1 (for cross-comparison). Column #2: Column 6 of SPM.1 - the global values. Column #3: OECD90 2050 GHG values as shown in Figure 6.29 Column #4: EIT 2050 GHG values as shown in Figure 6.29 Column #5: ASIA 2050 GHG values as shown in Figure 6.29 Column #6: MAF 2050 GHG values as shown in Figure 6.29 Column #7: LAM 2050 GHG values as shown in Figure 6.29
44980	SPM	13	3			To understand long term mitigation pathways, it is very important to know that stable concentrations of CO <sub>2</sub> in the long term require net (fossil) emissions to decline to zero. There is a lot of misunderstanding about this basic fact. Therefore, we think that it is important to include this information from section 7.11.4 in the SPM.
44112	SPM	13	4		39	There are a lot of different atmospheric concentration levels and ranges are presented on this page, and it can become confusing for readers. If possible, suggest trying to be consistent in the levels or ranges (e.g., avoiding changing back and forth where possible and use consistent ranges) and provide additional explanation to help the reader in interpreting the information and making comparisons across findings.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
46842	SPM	13	1	17	13	Although figures and tables mention the RCP scenarios assessed in the other IPCC working groups, the text and statements of the WG3 SPM hardly make any mention of these RCPs apart from Table SPM.1. This makes it very hard to relate the 2100 ppm levels/categories to WG1 and 2 assessments on physical changes and impacts, therefore also making it virtually impossible for policy makers to relate impacts to mitigation (costs). By itself the 2100 ppm levels/categories are virtually irrelevant for policy. The relations between costs and other mitigation scenario characteristics in the WG3 SPM should be presented in a way that the link with impacts can easily be made.
45839	SPM	13	13	13	23	Request that the baseline period with regard to which temperature changes are shown should be explicitly provided.
45840	SPM	13	17	13	18	According to the WG1 contribution, temperature change for 2081-2100 w.r.t. 1850-1900 is more likely than not (probability greater than 50%) to exceed 2°C for RCP4.5. On the other hand, this paragraph concludes the possibility of keeping temperature change below 2°C to be unlikely (probability lower than 33%) for scenarios corresponding to RCP4.5. These two projections do not seem to square with each other if based on the same baseline period. Request an explanation of what caused this apparent difference.
45841	SPM	13	18	13	18	For the sake of consistency in terminology, replace "keep temperatures below 2°C" with "keep temperature change below 2°C" as in the last sentence.
45838	SPM	13	7	13	12	Regarding scenario grouping by 2100 radiative forcing, the contents described in lines 14-17 on page 21 of Chapter 6 of underlining report, as follows, should be included in SPM in the text or footnote, as a major difference from AR4: "Equilibrium values (as presented in AR4) and 2100 concentration and temperature values (as presented in this report) cannot easily be compared given the wide range of possible post-2100 trajectories and the lags in the physical processes that govern both." As the former scenario category table (WG3 AR4 Table SPM.5) received so much attention from the point of the mitigation target, this description would help understand recent progress of scenario studies and lead to more reasoned discussion about the climate policy.
44277	SPM	13	1			"This section continues to lack solid issues on sustainable development especially that chapters and TS 3.1.4 have provided much elaboration on. This conclusion from TS should be added to this section mitigation pathways in the context of sustainable development: [Potential adverse side-effects of mitigation due to higher energy prices, for example, on improving access of the poor to clean, reliable and affordable energy services, can be avoided (medium confidence). Whether mitigation scenarios will have adverse distributional effects and thus impede achieving energy access objectives will depend on the climate policy design and the extent to which complementary policies are in place to support the poor. Approximately 3 billion people worldwide do not have access to electricity and/or are dependent on traditional solid fuels for cooking and heating with adverse effects on development and severe health implications.]"
44278	SPM	13	1			Although the heading of this sub-section falls under the larger frame of SPM.3 section on sustainable development, very little discussion is included here on sustainable development. This section must provide accurate understanding of the literature which is consistent with AR4 that mitigation and adaptation are part of the equation to avoid harmful climate impact which is another emphasize on the sustainable development. The following conclusion from TS 3.1.1 which is supported by findings from Ch 11, ch 12 and ch 6 should be added " Society will need to both mitigate and adapt to climate change if it is to effectively avoid harmful climate impacts (robust evidence, high agreement). There are demonstrated examples of synergies between mitigation and adaptation [11.5.4, 12.8.1] in which the two strategies are complementary. More generally, the two strategies are related because increasing levels of mitigation imply less future need for adaptation. Although major efforts are now underway to incorporate impacts and adaptation into mitigation scenarios, inherent difficulties associated with quantifying their interdependencies have limited their representation in models used to generate mitigation scenarios assessed in WG3 AR5. [2.4.4.4, 6.3.3]"
44513	SPM	13	1	17	13	Regarding Section 3.1, there is little to no mention of multi-gas strategies. The section should be re-written to incorporate this information.
44514	SPM	13	1	17	13	Regarding Section 3.1, the discussion of mitigation technologies is very limited. It seems important to mention the need for investment in long-term mitigation technologies (CCS, next generation nuclear, etc.)
43463	SPM	13	28	13	28	The acronym "CDR" should be given in full first before being used any subsequent parts of the document.
43464	SPM	13	36	13	36	The acronym "CCS" should be given in full first before being used any subsequent parts of the document.
45842	SPM	13	18	13	20	Wonder whether it is climatologically plausible to bring global temperature back to 1.5°C warming with a likely chance after allowing it to peak during the 21st century assuming concentration levels below 430ppm CO <sub>2</sub> eq in 2100. Remind that, according to the AR4 WG1, global temperature is projected to continue to rise even after the GHG concentration is stabilized throughout the 21st century at around 380ppm (Year 2000 constant concentration), which is substantially below 430ppm.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
45843	SPM	13	24	13	25	In order to improve the consistency of the discussion through SPM3.1, suggest that the upper limit concentrations of 580ppm CO <sub>2</sub> eq be replaced with 530ppm CO <sub>2</sub> eq. This replacement can be supported by the Table 6.2, which implies that the rate of scenarios with an overshoot greater than 0.4W/m <sup>2</sup> would be around 40% and 30% for scenarios with 2010 concentrations lower than 530ppm and 580ppm, respectively. For scenarios with 2010 concentrations between 530ppm and 580ppm the rate of scenarios with an overshoot greater than 0.4W/m <sup>2</sup> would be only around 10%. This replacement would make the text consistent with Figure SPM.7 right-hand panel for which the upper limit shown is also 530ppm.
45844	SPM	13	27	13	29	<p>Ask for clarification on the relation between the overshoot of greater than 35-50 ppm CO<sub>2</sub> eq (concentration) and the negative emission of 20GtCO<sub>2</sub>/year set in Figure SPM.7. No explanation can be found in SPM and thus this is a little difficult to correlate/understand (e.g. as to whether it is a one-to-one or inclusive relation).</p> <p>SPM page 13, line 28 indicates that net global CO<sub>2</sub> emissions should become negative in scenarios with "overshoot of greater than 35-50 ppm CO<sub>2</sub> eq" while TS page 24, line 38 specifies that net global CO<sub>2</sub> emissions should become negative in scenarios with "overshoot of greater than 0.4W/m<sup>2</sup> (&gt;35-50 ppm CO<sub>2</sub> eq)". Further, chapter 6 page 15 line 38 states that net global CO<sub>2</sub> emissions should become negative in scenarios with "overshoot of greater than 0.4W/m<sup>2</sup> (&gt;20 ppm CO<sub>2</sub> eq)". Wondering which is adequate: in chapter 6, 0.4W/m<sup>2</sup> appears to be equivalent to 20 ppm CO<sub>2</sub> eq while in TS, 35-50 ppm CO<sub>2</sub> eq is referred to as the equivalent concentration. SPM makes no reference to 0.4W/m<sup>2</sup>. Suggest consistency check and modification of the description if necessary.</p>
45845	SPM	13	28	13	31	<p>An acronym should be avoided when its corresponding term comes up first in the SPM, therefore suggest to rewrite as below for the better understanding of policy makers in its definition and scope.</p> <p>[Insert: Carbon Dioxide Removal (CDR), which is a set of techniques that aim to remove carbon dioxide directly from the atmosphere,] [Delete: CDR ] to an extent that net global CO<sub>2</sub> emissions become negative.</p>
45866	SPM	13	32	13	39	<p>Suggest to insert more concrete, practical information as written in the body text ch.7. In this regard, propose to replace a part of this paragraph with an explanatory piece from ch.7 as the following sentences in brackets.</p> <p>Reaching atmospheric concentrations levels of 430 to 530 ppm CO<sub>2</sub>eq by 2100 will require large-scale changes of the global energy system as well as cuts in GHG emissions over the coming decades (high confidence). In the majority of scenarios reaching these atmospheric concentration levels the share of low-carbon energy in electricity supply such as renewable energy, nuclear energy, fossil fuel generation with CCS increases from the current share of approximately 30% to more than 80 % by 2050 (Ch.7, p.4, line 34) (Figure SPM.9, left panel). The majority of scenarios in which concentrations remain below 530ppm CO<sub>2</sub>eq throughout the 21st century are associated with GHG emissions reductions between 40% to 70% by 2050 compared to 2010. [6.3, 7.11]</p>
45846	SPM	13	34	13	37	<p>Wondering if this sentence is consistent with the AR5 WGIII underlying chapters from where this information is supposed to be based on. Although it says TRIPLING TO A NEARLY QUADRUPLING [ ... ] RELATIVE TO 2010, Chapter 6 page 37 states that, "a scale up of anywhere from roughly a tripling to over seven times today's levels in 2050", while Chapter 7 page 67 states that, "a significant challenge for the time period between 2030 and 2050" where the low carbon share in these scenarios would need to be rapidly scaled by nearly a factor of four, but this is a comparison between 2030 and 2050, not 2010 and 2050.</p>
45847	SPM	13	36			Would appreciate spelling out CCS as this is the first appearance in AR5 WGIII SPM.
44125	SPM	14				<p>Table SPM.1: Suggest the authors should make this table more easily comparable with results shown in AR5 WGI SPM Tables SPM.2 and SPM.3. Specific suggestions include: (1) The base period for temperature changes should be changed to 1850-1900 for consistency with WGI Table SPM.2 (footnote a). (2) The cumulative emissions budget should be given over the period 2012-2100 not 2011-2100 for consistency with IPCC WGI Table SPM.3, which gives cumulative emissions budgets over this period. (3) Footnote 2: IPCC WG1 quotes emissions in 2011 relative to an 1861-1880 base period of 1890 [1630 to 2150] GtCO<sub>2</sub> (SPM Section E.8, bullet 2). It would improve consistency between reports if the same number and base period were quoted here.</p>

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44126	SPM	14				Table SPM.1: The authors should clarify in this table the relationship between the various classes of scenarios and the RCPs. What is missing is a column showing radiative forcing levels for the different classes of scenarios. Without this information, it appears that the scenario class 430-480 ppm CO <sub>2</sub> eq maps directly to RCP2.6 whereas we think the intent is to convey that RCP2.6 falls within the range of scenarios in this class. Similar concerns apply to the relationship of the other RCPs to the WGIII scenario classes. As drafted, it is far too easy to misinterpret this table as indicating that the RCPs are equivalent to the scenario class in the adjacent column (with, presumably, the range of concentrations reflecting results of different IAMs driven with the emissions from the RCP scenarios). There are a number of instances (see additional comments on this Table) where there are apparent inconsistencies between the results of WGI and WGIII for the RCPs. Some of these may be due to misunderstanding about how to correctly interpret the results in Table SPM.1.
44127	SPM	14				Table SPM.1: The third column needs a heading. Is this "overshoot subcategory"?
44128	SPM	14				Table SPM.1, Column 9: The results for the category that maps to RCP4.5 (i.e. 580-650 and 650-720 ppm CO <sub>2</sub> eq) seem somewhat inconsistent with WGI results for RCP4.5. WGI concluded (see SPM E.1 bullet 3) that warming is more likely than not to exceed 2degC for RCP4.5. Assuming the corollary to this is that warming is more unlikely than not (0-50% chance) to stay below 2degC, while it's 'consistent with' the probabilities given in column 9, the probabilities are narrower (i.e. WGIII concludes in column 9 that warming is unlikely (0-33% chance) to very unlikely (0-10% chance) to stay below 2degC. Please clarify this apparent inconsistency.
44129	SPM	14				Table SPM.1: This table includes the terms 'Less likely than not' and 'More unlikely than not'. These terms (which are presumably synonymous) are not in the IPCC Guidance Note on uncertainties, nor were they used by WGI. Moreover these terms are not commonly used in English. Recommend that these terms are replaced by terms from the IPCC Guidance Note (e.g., "more likely than not").
44130	SPM	14				Table SPM.1, Right-hand column, second last row: Replace 'Unlikely to very unlikely' with 'Unlikely'. As indicated in footnote 4 below 'unlikely' means 0-33% (not 10-33%) so it includes 'very unlikely' and there is no need to give both terms.
47116	SPM	14				The temperature increases for each RCP are different than the results from Earth System Models. The related chapters in WGI and WGIII well explain the reasons for these differences. Given the importance of the temperature increases the SPM should be more clear in this explanation and highlight that these results are based on more simplified models with intermediate complexity compared to the complex ESMs. And very brief the reason why these models have been applied. MAGICC is first introduced in a small Table note without any explanation, leaving the reader in confusing. In addition, we emphasize the inconsistency in likelihood concerning temperature increases related to the two degrees limit compared to those in WGI SPM. For RCP2.6 see earlier comment (no 7). For the other RCPs WGI applies a likely statement that the temperature exceeds two degrees. That is different than the likelihoods applied in this Table. The Table notes pay attention to these differences, but do not explain this inconsistency sufficiently. We suggest the authors apply formulations that are consistent with WGI or explain more clearly the differences. For example, given the different temperature distributions from MAGICC the likelihoods will also slightly differ or something in this respect so that the reader understands the different terminology. This explanation could be added when highlighting the MAGICC model as suggested in this comment.
47115	SPM	14				This figure exhibits a data overload, that will discourage policy makers to look into it. We suggest to depict only the means for each of the concentration categories, and to make such lines smooth (as it only represent arbitrary discontinuities in input, but raise questions about real societal change). We would like to apply the same approach to both panels.
43719	SPM	14				Green line is too optimistic. There are no CDR technologies by now. All of them are only the proposed ideas, in the best case they are pilot projects and small scale experiments. Sequestration of 20 Gt CO <sub>2</sub> /yr by the 2030s looks unreal.
47032	SPM	14				Are there 'preferred' technologies identified across scenarios that could be summarized here?
44883	SPM	14				Replace "CO <sub>2</sub> emission budget" for "cumulative CO <sub>2</sub> emissions" to keep consistency with WGI SPM.
45941	SPM	14				header of the 3rd column : Range of scenarios; 2nd column: RCP indicators should also be added for the two missing/empty cells
45942	SPM	14				it would be useful (for reference by Policymakers, negotiators) to introduce some simple identifier for these concentration pathways' ranges, e.g. as reference concentration range (or concentration range pathway), RCR430 RCR480 RCR530 RCR530+ RCR580 RCR580+ RCR650 RCR720 RCR1000 RCR1000< ((sometimes in the report the first four ranges are called as "low conc. scenarios"; apparently the 2nd and 3rd RCRs might be most frequently referred to e.g. during the international negotiations))
43940	SPM	14		14		The figure is too small and therefore hard to read. Please enlarge it.
45292	SPM	14				This is an important table, however it tries to include too much information. In particular, the temperature change columns are too complex. The 2100 temperature values should be simplified. We suggest using a mean and a range. It is not clear that including 2.5C degrees has policy relevance. Representing probabilities of having 4+ degrees may have more relevance to ongoing public discourse.

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45293	SPM	14				It might be more appropriate to use the word "overshoot" than "exceedance" as it is the term used in the preceding paragraphs and in the public discourse..
45294	SPM	14				It is not clear the communicative value Of showing two carbon budget columns. Could it be explained in plenary why the two budget columns are needed and how this relates to the WG1 analysis.
45295	SPM	14				the third column has no title.
45290	SPM	14				This is an important graph. It may be useful to supplement the left hand side graph with a bar indicating which scenarios are in the range of 2 degrees.
45291	SPM	14				The graphs are too small and it is not immediately obvious that the right hand graph is a detail from the left hand graph. If possible, increase the graph size and certainly bring through the same colours from the left hand graph to the right hand.
44353	SPM	14				We suggest adding an expansion of the acronym CDR (Carbon Dioxide Removal) in the text at the top of the right-hand plot, to assist non-experts in understanding the graphics.
45537	SPM	14	1	14	5	Figure SPM.7 and caption: Both panels: Numbers and text for all axis need to be larger. The squared bracket indicating that the right panel is a sub-selection of the left panel, should be extended to cover the whole range that is actually presented in the right panel. A better alternative might be to present these figures on top of each other as done in Figure 6.7. Please consider indicating the alternative "< 20 GtCO <sub>2</sub> /yr" in green, and the delayed action - pathway, ">20 GtCO <sub>2</sub> /yr" in red. I.e. opposite as it is now. The figure caption in Figure 6.7 is more informative than the one presented here, please consider to include explanation to the solid lines, dotted lines, dashed/dotted lines, black bar on the right etc.
44122	SPM	14	1	14		Suggest that all of the curves on these two figure panels should be defined in the caption, or perhaps extraneous curves not needed to convey the message of these figures could be removed. In particular, the interpretation of a number of the dash-dot pattern lines is not clear.
44534	SPM	14	1	14	1	Figure SPM.7: If possible, the authors should use the same coloring for the right panel as the left - as colored it makes it hard to tell which of the scenarios in the database are being featured.
44535	SPM	14	1	14	1	Figure SPM.7: The panel on the right needs additional description about what all the lines represent.
46856	SPM	14	1			The figures are too small. Thus, suggestion is to place them below each other. If possible, clarify the right figure, and explain all lines. Please explain what "full AR5 data base" means - it is different from the CMIP5 studies used in WG1.
46857	SPM	14	1			Comparison of the two graphs given in SPM.7: It seems as if in the right graph (for the negative emissions <20 GtCO <sub>2</sub> /yr range): - the minimum level of scenarios equals the minimum line of the 480-530 ppm range given in the left graph, - and the maximum level of scenarios equals the maximum line of the 430-480 ppm range given in the left graph. In other words: It seems as only the overlapping parts of the 430-480 ppm and the 480-530 ppm range are shown in the right graph. However, the labeling of the right graph says "430-530 ppm". It therefore seems that in the right graph: - the minimum line of the 430-480 ppm range should be taken as the minimum level of scenarios and - the maximum line of the 480-530 ppm range should be taken as the maximum level of scenarios.
45442	SPM	14	11	14	11	2035 GtCO <sub>2</sub> given in WG1 corresponds to the value given between 1750 and 2011 and not 1850 and 2011.
45384	SPM	14	11	14	12	Footnote 2: In order to enhance the user-friendliness of the text it is suggested to include the corresponding figure presented by WG1 as well as a link to the underlying report for those interested in more information with respect to this comparison.
43742	SPM	14	11	14	12	According to IPCC WGI report, the cumulative CO <sub>2</sub> emissions from 1750 to 2011 is 2035Gt (555GtC) instead of from 1850 to 2011. In addition, the cumulative CO <sub>2</sub> emissions from 1870 to 2011 provided by WGI report is 515GtC (1890GtCO <sub>2</sub> ). It is suggested to verify and modify that figure accordingly.
43706	SPM	14	13		20	there is the need to explain here the relationship between the Cancun pledges and the share of the carbon budget by 2020.
46860	SPM	14	13			Please explain "probabilistic manner" for non-experts or delete.
46859	SPM	14	13			Footnote 2: Is the indicated CO <sub>2</sub> emission budget of about 2035 Gt CO <sub>2</sub> related to the period 1850-2011 or to the period 1750-2011? It probably refers to the cumulative emissions since 1750. Please check with SPM WG1 (page 10, 2nd bullet point, last sentence).
47036	SPM	14	14	14	14	What is the overall outcome of this comparison of MAGICC with detailed models (error bars?)
46861	SPM	14	14			Delete the sentence on the comparison between WG3 and WG1 except for the reference. Instead, add substantial information on the link to WG1-results using information from chapter 6, page 31 and add text like this: "The MAGICC output based on this approach is broadly consistent with the output of the earth-system models used in WG1 both in terms of temperature outcomes and relationship between the cumulative CO <sub>2</sub> emissions and the transient temperature increase."

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
46862	SPM	14	17	14	19	This sentence is incomprehensible for non-experts, please rephrase: "The likelihood statements were selected based on the coverage of the 10-90th percentile ranges of the scenarios considered here."
44676	SPM	14	19	14	22	CHAPTER 2, P. 14, LINES 19-22: The characterization of the CBDR principle is not only incomplete, but it is inaccurate. The full principle of the UNFCCC is "common but differentiated responsibilities AND RESPECTIVE CAPABILITIES." Therefore, the text needs to be revised to read: "The UNFCCC refers to 'common but differentiated responsibilities AND RESPECTIVE CAPABILITIES' among countries of the world. This is sometimes taken to imply that FUTURE, current and historical causal responsibility for climate change AS WELL AS COUNTRIES' CURRENT CAPABILITIES TO MITIGATE AND ADAPT TO CLIMATE CHANGE, should play a role in determining obligations of different countries in reducing emissions and SUPPORTING adaptation measures globally (Rajamani, 2000; Rive et al., 2006; Friman et al., 2007)." Whenever a reference to CBDR+RC is linked to the UNFCCC, it is imperative that the authors include the "+RC" component.
44123	SPM	14	2	14	2	Figure SPM.7 caption: (1) Suggest editing to say "Global GHG emission pathways for different long-term concentration levels.....". The Figure shows the pathways, not the development of emissions. (2) Does 'long-term' mean '2100' here? If so, replace with '2100'.
43664	SPM	14	2	14	5	The figure legend should be elaborated to better spell out what the figures are showing - it isn't very clear.
47033	SPM	14	2	14	2	Figure SPM.7. Again spell out "CDR" in full.
44536	SPM	14	2	14	2	The authors should strike "Development" and replace it with "Evolution".
44350	SPM	14	2			The explanation and significance of this graph needs to be clearer.
46863	SPM	14	20	14	22	For non-experts, a brief explanation of MAGICC would be useful. E.g. "MAGICC is a coupled gas-cycle/climate model. It has been used in all IPCC reports to produce projections of future global-mean temperature and sea level .. " <a href="https://unfccc.int/adaptation/nairobi_work_programme/knowledge_resources_and_publications/items/5430.php">https://unfccc.int/adaptation/nairobi_work_programme/knowledge_resources_and_publications/items/5430.php</a>
43941	SPM	14	3	14	4	Please move "right-hand panel" before "for scenarios reaching 430-530..." in order to make the sentence easier to follow.
44537	SPM	14	4	14	4	The authors should clarify whether the last sentence of this figure caption refers to SHADED regions.
44988	SPM	14	6	14	7	Table SPM.1 : This table needs to be made easier to understand, it needs to be more "policymaker-friendly". Please remove the term "more unlikely than not", which seems to mean the same as "less likely than not", and is uncommon. In addition, as those terms are not part of IPCC's uncertainty guidance and the diversity of terms in general make the table difficult to read, please use percentage ranges in the table itself rather than in the caption. Could the column "CO2eq emissions in 2050" be provided in % change from a reference, as done in AR4 (e.g. -35 to -69% for the first category) ?
44989	SPM	14	6	14	7	Table SPM.1 : WGI SPM uses either 1850 - 1900 or 1861 - 1880 as a reference for global mean temperature increases. Could you consider using one of these two periods to facilitate comparisons ? If this is not possible, could you provide the increment that should, in the context of WGIII, be added to change to those reference periods ?
44990	SPM	14	6	14	7	Table SPM.1: The column for 1.5°C seems to carry very little information, as all categories have probabilities starting at 0% (and potentially as wide as 0 - 50%). By contrast, WGI SPM.E1 says that RCP 2.6 is not likely to exceed 1.5°C, suggesting that it has at least 33% of chances to stay below that level. Could similar information be provided here ?
45441	SPM	14	7			It would be good to add in the table the range of temperature change obtained from WG1 for the RCPs.
45538	SPM	14	7	14	22	Please consider how best to refer to the findings in AR5WGI relating to the carbon budget (numbers provided in WGI SPM, Table SPM. 3) and how they relate to the numbers provided in Table SPM. 1. Please consider using best estimates in addition to intervals in column # 1, 4, 5, 6 and 7.
45539	SPM	14	7	14	22	Table SPM.1: The likelihood statements used in the table need to correspond with those used elsewhere in AR5 as well as with those given in sub note 4 of this table. "Less likely than not" given for CO2eq concentration in 2100 of 430-480 (see column "probability of staying below 1.5 degrees C") is not included in the list of likelihood statements in sub note 4.
43665	SPM	14	7	14	23	It is difficult to follow this table back to the information in the IPCC AR5 WGI report, particularly in relation to the column 'CO2 emission budget 2011-2100' and the information in table SPM3 of the WGI report. For example, the range of allowable cumulative CO2 emissions (GtCO2) from 2012-2100 in the WGI report under RCP2.6 is 510-1505, however in the WGIII Table SPM.1; the CO2 emissions budget (GtCO2) for RCP2.6 is 630-1180. Consistency is needed.
47034	SPM	14	7			Table SPM.1. What does "less likely than not" in 8th column, 3rd row (430-480ppm) mean? This is not standard terminology.
47035	SPM	14	7			Table SPM.1. Please add another column providing CO2e emissions in 2050 relative to 1990.



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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44756	SPM	14	7	14	7	Indicate if the scenarios contain rapid or abrupt changes ("risks") such as feedbacks from melting permafrost. Indicate also the range of data used as baseline for the scenarios (e.g. 1850 to 2005?).
44538	SPM	14	7	14	7	Table SPM.1: the table uses both CO2eq and CO2 emissions. Would it be possible to use consistent metrics in the table?
44539	SPM	14	7	14	7	Table SPM.1 RCP needs units
45162	SPM	14	7			Table SPM.1 would be clearer to the reader with more colour coding. Suggest that "Very Likely", "Likely", "More likely than not" etc. are each given a particular shading, either from Dark Green to Red, or if this is felt prejorative, from pale blue to dark blue. This would draw the reader to the key message from the table
45163	SPM	14	7			A key question for policymakers (perhaps the key question in all of climate change) is "What needs to be done to avoid exceeding the 1.5/2 degree target?" It should be possible for the SPM to set this out much more clearly. By looking at all scenarios where the probability of the 1.5 degree limit is 50% what is the range of CO2 emission budgets? Looking at all scenarios where 2 degrees is not exceeded (50% probability) what is the range of CO2 emissions budgets? This would put an upper limit, as a single number, on the global carbon budget for 1.5/2 degrees. While this would obviously be subject to caveats about uncertainty etc., it gives policymakers a clear feel for whether a particular course of action is sufficient or not. Policymakers want to know "How much CO2 can we emit and still stay under 2 degrees?" That question needs to be answered, clearly.
43741	SPM	14	7	14	9	The conclusions on CO2 emission budget, CO2eq reduction value emission in 2050 and corresponding temperature change under scenario RCP2.6 in Table SPM.1 are inconsistent with those of the WG1 report. For example, according to Table SPM.1, a decrease of 35%-69% CO2eq emission in 2050 compared to 2010 is given under scenario RCP2.6 (equivalent to 15%-60% decrease compared to 1990), while a decrease of 14%-96% CO2eq emission compared to 1990 is given in WG1 report. It is suggested to add a footnote under Table SPM.1 to explain the reason of the differences between WG1 and WGIII results, such as the differences in methodologies and the influence of uncertainties etc.
44351	SPM	14	7			The phrase 'less likely than not' is used in the table but not defined in footnote
44352	SPM	14	7			A title on column 3 would be helpful
44124	SPM	14	8			Table SPM.1: Suggest placing the reference to footnote 1 that is currently in the caption at the place where it actually applies (first column of the row that corresponds to the 430-480 ppm range).
44408	SPM	14	8			In the 1st Row and 2nd Column, for the title "Representative Concentration Pathways (RCPs)", the word "Representative" should be written in only one line. It seems that we can still reduce the width of the 3rd column, so that we can enlarge the width of the 2nd column.
44540	SPM	14	8	14	8	A new footnote should be added to indicate what forcings are included in the column on CO2e emissions (i.e., does this include all aerosols?).
44541	SPM	14	8	14	8	It seems undesirable to express things in terms of temperature changes relative to 1850-1870, rather than preindustrial. (According to the IPCC, preindustrial means prior to 1750.) If it is too difficult at this point to alter these probabilities, it would be good to at least point out that that the starting point is not preindustrial.
44542	SPM	14	8	14	9	The authors should include a footnote highlighting the fact that the column entitled "2100 temperature" reflects transient temperature response not equilibrium temperature response - the latter of which is what is referred to in the UNFCCC's 2C Goal. If left as is, the typical policymaker will be left thinking that 450ppm does not equate with a 2C warming. Said differently, if left as is, policymakers may interpret this to read that the world can emit more to reach various temperature goals.
44543	SPM	14	8	14	9	Table SPM.1: The authors need to retitle the heading to the middle column to read "Cumulative CO2 Emissions", to be consistent with how this issue is dealt with in the WG1 report. Also, the authors need to *very carefully* cross-check the "cumulative CO2 emissions" numbers in this table with those presented in the WG1 SPM - particularly in light of the errata issued by the WG1 TSU. Consistency between the WG reports needs to be absolutely assured.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
46858	SPM	14	8			<p>This important table needs to be simplified and amended to be of better use for non-experts:</p> <ol style="list-style-type: none"> <li>1) Columns 4-7: give mean values in addition to ranges, see also WG1 Table SPM.3</li> <li>2) Please delete numbers in parenthesis in column 7 and add in the footnote that climate system uncertainties are not included.</li> <li>3) Column 3 is not comprehensible without a header. Please add a header ("Consideration of Overshooting").</li> <li>4) A column representing CO2eq emissions relative to 1990 should be introduced.</li> <li>5) Please explain why there are some lines written in blue.</li> <li>6) Please include a column showing the 2100 emissions relative to 2010 (%). Only showing the 2050 emissions relative to 2010 (%) could result in misleading conclusions, because a decline of emissions after 2050 is not visible.</li> <li>7) Be consistent with WG1: columns 7-10, first line show T-changes relative to 1850-1870 - please recalculate with the reference period 1850-1900 to be consistent with WG1 (see e.g. WG1 Table SPM.2, footnote 1 or Section E.1 in WG1 SPM); column 4 and 5: please start in year 2012 as in Table SPM3 of WG1.</li> </ol>
45855	SPM	14				<p>Would appreciate identification of the climate sensitivity parameter used in MAGICC. Would also appreciate a note that climate sensitivity can only be expressed in a range and that this means that the temperature outcomes of different concentration pathways assessed here are expressed in terms of a range of probable temperature outcomes.</p>
45856	SPM	14				<p>Appreciate if the relationship among AR4/WG3 best estimate 3 degree, AR5/WG1 climate sensitivity parameter, and MAGICC parameter is clarified.</p> <p>AR5 WG1 did not show the best estimate. Table. SPM1 note.5 states that "Temperature in 2100 is provided for a median estimate of the MAGICC calculations, which illustrates differences between the emissions pathways of the scenarios in each category. The range of temperature change in the parentheses includes in addition also the climate system uncertainties as represented by the MAGICC model." However, as our comment above shows, it is not clear which parameter has been used in MAGICC although scanned through entire Ch.6.</p>
45858	SPM	14				<p>According to the examples of likelihood statements in the note 4, it is our understanding that for 430-480 ppm, the "probability of staying below 1.5 degrees Celsius" would be MORE UNLIKELY THAN NOT, rather than "Less likely than not". Request clarification.</p>
45859	SPM	14				<p>Wondering if the "probability of staying below 2 degrees Celsius" provided is consistent with underlying report. For 650-720 ppm, should it not be MORE LIKELY THAN NOT (26-40% in underlying chapter); for 720-1000ppm UNLIKELY (4-17% in underlying chapter).</p>
45860	SPM	14				<p>According to AR5 WGI SPM page 10 second bullet, the cumulative budget results provided should be for 1750-2011, not 1850-2011. Request clarification.</p>
45861	SPM	14				<p>Which part in the SPM is corresponding to the "Baseline range" in Figure SPM.7?</p>
45862	SPM	14				<p>What kind of state does the phrase "delaying mitigation" refer to specifically? How, and relative to what, can mitigation be deemed as delayed? Request an explicit definition of "delaying mitigation".</p>
45854	SPM	14				<p>Would appreciate an explanation of the reasons why probability of staying below a given temperature does not always decrease (and sometimes even increases) as the natural assumption would be that probability would decline linearly for higher emission scenarios. Wonder if there may be risk of misinterpreting to mean that both 530 and 580 have the same probability (very unlikely, more unlikely than not) of staying below 1.5 and 2 degrees. Would recommend that the numbers provided in Table 6.3. be used. Likelihood is difficult to understand. Request further explanation of the range. Would also appreciate clarification on the 2.5 degrees column, specifically why the likelihood becomes stronger going down (e.g., category 480-530 and 530-580).</p>
45852	SPM	14		14		<p>It is unclear if the temperatures shown in three rows from the right in the table are as of 2100 or not. Appreciate if further clarification work to this table will be done.</p>
45853	SPM	14		14		<p>Appreciate efforts to reduce text due to length limitations and simplifying for policymakers, but would prefer the probabilities given in the three columns on the very right as likelihood statements were provided in percentage as in Table 6.3 on Chapter 6, page 23 for more accurate understanding of the differences between scenarios. Further, fear that left as is, it might lead to conclusions that there are no critical differences between 480-530ppm pathways and 430-480ppm pathways in terms of temperature change in 2100, Whereas the message understood from the text is generally that a 2 degrees goal can only be met under a 530ppm scenario. When replaced with percentages, explanation of what the ranges represent would also be very helpful.</p>

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45857	SPM	14		14		Would appreciate an explanation on temperature increase or decrease after 2100 for the scenarios shown under the category 480-530 ppm and 530-580 ppm be included. According to the IPCC Expert Meeting Report (2007) "Towards New Scenarios for Analysis of Emissions, Climate Change, Impacts, and Response Strategies", temperature will decrease under the RCP 2.6 after 2100. However, it is not clear when the temperature will be stabilized and start to decrease for the scenarios between RCP 2.6 and 4.5.
45848	SPM	14	1			For consistency in the SPM, it would appreciate to replace "CO2-e" with "CO2eq" as defined in body text (p8, L7).
45851	SPM	14	11	14	12	Footnote 2 of Table SPM.1; The period 'from 1850 to 2011' is inconsistent with the description of WG1 AR5. In SPM of WG1 AR5, "From 1750 to 2011, ... This results in cumulative anthropogenic emission of 555 GtC."
45849	SPM	14	7			row '430-480' column 'probability of staying below 1.5 degree C': The term 'less likely than not' is undefined as likelihood terms in footnote 4. It should be replaced by defined likelihood terms such as 'more unlikely than not'. row '720-1000' column 'probability of staying below 2.5 degree C': Only one likelihood term should be assigned.
45850	SPM	14	7			row '480-530' and '530-580': What is the purpose of using texts in blue here? The explanation of the blue texts as note 1 of Table 6.3 needs to be provided.
44134	SPM	15				The interpretation of the small diamonds that are included in the right hand panel is not understood. Also, the reference to "high negative emissions" in the legend seems odd - "large negative emissions" might be better, since high generally refers to points that are higher on the scale (higher emissions).
47120	SPM	15				This figure is extremely difficult to understand. If it remains like this, we prefer to delete it. If it could be simplified the message would however be very relevant. This may be done by having three smoothed idealised pathways that are consistent with limiting CC to maximally 2°, have a common value in a base year as close as possible to 2014 and to the real global cumulative emission, differ in the annual emissions in 2030 (say 47, 52, 57 Gt), and show that the higher the 2030 values, the steeper the decline. The impact of the build-up of high negative emissions (20 Gt) could be added as a dotted line. The range of Cancun-pledges is useful to retain. We strongly suggest to abstain from giving distributional data, but the caption could indicate that this is included in Figure 6.32.
43942	SPM	15				Quite a difficult figure. Please simplify the figure on the right. The figure legend should also be simplified.
44704	SPM	15	1	15	12	This is a key finding and should be highlighted and brought out clearly in the introduction/conclusion of this document
44733	SPM	15	1	16	20	Messages regarding costs of delaying mitigation action should be reflected in the SPM e.g. [6.3.6.4] "Future mitigation costs are higher because limited near-term action not only requires deeper reductions in the long run to compensate for higher emissions in the short term, but also produces a larger lock-in in carbon infrastructure, increasing the challenge of these accelerated emissions reduction rates." Estimates of costs of delayed action, e.g. from Figure 6.25, would be very helpful.
45541	SPM	15	1	15	12	Please consider including information in this section of the SPM, on a regional effort-sharing scenario towards 2030 sufficiently ambitious to be in line with the globally agreed targets stated in the Copenhagen-Accord/Cancun Agreement, as illustrated in AR5 WGIII, Chapter 6, Figure 6.9 and Table 6.4
45540	SPM	15	1	15	2	Is it possible to connect this finding with the possibilities/challenges related to reaching the 2 degree target in connection with mitigation efforts before 2030? Please be more specific if it is related to "bringing" or "stabilising".
44131	SPM	15	1	15	2	While we understand this phrase "delaying mitigation" refers to a specific category of mitigation scenarios, it would be helpful if here, in the SPM, this phrase were explained. Does it mean that no countries reduce emissions, some countries do while some don't, that global emissions continue to rise out to 2030, that peak global emissions occur after 2030? Some description would be helpful.
44132	SPM	15	1	15	2	Suggest replacing "bringing atmospheric concentration levels to 530 ppm CO2eq or lower" with "limiting atmospheric concentrations to no more than 530 ppm CO2eq". Also, it is not clear what the specific significance of 530ppm CO2eq. Although Table SPM.1 helps readers to understand, the written paragraphs should do a better job of helping the reader to understand the implications of various concentrations/ranges.
47117	SPM	15	1	15	12	A reference to table SPM.1 would help understanding this text.
44544	SPM	15	1	15	12	Clarify that 2030 emissions are the annual amount---with perhaps a reminder of the 2010 level.
45164	SPM	15	1	15	2	This is a summary for policymakers, and as such expressions of headline messages in terms of concentrations should be avoided. The headline message here should read "If emissions of greenhouse gases are higher in 2030 than they are today, it is likely the 2 degree target would be exceeded, and steps after 2030 to address this problem would be technically difficult, and costly"

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46864	SPM	15	1			This paragraph provides important information on the impact of delaying mitigation action through 2030. However, to make it more policy-relevant, the paragraph and the underlying analysis should predominantly refer to the 430-480 ppm CO <sub>2</sub> eq concentration range, which is – according to Table SPM.1 – the only concentration range with a likely chance of staying below 2°C. See also our general comment on this issue.
45296	SPM	15	1	15	3	This important message would have even more meaning for policymakers if it related back to the 2 degrees goal. We suggest this is possible given the information contained in current table SPM.1.
46867	SPM	15	10	15	12	Clarify the sentence, as “this range” in line 11 is not clear. Be explicit to which “range” you are referring to.
45443	SPM	15	11	15	11	what range is ‘this range’ exactly?
45385	SPM	15	11	15	11	The language “in this range” is ambiguous. It is suggested to explicit identify the range (scenarios with emissions above 55 GtCO <sub>2</sub> eq in 2030)
45943	SPM	15	11			emissions in this range ~ emissions in this range (i.e. above 55 GtCO <sub>2</sub> eq) ((for sake of unambiguity))
45167	SPM	15	12			The right hand panel of this figure would be better replaced with text (perhaps a new paragraph following immediately from Line 20) as figure SPM.8 is too complex as it is - suggest the left hand panel is expanded to form the entire figure, which would then be easier to see. Suggested text would be Failure to take significant mitigation action between now and 2030 will require extremely rapid reduction in GHG emissions post-2030. Emission reduction of rates of up 7% globally per annum would be required. Emission reductions at this rate would be extremely costly. If emissions are <50GtCO <sub>2</sub> e in 2030, emissions would need to fall by ~3 per cent per annum thereafter to ensure a ‘likely’ probability of avoiding 2 degrees. This increases to ~5 per cent per annum if emissions in 2030 are in the range 50 - 55 Gt, and up to 7 per cent per annum if emissions in 2030 are >55GtCO <sub>2</sub> e
44285	SPM	15	13	15	13	Additional information on Cancun Pledge is required in SPM.
44705	SPM	15	13	15	20	This is a key finding and should be highlighted and brought out clearly in the introduction/conclusion of this document
45542	SPM	15	13	15	18	We feel that the most important message from this para and therefore should be in bold are to what extent the Cancun pledges are able to meet the 2 degree target. Please consider to rephrase to address it even more explicitly.
47119	SPM	15	13	15	13	Cancun pledges are higher’. ‘higher’ can be confused by ‘more ambitious’. Please clarify whether this means “Pledges lead to higher levels than admissible for 430-550 ppm”.
45386	SPM	15	13	15	20	It is confusing to mix the consideration of the Cancun Pledges with the consideration of scenarios with delays in mitigation because the Cancun pledges are understood by Parties as pledges that require mitigation action. Therefore it is suggested to address scenarios with delays in mitigation in a separate paragraph.
44411	SPM	15	13	15	20	It is not clear what “The Cancun Pledges for 2020 are higher” means. Consider rephrasing ‘The full implementation of Cancun pledges would lead to higher GHG emissions levels’.
47037	SPM	15	13	15	13	One sentence (or appropriate reference) to summarize to what the ‘Cancun’ pledges are about may be helpful as this summary should be read for the next 7 years, when this information may not readily available anymore.
44884	SPM	15	13	15	15	The Cancun Pledges are mitigation pledges, therefore, the use of “higher” makes this sentence sound contradictory (if they are “higher”, that may mean “more mitigation”). Consider rephrasing for “The Cancun Pledges for 2020 are consistent with GHG emission levels that are higher than scenarios that reach...”.
44546	SPM	15	13	15	13	Suggest to revise the beginning of the sentence to “Emissions levels of the Cancun Pledges for 2020...”
45168	SPM	15	13	15	15	The headline message here doesn’t state the conclusion clearly enough. Suggest instead “The lowest global cost route likely avoidance of a 2 degree temperature increase requires global emissions lower than the Cancun pledges”
45298	SPM	15	13	15	16	The two sentences regarding the Cancun pledges are important. Given the information contained in Table SPM.1, it would increase clarity if this information was related to the internationally agreed 2 degrees goal.
44354	SPM	15	13			The Cancun pledges need more explanation. Suggest that after “Cancun Pledges” a reference is made to Section SPM 4.2 i.e. it would read “Cancun Pledges (see Section SPM 4.2) for 2020.....”
46869	SPM	15	14	15	15	The term “lowest global costs” is not explained clearly enough. Please add a definition in a footnote.
44286	SPM	15	15	15	15	Additional information on Cancun Pledge is required in SPM.
44991	SPM	15	15	15	15	Please clarify what the “costs” mentioned here actually cover, and how these numbers are derived.

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46870	SPM	15	15	15	16	The SPM states "The Cancun Pledges are broadly consistent with scenarios reaching 550 ppm CO <sub>2</sub> eq to 650 ppm CO <sub>2</sub> eq by 2100 without delays in mitigation." The underlying report (chapter 6 figure 6.31 panel b) shows that Cancun 2020 levels indeed overlap with 530-650 categories. However, Cancun levels are clearly in the (very) high side compared to these categories. This statement is therefore misleading, in particular when associated with "robust evidence, high agreement" in the headline statement. It must be shown that Cancun pledges do not, in fact, correspond with higher 2100 concentration levels, and therefore warming levels. If this cannot be shown, this statement needs to be deleted.
45543	SPM	15	16	15	20	In the reference to the Cancun Pledges it would be useful to specify if the statement refers to the upper or lower range of these as many large emitters have provided a range in their Cancun submissions. The range of the Cancun pledges seems to be reflected in figure SPM.8 and a reference to this would be useful.
45169	SPM	15	16	15	18	It is not clear what the authors mean by the line that states "The Cancun Pledges are broadly consistent ... without delays in mitigation". Could this be redrafted?
46871	SPM	15	16			"High confidence and robust evidence": Please give the aggregated confidence statement.
44355	SPM	15	16			Please clarify that this is the 'lowest global cost' of achieving the specific mitigation goal in question (i.e not accounting for avoided climate change impact costs)
45444	SPM	15	18	15	20	does this phrase make sense if we consider mitigation in a broader sense and not the likelihood of hitting a particular threshold of temperature increase (likelihood of exceeding 2°C,...) "Studies confirm that delaying mitigation through 2030 has substantially larger influence on the subsequent challenges of mitigation than do delays through 2020. "
47038	SPM	15	18	15	20	"Studies confirm...through 2020". This sentence is not clear. In what way does it influence the challenges? Increasing action before 2020 would increase mitigation options and reduce the burden of meeting global mitigation objectives in 2030 and 2050. We recommend also that the following is included (based on p.30 of the TS and Ch.6, section 6.3.6.4): "Delays in mitigation to 2030 or beyond could substantially increase mitigation costs in the decades that follow and the second-half of the century (high confidence). Furthermore, delaying to 2030 have substantially more profound aggregate economic implications than delays to 2020, both in terms of higher transitional impacts due to more rapidly increasing mitigation costs and higher long-term costs. Delayed action also further increased the dependence on the full availability of mitigation options". Finally, please replace "through 2030" and "through 2020" with "to 2030" and "to 2030" for clarity.
46872	SPM	15	18	15	20	Please be aware that this sentence could be misread as "delaying mitigation through 2030 leads to substantial challenges, but delaying mitigation through 2020 does not have major consequences." Rephrasing suggestion: "A likely chance of staying below 2°C might be missed due to mitigation delays up to 2020 unless post-2020 reduction rates are assumed to be very high, possibly unfeasibly high. Similarly, but much more pronounced, a delay of mitigation up to 2030 could even render higher temperature targets unreachable."
47039	SPM	15	20	15	20	Figure SPM.8 (right side) illustrates the emissions reduction rates from 2030 to 2050 for different emissions levels. It would have been useful to compare such reduction rates already from 2020 onwards, to allow for a better understanding of the emission reduction rates consistent with atmospheric concentration levels between 430 ppm CO <sub>2</sub> eq and 530 ppm CO <sub>2</sub> eq.
45544	SPM	15	21	15	32	Figure SPM 8. To increase readability we suggest several improvements. Please insert "annual" before "GHG emissions" in the title and in the y-axis title. Please consider to replace "pace" with "rate" in the right panel title and in line 22. Please indicate in the left panel actual GHG emissions from 2005-2013, for instance with a black line. It seems to be a minus-sign in front of 55 GtCO <sub>2</sub> e in the left panel. Please ensure consistency when using CO <sub>2</sub> equivalents (preferably CO <sub>2</sub> eq)
46873	SPM	15	21			The explanation of the right hand figure should be improved: 1) Why are there several diamonds and a circle for "<50Gt"? The caption states that only scenarios with default technologies are shown, but how does this match with including geoengineering, which is a non-existing, i.e. a non-default technology? Please explain and define "default technologies" upfront. 2) Improve figure caption, in particular the sentence between line 27 and line 29 in order to be comprehensible for non-experts, and explain the link between the two figures. The arrow between the figures does not add valuable information and can be deleted.
44356	SPM	15	22			The explanation and significance of this graph needs to be clearer.
45445	SPM	15	30	15	30	what does 'default technology' mean, and why does it matter ?
44133	SPM	15	30	15	32	This 'note' at the end of the caption for Figure SPM.8 is not readily understood. Suggest either removing if it is not necessary to understanding the graphic, or convey in more straightforward language.

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45387	SPM	15	30	15	32	The note is confusing. If the scenarios that have been excluded really show a complete different result, the reader should be informed about those scenarios. If the scenarios that have been excluded do not show completely different results the note can be deleted.
44818	SPM	15	30	15	30	The concept "...default technology assumptions" may need some explanation.
44757	SPM	15	30	15	30	It is not clear which are the "default technology assumptions".
45170	SPM	15	30	15	30	what is meant by "default technology assumptions"?
45171	SPM	15	31	15	31	what is meant by "exogenous carbon price"?
47118	SPM	15	5	15	13	It would be good to mention the global 2010 emissions (given the inconsistencies in the global 2010 emissions in the figure SMP 7, 8 and 1.
44545	SPM	15	5	15	5	It would be good to express these emissions also as percentages of 2010 emissions.
46865	SPM	15	6	15	10	It should be added that these scenarios are also characterized by higher global costs.
45165	SPM	15	8	15	10	The messages around reliance on CDR and higher transitional and long term economic impacts are critically and should be strongly drawn out
43943	SPM	15	9	15	10	"...and higher transitional and long term economic impacts". Do the impacts refer to costs?
45166	SPM	15	9	15	9	CDR technologies - These technologies are unproven and may not be available. Given that much of the information presented here is based on the availability of such technologies, a box detailing these technologies and their possible limitations should be included in the SPM otherwise there is a significant risk that the SPM misleads policymakers in think that mitigation actions could be delayed with little increased climate risk - a summary of the risks, uncertainties and limitations of CDR, as set out in Section 6.9.1 of the underlying report, should be presented clearly in the SPM
46866	SPM	15	9			Please add the information that CDR technologies are currently not available and would be associated with high risks and adverse side-effects. (See also our general comment on CDR above.)
45297	SPM	15	9	15	10	The "higher transitional and long term economic impacts" due to delayed mitigation is an important message for policy makers. This should fact should be split into a separate sentence for clarity.
46868	SPM	15	13	15	15	The text should be changed to "The level of GHG emissions to be expected, if all Cancun Pledges for 2020 are fulfilled, is higher than (...)".
45868	SPM	15		15		Request to include not only 430ppm-530ppm but also assessment of the range 530ppm-580ppm where the probability of staying below 2.5 degrees is more than 50% in order to give policy makers wider options to compare.
45865	SPM	15	13	15	15	Policy makers might want to be given a little more about scenarios that reach atmospheric concentrations levels between 430 and 530 ppm by 2100 at lowest global costs. Request these scenarios to be more specifically described.
45867	SPM	15	21			For consistency in the SPM, it would appreciate to replace "CO2-e" with "CO2eq" as defined in body text (p8, L7).
47121	SPM	16				As it now stands this figure is much to complicated and if it cannot be simplified it should be deleted. We prefer a graph with several panels each showing idealised wedges that over time contribute to the difference between the unabated emissions and the emissions that are consistent with several pathways, each of which would ideally be indicated as the peak or equilibrium temperature change.
45299	SPM	16				The information contained in this figure should be reflected in language in section 3.2.2 "Energy Supply".
45545	SPM	16	1	16	9	Figure SPM. 9: This figure is difficult to understand, partly because if it's technical quality. Please consider to improve the figures themselves and the figure captions.
44145	SPM	16	1			This figure includes a high level of detail and was difficult to interpret. Suggest the authors consider simplifying. For, example: Are both panels needed? Is the 2100 bar needed? One particular suggestion would be to present the subpanels in the same direction in both the left and right hand panels. In the left hand panel, results are presented going from higher emissions scenarios (left hand sub panels) to lower emissions scenarios (right hand sub panels of the left panel), whereas on the right the order of presentation is reversed.
43666	SPM	16	1	16	9	This figure is difficult to interpret and doesn't link well to the text where is it referenced (page 13, lines 32-39). Is there a need for both the left and right panels? Could these be merged together to make it more readable?
44547	SPM	16	1	16	1	Figure SPM.9: (a) Graph shows a system-wide clean energy ratio. To make text consistent with graphical content, the authors should consider changing "Low carbon energy upscaling", in the title, to "Clean energy transformation", and similarly substituting for "upscaling" in the caption: "Upscaling" evokes expanded technology deployment, whereas the chosen metric captures the combined effects of low-carbon energy upscaling (in the numerator) *and* any overall energy downscaling/reduction (in the denominator). (b) Caption refers to "fossil fuels with CCS", missing bio-CCS (unless counted under "renewables"). Consider breaking out bio-CCS, either explicitly ("BECCS") or by generalizing the CCS concept to hydrocarbons ("hydrocarbons with CCS"). Chapter 7 demonstrates both practices.
45172	SPM	16	1			Figures SPM9 is not immediately clear - why is this presented here and what story is it trying to tell?

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46874	SPM	16	1			The figure is very interesting but needs more explanation and, if possible, simplification. 1) Why is one in black/white and one colored? 2) Please explain the meaning of vertical arrows, e.g. by adding "The vertical arrows show the different scale-up efforts required between 2030 and 2050 depending on 2030 renewable energy deployment shares". 3) The arrow from the left to the right panel is not clear. 4) Explain the horizontal line for the 2010-range in the caption.
44287	SPM	16	10	16	20	This conclusion lacks perspective on sustainable development and how will the assumptions of scenarios result in adverse effects as cited in Chapter 6.3 "Fragmented action will influence aggregate global economic costs not only because of misallocation of mitigation across countries, but also through emissions leakage and trade related spillover effects (Babiker, 2005; Böhringer et al., 2012, p. 29; Bosetti and De Cian, 2013; Arroyo-Curras et al, 2014). The range and strength of these adverse effects and risks depends on the type of policy intervention and the stringency of the mitigation effort." This should be included to correspond to literature findings and the title of the chapter on sustainable development as it includes the effect on other countries through terms of trade that could negatively impact their economic systems and development.
44713	SPM	16	10	16	15	The aggregate economic costs of mitigation is measured in global consumption losses. It would be relevant also to provide the costs measured in GDP losses. The GDP losses are presented in chapter 6, Figure 6.2.1 (page 45), however not in the text.
44706	SPM	16	10	16	20	It is somewhat contradictory to write "high confidence" in line 11 when this section mentions very wide intervals in the reported results. We suggest changing the confidence level to "medium".
45546	SPM	16	10	16	11	The statement in bold is not considered to be the most relevant conclusion in this para, and because it does not include the benefits of mitigation. It is quite obvious. Instead of this wide/general sentence please consider to include cost estimates related to the 2 degree target. Preferably including benefits of mitigation.
44136	SPM	16	10	16	11	If the current bolded statement remains, then suggest being clear that this information is based on scenarios. E.g., "...costs of mitigation vary widely across scenarios...". Also, does this sentence really require a confidence assessment? If there is disagreement on this point in the literature, perhaps evidence and agreement language would be more informative for policy makers.
44137	SPM	16	10	16	15	Suggest that "global consumption losses" be explained, as this is not understood by the reader. E.g., is this global GDP? Also, consider elevating this information into the bolded heading, as this information is more relevant than the current bolded statement.
43667	SPM	16	10	16	20	A comment on estimating the benefits of mitigation should be noted here. The discussion in the Technical Summary (page 7) provides some mention of this as does Section 3.9.
44413	SPM	16	10	20		The paragraph lacks balance on the costs and benefits of mitigation. There is only a statement that the costs do not include the benefits of mitigation. The impression in the % terms is that the high end of the range only increases over time; actually in the long-term, the benefits of avoiding climate impacts will increase. Literature assessed in the Stern Review, and other, clearly calculated the benefits or a 'social cost of carbon'. Quantitative benefits of mitigation must be included
47041	SPM	16	10	16	20	Why was global consumption loss singled out as the metric chosen for the SPM when it is clearer what information and assumptions are included in estimates of GDP losses and abatement costs (see figure 6.21 e) and f)). Somehow one needs to ask what represented by consumption and what models generate these results. The global consumption losses have to be related to the increase in consumption in the underlying baseline. Are the costs of fuels for instance included in consumption? If so, isn't it logical that losses are larger if there is a shift towards a low-carbon economy that sees investments grow and fuel consumption decrease? And even if fuel costs are not included in the metric of consumption, one needs to ask the question what is optimised by the models. For instance if welfare is maximised it might mean models also take into account leisure as a positive, but resulting in lower consumption overall. Overall the choice of consumption losses as a metric seems to be unclear and misleadingly suggests relatively higher impact than other metrics that are represented in figure 6.21 or the metric that is often optimised in these models, i.e. welfare.
44819	SPM	16	10	16	20	This paragraph is problematic. It begins by talking about "Estimates of the aggregate economic costs". However, the numbers presented are not the aggregate economic costs since only some of the aspects are included. For example, the benefits of mitigating climate change are not included. Furthermore, other benefits for example related to improved air quality are not included. In fact, if the aggregated economic costs and benefits would be calculated, it would perhaps not be a cost at all. So writing about "aggregate economic costs" may be completely misleading. I therefore suggest that this paragraph is removed or completely rewritten to give a more balanced view of costs and benefits.

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45944	SPM	16	10	16	20	it is very much misleading info for Policymakers since these "aggregate economic costs" actually refer to changes in some economic indicators (global consumption losses) w/o aggregating "the benefits of mitigation including the reduction in climate impacts" (some co-benefits are indicated e.g. on the same page 16 lines 29-35 cont' on next page making very clear that the consideration of the mitigation related direct econ. losses should not be considered in their isolation ..)
44758	SPM	16	10	16	20	Co-benefits could be stressed more. This is where median cost estimates would be appropriate.
44759	SPM	16	10	16	20	The SPM does not make any explicit comparison of costs and benefits of climate change mitigation of different degrees of stringency of emission reductions, while this is the central question for policy makers. As explained for example in Stern Review, 2006, action on climate change is to be preferred to no action, but how fast action should happen and what stabilisation objective to adopt. This debate can be usefully informed by cost-benefit analysis tools. It would be useful to present an analogy on the impact cost side to the mitigation cost estimates for different degrees of stringency reported in the WG III background document. Why are median costs not reported? Judging by Figure 6.21, it looks like as if median consumption losses for 430-480 ppm scenarios are 0.5% in 2020, 1.75% in 2939, 3.5% in 2050 and 4.75% in 2100. The median NPV of consumption or GDP losses (calculated at the discount rate of 5%) is a bit less than 3% of the NPV of 'BAU, no CC' base case GDP. Furthermore, Stern discounting rate would be lower, i.e. around 2.5%. Most importantly, the global consumption loss figures reported here are not explained in the proper way for the policy makers: what are the reasons behind the ranges, it is important to mention different assumption of the studies that come up with different ranges. Furthermore, only one pathway of 430-480 ppm is considered, and the lower range of this pathway is already pretty much at today's level of concentration, therefore only presenting a very ambitious scenario.
44548	SPM	16	10	16	20	This bullet focuses on the limited and old paradigm of cost calculations vs a more balanced representation of the "full" (i.e., costs + benefits) costs of mitigation. While the language states clearly that the cost numbers do not include benefits, the inclusion of "negative costs" only unnecessarily skews the information. The sensitivities should also include technology costs, cost and availability of fossil energy sources, not just policy.
44549	SPM	16	10	16	20	The analysis of costs presented in this paragraph is important, but likely to be taken out of context without a corresponding analysis of benefits, notwithstanding the caveat on lines 17-18. [Is there some discussion of benefits, (e.g., using the social cost of carbon) that could be presented in relationship to the costs?] The corresponding discussion in the paragraph beginning on line 29 is non-quantitative, and thus not an equivalent point of comparison.
44550	SPM	16	10	16	20	The discussion of the economic costs of mitigation is too narrow and does not incorporate co-benefits of action such as avoided public health costs and avoided energy costs for efficiency measures.
44992	SPM	16	10	16	20	This paragraph appears unclear, please consider rewriting: -- the assumptions seems unrealistic : e.g. "there is a single global carbon price applied to well-functioning markets": what has a reader to understand by "a single global carbon price"? Is a US\$10/tCO2 the same price in Norway and in Bulgaria, in Canada and in Bolivia, in Japan and in Indonesia, etc.? What markets are well-functioning? The emissions trading markets? -- The "global consumption losses" are expressed as % "relative to what would happen without mitigation". The latter expression is not very clear, because the following lines explain that "these costs do not consider the benefits of mitigation, including the reduction in climate impacts". If this is the case, please clarify that the reference situation is an hypothetical one in which there would be no mitigation nor impacts of climate change. -- What is the period / starting point for the consumption losses ? (one may also question whether there is a proper distinction between "costs" and "prices")
45173	SPM	16	10	16	11	The statement "Aggregate economic costs .. increase with the stringency of mitigation". should be re-phrased. Models are consistent that investment requirements increase with the stringency of mitigation. There is a wider range on how investment translates into long run economic costs of the energy system. The term "aggregate economic costs" is itself somewhat ambiguous since it could be taken to include co-benefits and avoided climate damages. Either focus on investment costs, with more uncertainty about the returns; or at least be more explicit about "energy sector costs".



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45174	SPM	16	10	16	20	The statement "global consumption losses of ... 2% to 12% in 2100 relative to what had happened" could easily be taken out of context by those opposed to climate action. The fact that these figures do not include climate impacts only comes much later. This section should be re-written to start with "Ignoring the costs of climate impacts (as well as other benefits such as improved air quality, health and energy security) and focusing only on the costs of mitigation estimates are ...". It would also be good to be clear about what is happening to consumption forecasts in this period (i.e. these models assume consumption growth of around x% in 2050 and y% by 2100) and be explicitly clear that these reductions are relatively small compared to the underlying growth trend.
45175	SPM	16	10	16	20	It is important to be clear on the uncertainties in this modelling - particularly in the longer-term.
43743	SPM	16	10	16	20	The methodology for cost estimates has huge influence on their results. For more accurate description, it is suggested to replace the current topic sentence "Estimates of the aggregate economic costs of mitigation vary widely, but increase with stringency of mitigation." with the following text: "Estimates of the aggregate economic costs of mitigation vary widely and depending on terms and methodologies, but increase with stringency of mitigation.".
44358	SPM	16	10	16	20	The significance of the range 430-480ppm should be made clear. Is 450 ppm (line 17) used as an alternative for 430-480 ppm (line 14)? If not, please clarify the significance of 450 ppm.
45446	SPM	16	11	16	15	some better punctuation would help reading this very long sentence...
45547	SPM	16	11	16	20	We miss an overview of carbon price estimates in accordance with the two degree target. This is highly relevant for policy makers. Also consider to include in the para information about how the cost range is dependent upon early or delayed mitigation.
43720	SPM	16	11			An assumption that all countries can "begin mitigation immediately" sounds a bit naive. Consideration of scenarios based on such assumption is still just an academic exercise.
43668	SPM	16	11	16	15	This is an extremely long sentence and difficult to follow. Suggest re-writing it to say 'For most scenario studies based on the assumptions that 1) all countries of the world begin mitigation immediately, 2) there is a single global carbon price applied to well functioning markets, and 3) key technologies are available, the estimate for reaching 430-480ppm CO <sub>2</sub> eq by 2100 would entail global consumption losses of 1% to 4% in 2030, 2% to 6% in 2050, and 2% to 12 % in 2100 relative to what would happen without mitigation'.
44412	SPM	16	11	16	15	The assumption that "all countries of the world begin mitigation immediately" is policy-prescriptive in that it suggest that developed countries and developing countries mitigate in an undifferentiated manner. If most studies indeed make this political assumption, then qualifying language is needed to make clear that matter of CBDR&RC in the future climate regime is still open in negotiations, and that the literature reflects differing views on this
45683	SPM	16	11	16	13	The assumptions mentioned seem to occur only in the imaginary perfect world. So what are the implications of such assumptions on the realities? Is there any information on the assumption that OECD or Annex I countries taking action first.
46878	SPM	16	11	16	15	Please check grammar. Please put the percentage-figures in context, e.g. what does 5% consumption loss in 2050 mean (for example, you could write how many more years or month it would take to reach the same consumption level)? What is the baseline you are referring to? Does the baseline include the economic impacts of climate change?
45301	SPM	16	11	16	15	This sentence, beginning "Most scenario studies..." is too long. The information should be split into separate sentences for clarity.
45302	SPM	16	11	16	15	This sentence, beginning "Most scenario studies..." does not work grammatically. Insert comma line 11 after 'assessment'. Insert colon line 12 after 'assumptions'. Insert "that" after "immediately, " in line 12. Replace comma with semi-colon in line 13 after 'markets'. Insert 'that' before "key technologies".
44288	SPM	16	13	16	13	The assumption for "global carbon price applied to well-functioning markets" is an over ambitious target as evident from existing carbon markets which demonstrate that such price signal is neither realistic nor achievable
45548	SPM	16	14	16	14	Are "global consumption losses" the same as reduction in GDP? How relevant are such numbers if benefits are not taken into account? Would a reference to investment costs be more relevant in this context?
44551	SPM	16	14	16	15	Most readers will be more familiar with the idea of "GDP loss" as opposed to "global consumption loss". The authors should consider revising the text accordingly. Moreover, this presentation of the costs of mitigation should always be presented with a similar analysis of what it would cost if action on climate change were not taken. To clarify the text, the authors need to specify whether these amounts are annual or cumulative - it makes a significant difference.
45176	SPM	16	14	16	14	Define what is meant by 'global consumption losses'

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43744	SPM	16	14	16	15	The underlying report has explicitly pointed out the regional differentiation in mitigation costs. It is suggested to clarify the costs across region and add "The total aggregate economic costs of mitigation would vary substantially across countries and regions. Aggregate costs in the OECD are typically lower than the global average, those in Latin America are typically around the global average, and those in other regions are higher than the global average" (Ch6, P53, L34 - 38) after "without mitigation".
47042	SPM	16	15	16	16	The words "without mitigation" should be replaced by "without mitigation and without including the impacts of climate change on economic growth". This feedback loop is ignored.
45303	SPM	16	15	16	15	At end of line, suggest insertion of "and without impacts of climate change" after "without mitigation".
45549	SPM	16	16	16	18	Reduced fuel costs under a 450 ppm scenario should be included under benefits of mitigation and it would be informative to add it at the end of the sentence beginning on line 17: "These costs do not consider the benefits of mitigation, including the reduction of climate impacts and reduced fuel costs.". Some global models and studies have estimated that in the long-term (2050) reduced fuel costs as a result of energy efficiency and increased use of renewable sources under 450 ppm scenario will fully offset the increased investment costs required under such a scenario. The benefits of reduced fuel costs should also be highlighted in the paragraph in lines 29-35
45177	SPM	16	16	16	18	Recommend combining these sentences with 'however' instead of the full stop as this could be misinterpreted out of context
45550	SPM	16	17	16	18	Mitigation costs do not include mitigation benefits. We would prefer that this is included but if not it is very important that this is pointed out in the SPM.
44138	SPM	16	17	16	18	This point, that the estimated costs (global consumption losses) do not consider the benefits of mitigation, is extremely important for readers to understand. Suggest the lines be expanded to explain that the baseline scenarios, from which the estimates of global consumption losses are calculated, do not account for the costs associated with climate change impacts. That is, there are two sides to this story: 1. costs of inaction are not built into the baseline scenarios, and 2. benefits of avoided impacts are not built into the mitigation scenarios.
43946	SPM	16	17	16	18	It is said in the text that "These costs do not consider the benefits of mitigation..." Is it possible to give an educated guess of such benefits?
45304	SPM	16	17	16	18	The sentence beginning "these costs do not..." is an important message both here and wherever costs of mitigation are discussed. This information should be given due emphasis.
45551	SPM	16	18	16	18	In "Substantial higher and lower cost estimates....." the logic of "lower" is hard to understand. The logic of "lower" could be explained.
44139	SPM	16	18	16	20	Higher and lower cost estimates are discussed together, but presumably less idealized policy implementations, interactions with pre-existing distortions and non-climate market failures all increase the cost estimates, whereas complementary policies reduce the cost estimates. If this is the case, then suggest re-phrasing appropriately.
44146	SPM	16	2	16	9	Figure SPM.9 figure and caption: The figure appears to show the low carbon energy share of primary energy in different scenarios for three years, but is very difficult to understand. The term 'upscaling' is used in the title and caption, but is not defined. It appears simply to refer to the rate of change of share over time. Is this technical term needed? Could the figure instead be titled 'Evolution of low carbon energy share in all scenarios'?
47040	SPM	16	2	16	2	SPM9: up-scaling or upscaling as in Figure? Is upscaling anyhow a correct expression? Suggest: Increase of low-carbon technologies in energy production systems.
44357	SPM	16	2			The explanation and significance of this graph needs to be clearer.
45178	SPM	16	20	16	20	Define or better describe "complementary policies"
44289	SPM	16	21	16	21	A definition must be provided to "effort sharing framework" in the SPM. This conclusion also does not capture the insights from literature in chapters 6.3 and 13.4.2.4 that there is no agreement on such terms, which must be highlighted to avoid bias and prejudice.
45552	SPM	16	21	16	28	Discrepancies between distribution of costs and responsibilities is a very important point that is nicely highlighted here.
44140	SPM	16	21	16	23	This seems a rather complex statement. Suggest the authors consider breaking it into two parts. In particular, could the section before the comma be presented in a statement without a confidence assessment? It sounds like a statement of principle that is separate from the bit that follows, to which the confidence assessment presumably actually applies.
47122	SPM	16	21	16	23	We do not think the framing of effort-sharing in the light of ethical principles invites the realisation of effort-sharing mechanisms. We therefore suggest to change this bolded sentence to read: "Mitigation potential across countries differs from the benefits from GHG emissions and ability to pay. Effort-sharing mechanisms that are widely supported would increase both the volume and efficiency of global mitigation".
44423	SPM	16	21	16	21	What do you mean by effort-sharing? Please elaborate this concept because the principle of CBDR&RC should also be reflected here.

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44414	SPM	16	21	28		Several issues in this paragraph: 1. Name some of the "ethical principles", including those in FCCC and specifically responsibility. 2. Unequal distribution can be achieved through finance, but also through the allocation of efforts, burdens or carbon budgets. The IPCC's assessment of the literature on these elements needs to be reflected. 3. It is unacceptable to have a finding that future investments will be needed in "non-OECD" countries (defined by what they are not); without a sentence that the literature clearly shows that responsibility for historical emissions is clearly with developed countries.
47043	SPM	16	21	16	21	Presumably "Effort-sharing frameworks" are not the only means to clarify discrepancies? Perhaps it would be better to replace with "Intergovernmental agreements" or similar. Also, suggest that "clarify discrepancies" is replaced by "reduce the gap between" or "the variation" for clarity.
44552	SPM	16	21	16	23	The discussion of effort sharing frameworks in the underlying text is not well reflected in this paragraph. The authors should re-write the bold text to use the language from the chapter: "Effort sharing frameworks could help address distributional issues and de-couple regional mitigation investments from financial burdens, but would be associated with significant international financial transfers" (chapter 6, p 6, lines 27-29).
45179	SPM	16	21	16	21	"Delaying or limiting near-term global mitigation as well as reducing the extent of international participation in mitigation can significantly affect aggregate economic costs of mitigation" (from WGIII_AR5_FD_Ch06, page 49, lines 13-15 is a critical message from the underlying report and should be reflected as a key message in the SPM. This headline message should be followed with "Future mitigation costs are higher because limited near-term action not only requires deeper reductions in the long run to compensate for higher emissions in the short term, but also produces a larger lock-in in carbon infrastructure, increasing the challenge of these accelerated emissions reduction rates." (WGIII_AR5_FD_Ch06, page 49, lines 25 - 28). A simplified version of Figure 6.25 from page 50 of Chapter 6 of the underlying report would also be informative
45180	SPM	16	21	16	23	The formulaion of the headline message here is not really supported by the underlying report and phrases such as "clarify discepancies" and "distribution of responsibilities" are unhelpful. It would be simpler to say something along the lines of "Applying a global carbon price without trading would, in general, impose higher mitigation costs on developing countries than developed countries. This imbalance in costs could be addressed through effort-sharing frameworks, where countries are able to deliver against their emissions reductions targets through a mix of action at home, and payment for emissions reductions elsewhere". The text in 13.4.2.4 on "effort sharing" vs. "resource sharing" approaches is interesting and may be of use to policymakers if these two concepts can be concisely described
45305	SPM	16	21	16	24	The sentence beginning "effort-sharing frameworks..." may be policy prescriptive and should be deleted.
43745	SPM	16	21	16	23	The new expression of "effort sharing frameworks" is involved with national responsibilities and obligations related to climate change. However, there is still no explicit and established definition on this term. For clarification, it is suggested to add "effort sharing framework based on different principles and methodologies will result in different conclusions" after the topic sentence (L1-3).
46881	SPM	16	22			Please add "mitigation potential" to the glossary.
47044	SPM	16	23	16	23	Confusing statement. It suggest that "international financial transfers" are the only instrument to "reconcile" differences in mitigation potentials.
44141	SPM	16	24	16	24	Suggest replacing "to reach concentrations of roughly 450 to 550 ppm" with "to remain below roughly 450 to 550 ppm".
45389	SPM	16	24	16	26	The sentence starting: Studies find that in order to reach ... sounds strange because it could be interpreted such that OECD countries would delay mitigation investments even beyond 2050 according to studies with lowest global cost. However, figure SPM.9 shows that by 2100 low-carbon energy will have a penetration by 2100 of about 90%. It would be interesting to learn about the share of investments in BAU scenarios over this century and its comparison between OECD and non-OECD countries. Such shift in investments seems not primarily driven by the mitigation goal.
45684	SPM	16	24	16	24	The word 'find' may be replaced by the word 'revealed'.
45686	SPM	16	24	16	26	Achieving concentration of 450-550 at lowest cost, majority of the investments need to occur in non OECD. Is this associated with increased or decreased GDP in non OECD countries?
45685	SPM	16	24	16	29	The scenarios considered in these 2 paras have very close ranges - 450-550 and 430-530. Is it possible to harmonize these two closely ranged scenarios?
45181	SPM	16	24	16	28	both these sentences refer to "studies" without qualification. Should it say "Most" or "all" studies?
45306	SPM	16	24	16	26	The sentence beginning "Studies find that ..." is an important piece of information for policy makers and should be given due emphasis.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
43746	SPM	16	24	16	26	In order to provide accurate information to the policy makers, it is suggested to add "assuming a uniform carbon price across regions" after "at lowest global cost". Except for the imbalance in investment distribution, imbalance also exists in cost distribution. It is suggested to add the following text after "non-OECD countries": "and without transfers across regions, cost-effectively allocating emissions across countries would yield an uneven distribution of mitigation costs. Scenarios indicate this would lead to higher relative costs in developing economies as well as to many fuel exporters."(Ch6, ES, P6, L29-32).
44359	SPM	16	25			Add "the 21st" before "century"
45447	SPM	16	26	16	26	"to ameliorate this asymmetry" to be rewritten in "to cope with this asymmetry" ?
44707	SPM	16	26	16	26	The text should read "investment needs" rather than "financial transfers", since not only financial transfers are relevant
45553	SPM	16	26	16	26	Please consider to replace "ameliorate" with a word easier to understand.
44142	SPM	16	26	16	28	As written it sounds like the financial transfers themselves will bring concentrations in the range of 450 ppm CO <sub>2</sub> eq, but we think what is meant is that transfers of the stated size are required to ameliorate the asymmetry introduced by the costs of mitigation efforts to reduce GHGs to 450 ppm CO <sub>2</sub> eq by 2100. Suggest deleting 'to bring concentrations in the range of 450 ppm CO <sub>2</sub> eq in 2100'. It is already clear that 'this asymmetry' refers to the scenarios discussed in the previous sentence.
47045	SPM	16	26	16	28	The level of transfers depends on what your starting point is to determine what a fair distribution of costs is, as well as the level of cost effectiveness achieved on a global scale. The manner in which this sentence is presented gives no information at all on these key issues. This either requires further elaboration to be useful from a policy perspective or the sentence should be deleted as it stands.
44553	SPM	16	26	16	28	While the language in this sentence is drawn from the underlying chapter, it is taken a bit out of context. Please re-write to read: "Studies estimate that the financial transfers to yield an even distribution of mitigation costs could be very significant to bring concentrations to roughly 450 ppm CO <sub>2</sub> e in 2100. However, these studies do not reflect co-benefits or the potential for new technologies to ameliorate these costs."
44554	SPM	16	26	16	28	Given the uncertainties in the costs and benefits calculations, the authors should not state a specific dollar value for financial transfers from OECD to non-OECD countries by mid-century. The value stated, "hundred billions of USD per year" is speculative. Instead, the statement needs to read something like, "significant resources - including financial, technical, and human capital resources - will likely be needed by ...".
45182	SPM	16	26	16	26	The financial transfers do not arise to "ameliorate" this "asymmetry", they arise because they are economically optimal. This might have the effect of reducing asymmetries, but this isn't why they happen - this needs redrafting.  One approach would be to say "These investments will involve a mix of returns, some accruing to those countries in terms of enhanced energy security and lower fuel bills and local environmental impacts; and others primarily benefitting the global environment. Financial transfers .. [of hundreds of billions] could/would help accelerate such investments and thus help to bring concentrations ..."
46882	SPM	16	26			Please replace the statement "Studies estimate that .... In the range of 450ppm CO <sub>2</sub> eq in 2100" by the original sentence from chapter 6, page 57, line 18: "Multi-model studies indicate that the size of the carbon market transfers would be significant in relation to the total global aggregate economic costs of mitigation, of the order of hundred billions of U.S. dollars per year before mid-century". Rationale: The current formulation is misleading in the context of the previous sentence of the SPM stating that the "the majority of mitigation investments ... will occur in non-OECD countries". The reason for this allocation of investments is partly because overall emissions (and mitigation potentials) are much higher in non-OECD countries, and partly a consequence of a carbon market that would channel mitigation investments to those areas where the marginal abatement costs are cheapest. In other words, the financial transfers would result to a large degree from a functioning global carbon market, with initial emission allocations across OECD and non-OECD countries. There are many reasons for substantial financial flows, but the current statement lacks in our view the reference to the carbon market and is not backed by the underlying chapter and assessed literature. This correction of language should be trickled down to the Technical Summary and Executive Summary of chapter 6.
45307	SPM	16	26	16	28	The sentence beginning "studies estimate that..." needs a statement of evidence/agreement/confidence.

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43747	SPM	16	26	16	28	According to the expression "Multi-model studies indicate that the size of the carbon market transfers would be significant in relation to the total global aggregate economic costs of mitigation, of the order of hundred billions of U.S. dollars per year before mid-century" in underlying report (Ch6, P57, L18-21), the referred "financial transfer" is limited to emission allowance transaction in carbon market. It is only part of international financial transfer. The public funding provided by developed countries to developing countries has not been covered. It is suggested to replace the current sentence with the following text: "Only in the context of a uniform global carbon market, the financial transfers to ameliorate this asymmetry estimated by multi-modelling simulations could be in the order of hundred billions of USD per year before mid-century to bring concentrations in the range of 450 ppm CO2eq in 2100".
44143	SPM	16	27	16	27	It is not clear if the text means to say "order of 100 billion USD", or whether "order of hundreds of billions USD" is the intended meaning. Please review.
43669	SPM	16	27	16	27	This sentence is missing a word or letter which is important to the meaning of the sentence: 'hundreds of billions' or 'a hundred billion'.
45388	SPM	16	28	16	28	It is strongly suggested to substitute "clarify" by "address". Furthermore not only the mitigation potential is relevant but also the associated costs to implement the corresponding policies and measures. Some countries might have already implemented low hanging fruits and are left with more expensive solutions. In other countries that are rich in fossil fuels substitution of fossil fuels would have significant socio-economic consequences.
45945	SPM	16	28			in the range of 450 ppm .. ((it is unclear how to understand this "range"))
44290	SPM	16	29	16	31	The statement "reduce costs of energy security and air quality objectives" shall be substantiated with examples in SPM. Impact on AFOLU shall be mentioned. This is also not comprehensive of top sustainable development objectives such as access to energy, eradication of poverty, food security and other socioeconomic adverse impacts.
45448	SPM	16	29	16	31	the paragraph mentions energy security and later the sufficiency and resilience of the energy system: how do these three differ?
44708	SPM	16	29	16	31	This is a key finding and should be highlighted and brought out clearly in the introduction/conclusion of this document
44709	SPM	16	29	17	6	Co-benefits are highly diverse, i.e. for instance energy security, air quality, ecosystem. Accordingly, they should be treated individually in separate paragraphs rather than as a group. Moreover, adverse effects should be treated in separation, cf. above general comment.
45554	SPM	16	29	17	6	Please consider to change the headlines statement by: Most mitigation options result in co-benefits for energy security and air quality with significant short-term welfare gains (high confidence). Then continuing the paragraph by this text as it was in the SOD SPM: The range of the economic value of air quality co-benefits from climate change mitigation range from 2/tCO2 to \$196/tCO2, with a mean of \$49/tCO2, depending on diverse geographies, economic sectors, time horizons, and valuation techniques considered. Welfare gains from co-benefits tend to be higher in developing countries than industrialized countries due to higher pollution levels. Many mitigation options also result in co-benefits for energy security (medium confidence). There is a wide range of co-benefits and adverse side-effects other than air quality and energy security. Overall, the number of co-benefits for energy end use measures outweighs the number of the adverse side-effects, whereas the evidence suggests this is not the case for all supply side measures. [WGIII 4.8, 5.7, 6.3.6, 6.6, 7.9, 5 8.7, 9.7, 10.8, 11.7, 11.13.6, 12.8, Figure TS.14; WGII 11.9]
44144	SPM	16	29	17	6	Our understanding is that the benefits of lower overall emissions extend beyond health, ecosystems and energy - could/should the message be expanded here? Additionally, some information about the offset between these cost savings and the consumption losses described earlier would be useful.
45687	SPM	16	29	16	31	Implications of reduced deforestation could be mentioned along with the co-benefits of biodiversity conservation etc.
46883	SPM	16	29	17	6	Chapter 3 (page 9, lines 42 – 48) states that "central to the politics of taking action on climate change are disagreements over how much mitigation the world should undertake, and the economic costs of action (the costs of mitigation) and inaction (the costs of adaptation and residual damage from a changed climate)." However, the SPM does not give any information regarding this important issue. Please add a statement on the possible costs of in-action in relation to those of action, and in relation to those of adaptation at different concentration levels.
43748	SPM	16	29	17	6	This paragraph focuses on co-benefit, neglecting possible adverse effects of certain mitigation measures on energy security, environment and economy. It is suggested to replace the current sentence in bold with the last sentence of this paragraph and change the latter in bold: "Overall, the number of co-benefits for energy end use measures outweighs the number of the adverse side-effects, whereas the evidence suggests this is not the case for all supply side measures." and cancel the current bold mode.
44555	SPM	16	30	16	30	The authors should add, "co-benefits for human health AND AGRICULTURE, ecosystem impacts..."
45183	SPM	16	30	16	30	remove comma after "health", replace with "and"

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45184	SPM	16	30	16	30	remove comma after "health", replace with "and"
45308	SPM	16	31			Insert "food production systems and" before "ecosystem impacts".
44556	SPM	16	33	16	33	The authors should delete "national" and replace it with "global".
43670	SPM	16	34	16	35	This sentence uses a double negative term (i.e. 'reduced health impacts', and 'welfare impacts') and could be clearer. Suggest it may be clearer to word this as 'The social benefits from reduced negative impacts to health and ecosystems associated with major cuts in air pollutant emissions significantly below baseline scenarios, are particularly high where currently legislated and planned air pollution controls are weak, such as in developing countries.'
46875	SPM	16	5			The term "error bands" might be misunderstood. Please use term "whiskers" which is used in several places throughout the SPM.
46876	SPM	16	7	16	8	The caption states that only scenarios with default technologies are shown, but how does this match with including CCS?
45300	SPM	16	7	16	9	It is not clear what the default technology assumptions are - even at a basic level.
44135	SPM	16	8	16	9	This 'note' at the end of the Figure caption for Fig SPM.9 is not readily understood. Suggest either removing if it is not necessary to understanding the graphic, or convey in more straightforward language.
43945	SPM	16	8	16	9	The last sentence of the figure caption text is rather difficult to understand
46877	SPM	16	8			"exogenous carbon price trajectories"? Is there a simple way to describe this in non-expert language?
46879	SPM	16	11	16	15	The whole sentence is difficult to follow. 1. "Most scenario studies... that are based..." - are there other studies included in the report which do NOT use the same assumptions? I reckon, yes, but these other studies assume that action on mitigation starts later. In general I would separate the long sentence and list the assumptions for the scenarios before or after the sentence which describes the results. "Most scenario studies collected for this assessment estimate that reaching ..." "These studies are based on the following assumptions: ..."
46880	SPM	16	18	16	20	To motivate adequate policy design, factors that contributed to substantially higher cost estimates as well as factors that contributed to substantially lower cost estimates could be enlisted, though on an exemplary basis, separately for both. It should be specified, also on an exemplary basis, which of the enlisted factors (less idealized policy implementations, interactions with pre-existing distortions, non-climate market failures, or complementary policies) contributed to higher and which factors contributed to lower cost estimates, respectively.
44000	SPM	16	21	16	28	It is requested to remove this paragraph because the historical responsibilities of countries should not rely on subjective considerations. Also, economic analysis should include not only costs related to environmental technology changes, but also opportunity costs for development in non-OECD countries.
45869	SPM	16	1			For consistency in the SPM, it would appreciate to replace "CO2-e" with "CO2eq" as defined in body text (p8, L7).
45870	SPM	16	11	16	15	Would appreciate if authors of WG2 and WG3 work in collaboration to compare income loss by impact of global warming and cost of mitigation in same metric. If above is difficult, would appreciate if cost of mitigation is measured in percentage of global GDP and note that this cost cannot be compared with income loss ( WGII SPM p. 11, II.22-23 )directly.
45871	SPM	16	11	16	16	Cost comparisons in this page being very useful information. Would be even more helpful if total costs involved over the different time frames of different scenarios in reaching their respective goals (temperature maintaining some levels or decrease) were included.  Although global consumption loss at certain points in time (2030, 2050 and 2100) are provided on page 16, along with a comparison of costs under 450ppm and 550 ppm scenarios to understand magnitude, it seems insufficient to compare transient or cumulative costs at a certain point in time as the time frame, until reaching its respective goal (temperature maintaining some levels or starting to decrease), differs among different scenarios.  Also wonder if the words "reaching" and "maintaining" are intentionally used to describe different states (reaching a certain concentration level / maintaining levels below a certain concentration level) and if so, should they not be reversed? Would appreciate more clear wording to avoid unnecessary confusion.
45872	SPM	16	21	16	28	Appreciate if more explanation on "effort-sharing frameworks" is added, so that readers could clearly understand the backdrop of "hundred billions of USD per year".
45873	SPM	16	24	16	26	This part should be maintained as it is. The description about the condition on which scenarios are based in this part is important in order to give reference information for policy makers about reducing global GHG emission at lowest global cost.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
45874	SPM	16	29	16	31	Wonder if "Mitigation scenarios reaching 430 and 530 ppm CO <sub>2</sub> eq in 2100" would be better put as "Mitigation scenarios reaching 430-530 ppm CO <sub>2</sub> eq in 2100" .
45875	SPM	16	29	16	31	<p>Comparisons between concentration ranges such as The description in bold letters should be described as future subject of studies in this field on the basis of the fact that the corresponding part seems not to exist in the body text.6.</p> <p>From the view stated above, suggest to add description in TS p.33 117-123 where TS indicate that assessment of possible benefit and harm of co-benefit is limited at this moment.</p>
44557	SPM	17	1	17	5	While "adverse side effects" are mentioned, there is not a single mention of an example in this paragraph.
44295	SPM	17	10	17	12	<ul style="list-style-type: none"> <li>• Clarification must be provided on the exact treatment of these impacts on the literature as the assessment of the negative impact on oil exporter is clearly supported by a wide body of literature and needs to be stated explicitly and accurately. Therefore, following the same underlying chapter 14.4.2, this conclusion must include: "[In this context, it is also important to consider spillovers on energy that may appear due to trade. As discussed in Chapter 6 (Section 6.6.2.2), mitigating climate change would likely lead to lower import dependence for energy importers (Shukla and Dhar, 2011; Criqui and Mima, 2012). The flip side of this trend is that energy exporting countries could lose out on significant energy export revenues as the demand for and prices of fossil fuels drops. Some studies indeed find that pricing carbon would decrease oil wealth (Haurie and Vielle, 2011).<sup>3</sup> These findings are consistent with the literature which was reviewed in AR4. The effect on coal exporters is very likely to be negative in the short and long term as mitigation action would reduce the attractiveness of coal and reduce the coal wealth of exporters (Bauer et al., 2013a; b; Cherp et al., 2013; Jewell et al., 2013)."</li> <li>• The following statement also needs to be included "Several studies suggest that the effect of climate policies on oil wealth and export revenues is found to be negative in most studies (McCollum et al.; IEA, 2009; Haurie and Vielle, 2011; Bauer et al., 2013a; b; Tavoni, 2013).]"</li> <li>• Also INSERT Box TS 11 "All these side-effects are important, because a comprehensive evaluation of climate policy needs to account for benefits and costs related to other objectives. If overall social welfare is to be determined and quantified, this would require valuation methods and a consideration of pre-existing efforts to attain the many objectives." .Also delete sentence beginning with "however..." as it is not representative of the established literature.</li> </ul>
45186	SPM	17	14	24	3	As a whole this section lacks impact. There is too much information on different mitigation measures without any clear analysis on how much mitigation different measures might be able to contribute. Much of section 3.2 comes across as long winded and there's no clear narrative or conclusion to take away from it.
45390	SPM	17	15	17	15	For the sake of clarity it is suggested to insert "global" before "GHG emissions".
45187	SPM	17	15	17	17	<p>The headline message here lacks impact. We suggest "Without mitigation, global GHG emissions will rise, resulting in a global mean temperature increase of around 4 degrees Celsius by 2100". [this statement is supported by lines 20-23 of WGIII_AR5_FD_Ch06 page 5, which states "Atmospheric concentrations in baseline scenarios collected for this assessment (scenarios without 20 additional efforts to constrain emissions) all exceed 450 ppm CO<sub>2</sub>-e by 2030 and lie above the RCP 21 6.0 concentration pathway in 2100 (770 ppm CO<sub>2</sub>-e in 2100); the majority lie below the RCP 8.5 22 concentration pathway in 2100 (1330 ppm CO<sub>2</sub>-e in 2100)" - this implies temperature increase somewhere between the 3.1 - 3.7 (RCP6.0) and 4.1 - 4.8 (RCP8.5) range. The clause about land-use can then follow in the explanatory material.</p> <p>In addition the text "All major-emitting regions make substantial reductions from their baseline CO<sub>2</sub>-e emissions over the century in scenarios that bring GHG concentrations to 550 ppm CO<sub>2</sub>-e or below by 2100" from WGIII_AR5_FD_Ch06 page 5 lines 40-31 should be highlighted as a headline message. This message could be further clarified by expressing it as "All major-emitting regions make substantial reductions from their baseline CO<sub>2</sub>-e emissions over the century in scenarios that are more likely than not to meet the 2 degree target"</p>
45558	SPM	17	16	17	22	In this para it is unclear what is meant by the land-use sector. This refers to Figure TS.15. Does it make sense that the "land-use sector" changes from a source to a sink around 2050? Is not the land/terrestrial ecosystem a sink already (please site WG1 6.3.2.6)? What is meant by land-use sector in this respect? Does it mean that areas with status as a source today (due to land use change, deforestation and forest degradation e.g.), are likely to transform to a sink by 2050? Please consider a term that clarifies this (the interactions between AFOLU emissions and the residual land sink. E.g in WG1 figure TS 4). It would also be useful if the term "land-use sector" is explained in Annex I/Glossary.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
45688	SPM	17	16			Please clarify what is meant by "new" as opposed to existing or old. Para content does not seem to support the bold statement (headline statement).
45310	SPM	17	16	17	22	This paragraph does not use consistent terminology with sectoral splits. While important to mention expectations for forestry, this is part of the AFOLU sector. Landuse is not a standalone sector.
45450	SPM	17	19	17	19	why 'As a result'?
45189	SPM	17	19	17	19	"As a result" is used. As a result of what? The increase in energy generation does not, of itself, lead to an increase in emissions from buildings and industry. A better formulation would be "Increasing demand for energy in the buildings and industry sectors leads to an increase in emissions." Direct emissions increase as well as indirect so both, or neither, should be mentioned.
44291	SPM	17	2	17	3	On the following statement: "There is a wide range of co-2 benefits and adverse side-effects other than air quality and energy security." This range of co benefits and adverse side effects need to be mentioned
44147	SPM	17	2	17	3	This sentence, especially the reference to "adverse side effects" is unclear. Presumably, air quality improvements and improvements in energy security would be co-benefits. Suggest providing examples of potential adverse side effects.
43671	SPM	17	2	17	4	This sentence would have more impact if some example of co-benefits and adverse side-effects were given.
44885	SPM	17	2	17	2	Delete "such as in many developing countries" to avoid generalization and singling out certain countries. There are certainly examples of developed countries or areas in developed countries with weak pollution controls, as well as of developing countries or areas in developing countries with stricter pollution controls than their developed counterparts.
44151	SPM	17	20	17	21	This statement, that "deforestation decreases in most of the baseline scenarios" is surprising. While we see this is the case from Figure TS.15, we suggest that some explanation would be warranted and helpful in the SPM. Presumably, baseline scenarios have rising global population with increasing demand for food and land which would put pressure on forests. RCP8.5 has increasing cropland and grassland, and declining forest cover, and therefore would seem to be at odds with these other baseline scenarios.
44887	SPM	17	20	17	20	Insert "In the context of positive incentives" before "deforestation decreases in most of the baseline scenarios."
44152	SPM	17	21	17	22	Suggest inserting 'anthropogenic' before 'land-use sector' or make some other change to indicate that this refers to anthropogenic land-use change only, and does not include the natural terrestrial carbon sink.
47048	SPM	17	21	17	22	"In some scenarios... around 2050". This statement doesn't appear to be supported by the underlying report. Please could you clarify how this statement was derived. If it is referring to the results of some of the most extreme baseline scenarios, we would suggest that the sentence is deleted or made clearer that this is the case. As it currently stands, the sentence could give the impression that land-use emissions might disappear without any efforts to reduce them which is not the conclusion of Ch.11.
44888	SPM	17	21	17	22	See comment on page 17, section 3.2
43947	SPM	17	21	17	22	Rephrase the last sentence: Could the assumptions of such a development be briefly explained here?
45559	SPM	17	22	17	22	The AR5 WGI addressed the connection between CO2 concentration and natural removal by carbon sinks and concluded that "Climate change will affect carbon cycle processes in a way that will exacerbate the increase of CO2 in the atmosphere (high confidence)." "Based on Earth System Models, there is high confidence that the feedback between climate and the carbon cycle is positive in the 21st century; that is, climate change will partially offset increases in land and ocean carbon sinks caused by rising atmospheric CO2. As a result more of the emitted anthropogenic CO2 will remain in the atmosphere." Please consider reflecting these finding at the end of this paragraph, i.e. that the potential for terrestrial systems to remove carbon from the atmosphere in the future is scenario dependant. The potential for removals will probably be reduced in high-level emission scenarios compared to low-level scenarios.
45560	SPM	17	22	17	22	Please also give reference to the underlaying AR5 chapters here to enable readers to go into more detail (since this is exactly the same text as in the TS), and also to check sources and validity of statements using the scientific publications and other sources from the underlying chapters.
45561	SPM	17	23	17	24	Early action and the opportunity to avoid lock-in and save costs by early mitigation action should be reflected. Please consider to further develop the bolded sentence to reflect this. E.g "....., and early mitigation action connected to long-term investments could reduce the overall costs considerably."
45188	SPM	17	23	17	23	We would like to see figure 6.21(a) in the SPM (from page 45 of WGIII_AR5_FD_Ch06), and additionally a new paragraph before line 23, page 17 stating "Moving towards atmospheric stabilisation requires a steadily increasing effort. Most models express this as a carbon price which rises over time to meet stabilisation goals, though it can also be interpreted more broadly in terms of an index of overall effort." "
45311	SPM	17	23	17	29	The information contained in this paragraph is important and clearly stated. The term dematerialisation should be clarified.
43948	SPM	17	25	17	26	Please clarify the sentence.



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44153	SPM	17	26	17	27	We think the term 'land-use planning' here refers to planning of infrastructure, but might easily be confused with planning in the 'land-use sector' referred to in the previous paragraph. Suggest deleting 'land-use'.
44993	SPM	17	26	17	26	the word "land-use" points to something different as "land-use" in the preceding § (e.g. Line 21) and in FOLU: therefore, replace by 'infrastructure and urban/spatial planning'
45190	SPM	17	26	17	27	What is "land-use planning related lock-in"?
44298	SPM	17	27	17	27	This conclusion needs to be clarified for Policy makers by including insights to all issues dimension and, thus the following statement from TS 3.2.1 is needed after the word".. eliminates. " [In mature or established cities, options are constrained by existing urban forms and infrastructure, and the potential for refurbishing or altering them]
43672	SPM	17	27	17	29	Currently worded, it is unclear what 'dematerialisation' means. Suggest rephrasing to 'However, low-emission products and infrastructure built for longer lifetimes can ensure positive lock-in as well as avoid emissions by reducing the quantity of materials used'.
44994	SPM	17	27	17	29	"However, longer lifetimes of low-emission products and infrastructure can ensure positive lock-in as well as avoid emissions through dematerialisation." Does this mean that low emissions product and infrastructure HAVE a longer lifetime or COULD HAVE a longer lifetime ? Please clarify.
45391	SPM	17	28	17	28	It is suggested to substitute "ensure" by "result in".
44154	SPM	17	29	17	29	Not all readers will understand "dematerialization". Suggest avoiding technical jargon if possible.
45392	SPM	17	29	17	29	It is suggested to avoid the quite technical term "dematerialization" in the SPM and be more explicit, using wording such as "decoupling of material resource consumption from economic growth" as this would increase the readability.
47049	SPM	17	29	17	29	dematerialisation': it is difficult to understand what is meant here? Possibly a prominent example could help?
45191	SPM	17	29	17	29	what is "dematerialisation"?
46886	SPM	17	29			What does "dematerialisation" mean?
44292	SPM	17	3	17	5	On the following statement: "Overall, the number of 3 co-benefits for energy end use measures outweighs the number of the adverse side-effects" it is not clear how this conclusion has been derived as it appears to be extremely biased and pre-judgmental. Clarification needs to be provided on how this result emerged
45555	SPM	17	3	17	5	It is not the number of co-benefits and side-effects, but the value of these effects that is relevant.
44148	SPM	17	3	17	4	Suggest deleting the two instances of 'number of'. We assume that it is not the number of co-benefits or adverse side-effects which is important here, but some aggregate measure of their net value or cost.
44558	SPM	17	3	17	5	This line risks overstating adverse side-effects ("outweigh[ing] co-benefits") of supply-side mitigation. Chapter 7 does cover unintended consequences like injury to raptors, but the focus here on adverse phenomena may be disproportionate and imbalanced: Chapter 7 discusses these effects, but clarifies that they are (i) likely more than offset by the benefits of avoided climate related damages/catastrophes and (ii) manageable/lessened by appropriate technology, operational, siting, and/or other choices (e.g., p. 6, l. 8-13, on RE).
44299	SPM	17	30	17	39	This conclusion only relates to energy systems, which is biased towards fossil fuel in SPM. Other cross sectoral mitigation approaches (for example industry) shall also be presented.
44155	SPM	17	30	17	31	The use of the "sector-by-sector" terminology in the following statement "Systemic and cross-sectoral approaches to mitigation are expected to be more cost-efficient and more effective cutting emissions than sector-by-sector policies", is not consistent with the language used in the chapters. The chapters contain language such as sector-specific, sector focused, etc. We propose that the language be consistent with the underlying chapters.
43673	SPM	17	30	17	39	The overarching bold point here refers to cross-sectoral approaches being more effective than sector-by-sector policies, however the unbolded text below it relates only to sectoral approaches which don't support the bolded statement. More discussion on the reasons why cross-sectoral policies are more efficient here would be more appropriate.
44820	SPM	17	30	17	31	There is a discrepancy between this statement and the ones you have in the section on end-use sectors which talk about multiple-goal sectoral policy packages, and what you said on page 7 about co-benefits, side-effects, trade-offs and synergies. There is also a discrepancy with the following passage (line 40-46). The first sentence is misleading since it can give the impression that a cross-sectoral approach with low ambitions can be more effective than an approach with different but higher ambitions in different sectors. It should therefore be rewritten, for example: "Systemic and cross-sectoral approaches to mitigation are expected to be more cost-efficient in providing a certain emission reduction. However, if such approaches do not lead to sufficient mitigation, sector-by-sector policies may be necessary."

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
45946	SPM	17	30			there is a reference to cross-sectoral approaches, however, none is mentioned in that paragraph except key categories (subsectors) of the energy sector
45689	SPM	17	30	17	31	Also mention that systemic and cross sectoral approaches are also difficult to implement than sectoral approaches, if evidence exists.
43949	SPM	17	30	17	39	The first sentence is very good but the rest of the paragraph and Figure SPM.10 are difficult to understand. The figure contains a lot of information and it takes quite an effort to study it. Please seek ways to simplify the figure.
44562	SPM	17	30	17	39	The agreement of the models is less important than the insight. The authors should rework this to focus on insights and importance of end use reductions-even in light of population and economic growth, and fuel switching to low/no carbon energy sources.
45192	SPM	17	30	17	31	The headline message lacks impact. Can this be re-written?
45193	SPM	17	30	17	39	It is difficult to see what message for policymakers this entire paragraph is trying to convey.
44995	SPM	17	31	17	34	"Integrated models identify...": this assigns magical power to models, while it is the modellers or analysts, etc., that identify. We suggest 'The output of integrated models are ....', or "Analyses using integrated models suggest that..." The rest of the sentence is also very confusing. We suggest to replace the sentence by: "three categories of energy system related measures are prominent: decarbonization of the energy supply sector, final energy demand reductions, and switching to electricity or low-carbon fuels in energy end uses".
45194	SPM	17	31	17	32	"integrated models identify" is unnecessarily long. Replace with "There are "
45312	SPM	17	31	17	35	As the list is begun with a colon, the listed items should be separated by semi-colons instead of commas. This would clarify in particular the ending of the sentence.
45562	SPM	17	33	17	34	In this context, we think that electricity should be regarded primarily as an energy carrier and not a fuel. We propose the following rewriting: "... switching to low carbon energy sources (direct or indirect) in the energy end use sectors."
44563	SPM	17	33	17	34	Electricity itself is not a fuel, but a carrier. Also, electricity can be "high carbon" if from fossil energy, particularly coal. Thus, "low or zero emission electricity" may be more appropriate.
44156	SPM	17	34	17	34	Our understanding is that electricity is not low carbon everywhere, it depends on how it is generated. Suggest the authors consider further nuancing this statement.
44996	SPM	17	35	17	36	This sentence, mainly line 36, is best expressed with the decomposition terminology and sequence (Ch.5, SPM figure 6), therefore please consider the following wording: "... reductions in energy intensity, combining improvements in energy efficiency and changes in activity, and reductions in GHG emissions intensity."
44157	SPM	17	36	17	36	It is not clear what 'changes in activity' means here. Can this be qualified?
44158	SPM	17	37	17	37	The term "broadly agree" is vague - can this be replaced with confidence or agreement/evidence qualifiers?
47046	SPM	17	4	17	4	It is not only about the number of co-benefits versus dis-benefits. The overall economic or other impacts are more important.
44300	SPM	17	40	17	41	This statement focuses energy end-use sector as a "key mitigation strategy", which is biased towards fossil fuel. Other sectors for example AFOLU shall be mentioned in SPM.
45563	SPM	17	40	17	41	Please consider to rephrase the beginning of the bolded statement to: "Reductions in the demand for energy in end-use sectors ...."
44159	SPM	17	40	17	40	The phrase "are a key mitigation strategy" could be interpreted as prescriptive/subjective, unless this is being said in the context of scenarios - if this is the case suggest making it explicit that this statement is based on the scenario analysis (this also applies to the supporting paragraph as well).
44889	SPM	17	40	17	41	The statement in bold can only be valid in the context of universal or widely available energy access. Strategies to reduce demand in the energy end-use sector cannot be at the expense of energy access, which is key to sustainable development. Insert "In the context of universal or widely available energy access," at the beginning of the sentence.
45690	SPM	17	40	17	46	limiting energy demand is relevant only for high energy consuming countries and sections of societies - please mention this.
44564	SPM	17	40	19	10	"Demand reductions in the energy end-use sectors are a key mitigation strategy and determine the scale of the mitigation challenge for the energy supply side" (p. 17, l. 40-46) is followed by "The availability of carbon dioxide removal technologies determines the mitigation challenge for the energy end-use sectors." (p. 19, l. 9-10) One underlines that demand reduction in end-uses increases supply-side flexibility. The other points out that, vice versa, supply-side mitigation relieves pressure on end-use sectors. Each statement, alone, seems to imply a unidirectionally deterministic effect. It would be preferable to combine these, so as to reflect actual supply-demand interaction in a dynamic and integrated system context.
44997	SPM	17	40	17	41	"Demand reductions in the energy end-use sectors are a key mitigation strategy and determine the scale of the mitigation challenge for the energy supply side". We suggest to rephrase as "Near-term demand reductions etc..." in the beginning of line 40' (see 6.3.4 p 36 line 8 & 19, p38 lines 15-17, 7.11 p 60 line 5 ). The addition of 'near- term' is important for a proper expression of the lock-in effect.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
45195	SPM	17	40	17	41	Would it not be simpler and more impactful to say "Reducing energy consumption through a mixture of improved energy efficiency, and more energy conservation, significantly reduces the amount of low-carbon generation capacity that will need to be built, and therefore reduces the overall costs of mitigation significantly"?
43749	SPM	17	40	17	41	To avoid misunderstanding of "demand", it is recommended to replace "Demand reduction" with "Energy demand reduction in the energy end use sector, through change of technology and behavior".
45564	SPM	17	41	17	41	Please consider to insert " or reducing" after "Limiting". Rationale: In some cases energy subsidies lead to over-consumption.
44160	SPM	17	43	17	43	Technical terms such as "up-scaling" and "supply side" makes this difficult to understand. Consider using plain language.
44821	SPM	17	44	17	44	Avoids a potentially premature retirement? Rephrase.
44565	SPM	17	44	17	44	It is unclear how efficiency gains would avoid premature retirements of carbon-intensive infrastructure? The authors should strongly consider deleting this phrase.
44998	SPM	17	44	17	44	The wording "potentially premature retirement of, carbon-intensive infrastructure" is unclear: do you mean that it could result in either lock-in or premature retirement of the new (carbon intensive) infrastructure ? Please clarify.
44301	SPM	17	45	17	46	The statement only refers to the co-benefits and does not address the adverse side effects for the supply side which must be provided for impartial and sound conclusion.
45565	SPM	17	45	17	45	Demand reductions is a particularly important measure to meet the global policy goals of reducing loss of biological diversity (cf CBD). We suggest mentioning this specifically to give some more context to the term "policy objectives" in line 45: e.g. "4) maximizes co-benefits or other policy objectives, such as energy security, health, and protection of ecosystems and biological diversity"
44161	SPM	17	46	17	46	The phrase "effectiveness of the transformation" is unclear. What kind of transformation is being referred to here?
44149	SPM	17	5	17	5	Not all readers will understand "supply side measures". Suggest avoiding technical jargon if possible.
47047	SPM	17	5	17	5	Replace: "is not" by "may not". This depends on the shift. Coal to gas helps, gas to biomass may not help for example.
44294	SPM	17	7	17	13	This is a key message as adverse impact of mitigation measures focusing on energy sector. This statement shall be given in the Framing Section of SPM after modifications in the previous comments.
44293	SPM	17	7	17	8	The conclusion needs also to be precise in representing the literature and refer to the used terms "response measures and spillover effects" which is supported by AR4 and recent literature in Chp 13.2.2.3 and explain using the following statement to be inserted [Another dimension of distributional equity is the possibility for mitigation actions in one jurisdiction to have positive or negative consequences in another jurisdiction. This phenomenon, sometimes referred to as "response measures" or as "spillover effects" (as in AR4 – see glossary), can lead to an unequal distribution of the impacts of climate change mitigation actions themselves.]
45449	SPM	17	7	17	13	please add 'relative to what would happen without mitigation measures', or some other wording that makes it clear that this is not necessarily a reduction from current levels.
44150	SPM	17	7	17	7	Not all readers will understand "endowments" - suggest clarifying. More generally, isn't the point that proven, and yet to be proven fossil fuel reserves may be devalued? If that happens, it would presumably affect all fossil fuel reserves, whether they exist in a country with net fuel exports or imports. Thus it seems that the headline is perhaps not quite on the mark. Suggest reviewing.
47123	SPM	17	7	17	8	We do not think it is useful to frame the issue as it is done in this paragraph. We would prefer to reword to: "The transition to a low-carbon economy implies a gradual revaluation of assets, not unlike in other transitions that have occurred in the past. Such transitions always harm the interest of some, while benefiting others. Consistent long term policy may minimize damages and maximize opportunities, such as in investment decisions. Countries and companies that currently have a strong interest in fossil fuels may have an advantage in providing low carbon energy services because of their networks and infrastructure if they reorientate in time. ..."
44415	SPM	17	7	17	13	There is no reference to renewable energy, and increasing competitiveness of countries with those endowments and technologies, in a carbon-constrained world. Surely there is a literature on this
44559	SPM	17	7	17	13	The bold text is incomplete; it should be revised to read: " Absent widespread deployment of CCS technology, mitigation policy..."
44560	SPM	17	7	17	13	The discussion of the potential effect of mitigation policy on the value of fossil fuel endowments should be counterbalanced by a discussion of the potential benefits of mitigation policy for countries with strong potential for development of renewable energy (e.g., hydropower, geothermal energy, solar energy, wind energy). The statement that "differences between regions . . . exist" may be accurate but is not clearly elucidated in the underlying chapter (14.4.2).

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
45185	SPM	17	7	17	8	<p>Is it fair to pick out an industry negative (coal export industry suffers) without also balancing this with industry positives (renewables industry improvements)? We would have thought that the more striking point here is that the existing stocks of fossil fuels will have untold global financial ramifications if left un-burnt. What does the underlying report say on un-burnt fossil fuel reserves and the implications of this?</p> <p>"itigation and energy efficiency improvements would make energy systems more resilient to various types of shocks and stresses and would help insulate economies from price volatility and supply disruptions." from page 75, lines 32 - 34 (Chapter 6) should be included here, as the positive impacts of mitigation on energy security need to be better reflected</p>
46884	SPM	17	7			"Endowment" is a rare word. We propose to use a more colloquial expression for non-native speakers (e.g. financial advantages, profits, benefit).
45309	SPM	17	7	17	8	The language does not reflect that mitigation policies may enhance the value of endowments of renewable energies. This should be reflected or else delete the existing sentence.
46885	SPM	17	10	17	10	It remains unclear whether the export revenues from oil are reduced on an annual or a cumulated basis.
45556	SPM	17	14	24	33	SPM.3.2. Please consider to introduce an illustration in the introduction to chapter 3.2, illustrating a) Emissions from sector in 2010 (ref Figure SPM.3.), b) Baseline projections towards 2050 (ref introductory text in subchapters of SPM 3.2.x), and c) Potential emissions reductions towards 2030 and 2050 (ref. Figure SPM.11 median emission reduction potential for each sector 2030 and 2050). For illustrative purposes, an example of such a figure is given in a separate document (WGIII SPM proposal for new figure section 3.2.png). This would provide the reader with key information for each sector. For the purpose of clarity and consistency, please also consider providing key information from this illustration in the introductory text for each sub-section in chapter 3.2, i.e. a) estimates of 2010 emission from each sector, b) baseline 2050, and c) reduction potential towards 2030 and 2050
44886	SPM	17	14			WG1 states that "A majority of models projects a continued land carbon uptake under all RCPs, but some models simulate a land carbon loss due to the combined effect of climate change and land use change", which contradicts (or at least is much more conservative than) the affirmation that the land use sector may change from "an emission source to a net emission sink around 2050." All references to the land use sector becoming a net emission sink should therefore be revised in order to ensure consistency. On another account, this session as a whole offers a nice parallelism in its subsections for each sector (i.e. a paragraph for contribution of the sector, key strategies, mitigation potential, etc) that should be maintained for clarity.
45557	SPM	17	15	20	47	SPM 3.2.1: We propose to introduce a new table to sum up the potential for emission reduction in 2050 for the different sectors. In SPM 3.2.2 – 3.2.4 the emissions and potential for mitigation for each sector is discussed. For energy supply, transport, buildings and industry emissions in 2010 are presented in Gt CO <sub>2</sub> eq, and emissions in 2050 relative to 2010 emissions. For AFOLU figures for emissions in 2010 and 2050 are lacking but emission reduction potentials are given in 2030 for supply-side measures and 2050 for demand-side measures. To present the cross-sectorial picture it would be useful to present the information for each sector in the same format and in a common table. An example of a table is given in a separate document (WGIII SPM proposal for new table in section 3.2). The numbers presented in the table are taken from either SPM or TS. Emission reduction potential in AFOLU is taken from Chapter 11. The Table should be complemented and checked by the authors.
43660	SPM	17		17		Earlier comments in the SPM (page 13, line 28) suggest that overshooting target concentrations will require CDR technologies to be deployed to the extent that global emissions become negative. There is no indication, however, of the feasibility of widespread deployment of CDR despite remarks in this section about barriers to widespread use of one of the key CDR technologies, 'BECCS - BioEnergy with Carbon Capture and Storage'. It would be worthwhile to include a comment in this section on the feasibility of CDR technologies.
44001	SPM	17	2	17	2	"such as in many developing countries". It is suggested to remove this clarification because it is inappropriate.
44296	SPM	17	14			This section re-formatted as energy supply, energy end-use, AFOLU and human settlements compared with structure in AR5. While the section title started sectoral, the sub-title starts with cross-sectoral in SPM, this is not consistent with the structure of AR5. This section lacks information on sectors which must be provided based on underlying chapters and not focus only on energy. Sectors in Table TS.2 should be utilized.
44297	SPM	17	14			This section does not include information on adaptation and mitigation interdependencies on sectoral level as discussed in underlying chapters e.g. 8.5

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
43674	SPM	17				This sub-heading 'Cross-sectoral mitigation pathways and measures' does not reflect well what is actually discussed in the paragraphs following it which seems to be focussed more on specific sectoral approaches. Suggest that the heading is clearer regarding what is in the paragraphs, or the paragraphs are more targeted to align with the heading.
44561	SPM	17	15	19	30	Regarding Section 3.2.1., in the first paragraph - Without new mitigation policies GHG emissions are projected to grow in all sectors - the focus is entirely on CO2. The authors should incorporate a discussion of non-CO2 GHG mitigation policies.
45878	SPM	17	30	17	31	For the reason below, request to remove the bold part and replace it with an other sentence such as "Both integrated modelling and sectoral studies agreed on the opportunities for energy use reduction and fuel switching in energy end use sector though both approaches are different in scopes."  (1) Could not find the corresponding part of the bold part "Systemic and cross-sectoral approaches to mitigation are expected to be more cost-efficient and 30 more effective in cutting emissions than sector-by-sector policies (medium confidence). (2) The bold part seems not to summarize or represent the content following the bold part. (3) The terms such as "sector by sector policy" or "sectoral approach" have the distinct meaning in the UNFCCC negotiations, thus the use of the words should be avoided in order not be confused with "sectoral studies" in general academic sense.
45877	SPM	17	11	17	12	Would like to suggest "coal to liquid" should be rewritten as "derived" based on the body text Ch.6, p.59.
45876	SPM	17	2	17	5	No examples are given in bullet about adverse effects and therefore leaves the policymaker wondering what adverse effects could occur. Perhaps, reference could be made to Box TS.11. If any tables or figures could be referred to as well, would appreciate that they be written out.
45393	SPM	18				It is noted that the SPM does not include any reference in the text to figure SPM.10. It is therefore suggested to delete figure SPM.10.
45566	SPM	18	1	18	11	Figure SPM.10: Please include "ppm" in the legends in both upper and lower rows. The Figure should also be given a short and descriptive title, e.g. "Reduction and share of low carbon fuel in final energy". Please consider removing sectoral studies in the Figure for simplicity.
43675	SPM	18	1	18	11	This figure is particularly difficult to interpret, and the caption provides little clarity.
45197	SPM	18	1			Figure SPM10 interesting, but difficult to tie directly into policy relevant information. Would a simpler percentage change be more useful? With tolerances? This could apply more readily to a country level
45196	SPM	18	1	18	8	This is excellent but care must be taken to avoid implying that behaviour change only applies to developed countries. Behaviour change can also reduce emissions in rapidly developing countries, and those countries with high per capita energy consumption - this should be reflected here
46887	SPM	18	1			The difference of "mitigation scenarios" and "sectoral studies" must be explained to non-experts (top down vs. bottom up), possibly on page 17, lines 37-39 (at least using the same wording for "mitigation scenarios" (caption) and "integrated models" (text). In addition, please enhance readability by deleting the comma after "end-use sectors" in line 3, and set instead "transport, buildings and industry" into brackets.
44822	SPM	18	2	18	2	Should it be a "scenario" after the word "baseline"?
44360	SPM	18	2			The explanation and significance of this graph needs to be clearer.
44890	SPM	18	3	18	7	The term "low-carbon fuels" should be replaced with "low-carbon energy sources", since "fuels" is related to "combustion". "Energy sources" is a broader term, which adequately encompass electricity.
43676	SPM	18	5	18	7	This text could be clarified for readers by including qualification that the carbon intensity of electricity and hydrogen is dependent upon its source. For example, hydrogen is only a low-carbon fuel for transport when produced from a 'low-carbon' source.
44823	SPM	18	5	18	7	It is a bit surprising to see that "Low-carbon fuels include electricity, hydrogen and liquid biofuels in transport, electricity in buildings and electricity, heat, hydrogen and bioenergy in industry." Whether they are low-carbon fuels depends on how and from what the electricity, hydrogen and liquid biofuels have been produced. This should be noted.
44162	SPM	18	6	18	6	Figure SPM.10: Our understanding is that electricity is not low carbon everywhere, it depends on how it is generated. Suggest the authors consider further nuancing this in this figure/caption.
44361	SPM	18	6			Electricity is only a low-carbon fuel if it is from renewable generation. Suggest "renewable" is added before "electricity".
44163	SPM	18	7	18	11	Figure SPM.10 caption: The caption needs to include a description of the row of numbers that appears at the bottom of each panel (presumably indicating the number of scenarios assessed in each case).
43677	SPM	18	8	18	8	The reference to 'whiskers' should be referenced as the 'white area of the histogram' (as no whiskers are drawn in, and presumably the white area of the histogram represents the total range).
44824	SPM	18	8	18	8	Caption of Figure SPM.10; the used graphics do not really have "whiskers". Rephrase?

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47125	SPM	19				As with previous figures, it is difficult to understand. We would there suggest to simplify the data by abstaining from distributional data and give mean values only. Also we suggest to use smoothed lines over time for each of the sectors.
43952	SPM	19				This figure is also rather complex and not easy to read. Please seek ways to develop a simpler illustration.
45314	SPM	19				Should clarify whether this figure relates only to energy emissions. Otherwise why are the non-CO2 GHG emissions so low?
45451	SPM	19	1	19	1	The mention of culture might be avoided here.
45567	SPM	19	1	19	8	We are very happy to see that the importance of behaviour, lifestyle and culture for energy use and GHG emissions is explicitly stated in the SPM.
44164	SPM	19	1	19	1	Is the information in this paragraph based on the scenario analysis? I.e., is it describing possible futures associated with different choices or is it summarizing past experience? It is difficult to understand the evidence based for this paragraph based on how it is worded.
44775	SPM	19	1	19	2	It is stated correctly that changes in consumption patterns can have a potential for reducing GHG emissions. The role of public awareness programs under Article 6 of the Convention should be emphasized.
44999	SPM	19	1	19	8	Behavior, lifestyle and culture are indeed important, but the § is unclear about 'supplementing technological and structural change'; we miss the interaction between behavior, low-carbon options (see adverse lock-in), and budget reform (higher levies on negative externalities). This leaves the message of this § appear general and weak.
46888	SPM	19	1	19	2	Behaviour, lifestyle etc. not only have influence on energy use and "its" emissions, but on GHG emissions in general, therefore the "its" should be replaced by "GHG"
46889	SPM	19	1	19	8	This is very important information.
45313	SPM	19	1	19	3	Limited evidence here refers to changes to date; but not true to say that there is limited evidence that change can (i.e. future tense) impact mitigation.
44760	SPM	19	12	19	12	Write: "... sectors to keep global surface temperature change below 2°C relative to the average from year 1850 to 1900."
45570	SPM	19	13	19	16	We propose to delete ", including public acceptance issues, resulting from, for example, limited availability to achieve negative emissions when combined with bioenergy," in this sentence. Rationale: It is not clear why public acceptance is mentioned specifically here, we believe it would be more appropriate to address this issue in the para from lin 1-8 on page 19 because it is relevant to almost all mitigation options.
44168	SPM	19	13	19	16	This is a long confusing sentence. Suggest splitting into two. First, state that "barriers to decarbonizing the supply side exist, and these include.....". Please revise the existing text about barriers as it is unclear. As written, it seems to say that the barrier is public acceptance of limited CCS availability, which doesn't make sense. The second sentence could then state "Barriers such as these, if not overcome, would require more rapid and pervasive decarbonisation of the energy end-use sectors."
47051	SPM	19	13	19	13	"However, barriers to decarbonising...including public acceptance issues...". It currently reads as though this is simply a matter of communications whereas there are public safety issues and constraints on land availability and water availability (for example) to be considered. Recommend that the text is amended to read: "...public safety and public acceptance issues [7.9.3 and 7.9.4]."
43951	SPM	19	13	19	16	The whole sentence is too long and should be revised. Now it seems to imply that public acceptance issues result from limited availability of CCS to achieve negative emissions when combined with bioenergy although this has probably not been the intention of the authors.
45001	SPM	19	13	19	16	Wording changes are needed for clarification : "Barriers (...) require a more rapid" is strange. A possibility might be something like : "Due to barriers on the supply side (...) a more pervasive decarbonisation of the energy end-use (...) is required".
45202	SPM	19	13	19	15	the argument about public acceptance issues is poorly expressed. They won't result from limited availabilityof CCS. Rather, CCS availability might be limited by public acceptance. However it would be better to give a more important and definite example of a barrier to decarbonising supply. What about competition for land for food production constraining bioenergy?
47052	SPM	19	14	19	14	Perhaps the words 'negative emissions' should be explained/clearly defined.
44568	SPM	19	14	19	14	Change "resulting from" to "resulting in", to correct causality.
44362	SPM	19	14			This is the first use of the acronym CCS. Please also provide an expansion.
45571	SPM	19	16	19	19	We strongly suggest rephrasing this sentence. As it stands, "flexibility for the development of mitigation technologies" seems to be more important than "adverse impacts on sustainable development"! We suggest that one could rephrase e.g. by ending the sentence with "..., however, adverse impacts on sustainable development need to be avoided." "..., thought the need to avoid adverse impacts on sustainable development may limit this flexibility." In addition give chapter references to 11.4 and reference to Table 11.5.

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43679	SPM	19	16	19	19	For clarity, suggest replacing 'ability' with possibility' and 'also provides' with 'can also provide'. These slight amendments would reduce possible misinterpretation of the sentence. Also, in addition to impacts on sustainable development, impacts on availability of land (and water) for food production should also be noted, and the statement should also acknowledge that terrestrial stores can be sensitive to climate change.
44891	SPM	19	16	19	19	Delete from "The ability of storing..." to "...impacts on sustainable development". WG1 states that the ability of storing carbon in terrestrial systems, such as forests, may be limited by climate change (see also comment on section 3.2 as whole), therefore such "flexibility" should not be taken for granted. If the intent here is to refer to CCS, please replace by "geological formations".
45692	SPM	19	16	19	16	The word may be added 'carbon sustainable technology' after the word 'of'.
45694	SPM	19	16	19	19	It seems incorrect to state that storing carbon in terrestrial systems may have adverse impacts on sustainable developments, since most evidence suggest that afforestation and deforestation and increasing soil organic carbon in agriculture soils promotes sustainable development- increased crop yields, increased employment, reduced pressure on natural forests, etc.
45203	SPM	19	16	19	19	"the ability" is described as "very uncertain" in 6.9.1 but it is presented here as a reality. Say instead "the very uncertain ability to store carbon at a significant scale in terrestrial systems may provide an additional means to help reach concentration targets" and retain the phrase about sustainable development.
44169	SPM	19	17	19	17	What does 'storing carbon in terrestrial systems' mean here and how does it provide flexibility to the development of mitigation technologies? Is this referring to biochar, reforestation or something else? Could this be made more specific?
44826	SPM	19	17	19	17	Any particular reason why you say "storing carbon in terrestrial systems" rather than just CCS or geological storage?
45693	SPM	19	17	19	17	The word 'storing carbon' may be deleted.
44569	SPM	19	17	19	17	The authors should strike "terrestrial" and replace it with "natural". The role of the oceans in absorbing carbon deserves at least an implicit mention through this revision.
46892	SPM	19	17	19	17	What is meant by "storing carbon in terrestrial systems"? (1) Please re-phrase: "storing carbon in terrestrial systems" into "storing carbon in terrestrial ecosystems" (2) In addition: Chapter 11.3, which is given as a reference here, discusses comprehensively the issue of permanence/non-permanence. We'd prefer to reflect this important issue here explicitly.
45452	SPM	19	19	19	19	Avoid the term 'sustainable development', better to be precise (is it about food availability, fertiliser use, loss of biodiversity, ...). The sentence is unclear : what kind of opposition is meant between storing carbon and sustainable development ? It needs to be more explicit.
44170	SPM	19	19	19	19	Suggest explaining how these adverse impacts might come about (we assume because of possible impacts on the development and adoption of renewables, but perhaps the authors have something else in mind).
45002	SPM	19	19	19	19	Could "Sustainable development" be replaced by "the environment" in this sentence?
45572	SPM	19	20	19	29	Figure SPM.11: This figure is difficult to read and understand. For readability, please consider removing the grey dots representing individual model findings. Please consider to change labels so that it communicates that the "Non-CO2 GHG" sector comprises Agriculture. For consistency, it would be useful to include "ppm" before "CO2eq" in both panel titles. See also comment to subchapter 3.2, and our proposal for a new figure summarizing emission reduction potential for each sector. If the new figure is introduced, please consider if this figure SPM.11 is necessary.
44171	SPM	19	21			The y-axis label on this figure is incomplete. 'Fraction of 2010 level' of what? Emissions?
44172	SPM	19	21			How can electricity generation have negative emissions? Is this biomass burning with CCS? While technologies for achievement of negative emissions are discussed in the text, the Figures need to be self-sufficient and so a footnote is required here to explain this.
44173	SPM	19	21			Why don't emissions of non-CO2 GHGs decrease in these scenarios? Is this because it is hard to limit N2O emissions, or does this reflect some peculiarity of the way these scenarios were constructed? It would be useful to include some comment on the role of non-CO2 GHGs in mitigation policies somewhere in the SPM.
46893	SPM	19	21			1) Please provide additional information on the "non-CO2 GHG"-sector as this expression is not self-explaining. 2) The vertical axis should say, what is shown ("direct emissions in [fraction of 2010 level]"), and percentage instead of fraction would be simpler. 3) The vertical axis should have 1.5 as a maximum, differences between 0 and 1 are difficult to see.
46894	SPM	19	21			The meaning of "default technology assumptions" is unclear in this context. Please explain.
46895	SPM	19	21			Check consistency of "FOLU" label, as it states "Land-use" in the original graph in chapter 6.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44570	SPM	19	22	19	29	Figure SPM.11: This graph is very difficult to follow. The authors should delete it or simplify the figure. If retained, the authors need to provide a better explanation of the difference between "default technology assumptions" and "no CCS". Also, does this plot include agriculture anywhere? If it's in "FOLU", then it should be changed to read "AFOLU".
46896	SPM	19	22	19	29	Please add to the caption the text from Figure 6.35. "Note that values below the dashed black zero line indicate negative sectoral emissions."
44363	SPM	19	22			The explanation and significance of this graph needs to be clearer.
44409	SPM	19	24	19	24	In the Figure SPM.11. legend, we would suggest inserting: "Note that values below the dashed black zero line indicate negative emissions." It will be helpful to quickly understand and interpret the figure as it has been done in the Figure TS.17.
44165	SPM	19	3	19	8	This paragraph is composed of one very long sentence. Suggest splitting into two. Also suggest avoiding technical jargon such as "mobility demand" and "sharing economy" as the meaning of these terms is unclear.
47050	SPM	19	3	19	8	"Emissions can be substantially lowered ... changes affecting activity)." The groupings of items and sub-items listed in this sentence are confusing (e.g. dietary change can be included in the category of "changes in consumption patterns"). Reordering would be welcome. Also, there is no scientific basis for focussing on the most developed countries concerning stabilizing/lowering consumption. If equity is brought into this, then (i) the text should pick on most wealthy individuals/households irrespective of which country they live in, rather than on particular countries based on average individual income; and (ii) the text should also point to the need to decouple lifestyle enhancements from the growth in emissions related to consumption patterns in emerging middle classes.
45198	SPM	19	3	19	3	why is this "limited evidence, medium agreement"? It sounds very obvious and there is a similar statement on page 21 lines 14-17 which has "robust evidence"
44166	SPM	19	4	19	7	It is not clear how the first example in this statement on line 6 ("stabilizing/lowering consumption in some of the most developed countries") is different from the first item on line 4 about "changing consumption patterns". Suggest clarifying further. Also, what is meant by "sharing economy and other behavioural changes affecting activity"
45947	SPM	19	4	19	4	the text "energy use in households" in its current form suggests that ALL energy use is subject to behaviour, which may only be partly true e.g. with respect to heating. I suggest to say "various elements of energy use in households".
43950	SPM	19	4			The mode of mobility has also impact on the emissions. Please, add the words "and mode" after the words "mobility demand".
44825	SPM	19	6	19	6	What does "sharing economy" mean? Car pools?
45948	SPM	19	6			stabilizing/lowering consumption in some of the most developed countries ~ halting/lowering UNSUSTAINABLE consumption – (i) the "consumption" is a very broad term and generally, the "unsustainable" consumption is addressed in the sci. literature and pol. papers; (ii) obviously, unsust. cons. exists not only in some social groups within some of the most developed countries
45949	SPM	19	6			sharing economy ~ WIDER APPLICATION OF THE sharing economy concept
45199	SPM	19	6			what is "sharing economy"?
45568	SPM	19	8	19	9	Please consider adding the paragraph (or parts of it) on spatial planning from the TS, p. 40 l. 22-31. between line 8 and 9. Spatial planning is a cross-sectoral measure with huge implications for e.g. transport, energy use, biodiversity, food security, carbon storage etc. Successful mitigation and adaptation to a large degree depend on spatial planning. It is also immensely relevant for policy makers. Therefore it merits its own paragraph in the SPM.
45569	SPM	19	9	19	10	We believe this paragraph is not clear regarding which mitigation options are included. It would be more useful if it is focused on the realistic decarbonisation options instead of CDR. Please consider to rephrase the bold sentence to read: "The implementation rate of carbon capture and storage technologies and carbon storage in terrestrial systems determines the mitigation challenge for energy supply and end-use sectors." Rationale: It is better to be more explicit because "carbon dioxide removal" is a very wide term and does not include for instance CCS, also CDR does not separate between removals that requires specific technologies and storing carbon in terrestrial systems. We also believe that this conclusion is valid for both the energy supply sector and the end-use sectors.
44167	SPM	19	9	19	10	If the CDR technologies being referred to here are in the energy supply sector, then suggest this be specified (e.g., revise sentence to say "The availability of CO2 removal technologies in the energy supply sector determines the mitigation challenge for the energy end-use sectors."
47124	SPM	19	9	19	10	We think bolded section is not aptly worded and we suggest to revise it to: "The volume of CO2 that will be stored, determines the amount of fossils fuel that can be used in any given temperature limit".
45394	SPM	19	9	19	10	The first sentence (in bold!) gives the wrong impression that the availability of carbon dioxide removal technologies alone determines the mitigation challenge.



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45395	SPM	19	9	19	19	The whole paragraph gives the impression that deployment of CCS is mainly limited by limited public acceptance. However, factors such as high costs, difficulties in guaranteeing long-term storage and associated liability issues are other relevant issues. It is suggested to include a more general consideration if deployment of certain key technologies is limited by other factors (risks) than costs. There seems to be a similar case for nuclear energy, or limitations for solar and hydro due to limitations in electricity networks etc. More relevant than the flexibility for sectors seem to be the overall costs as well as the overall impacts on sustainable development. It is therefore suggested to rewrite the paragraph and amend/delete figure SPM.11.
43678	SPM	19	9	19	19	What this paragraph is saying is that if carbon capture and storage doesn't realise the anticipated (modelled) level of mitigation, the land sector will need to provide the abatement instead. Figure SPM11 illustrates this, but the text doesn't fully capture the policy consequences. This should be spelt out more clearly as it's important for policymakers to understand i.e. an explicit statement about the risk of making assumptions about CCS uptake on policy decisions. Also, there seems to be an assumption that the starting point should be technological change, not land use change.
45691	SPM	19	9	19	13	Kindly clarify if decarbonization is more important and easily achievable compared to end use efficiency improvements - a contrary perspective seems to be presented here.
44566	SPM	19	9	19	19	This bullet is misleading. It should be constrained by a range of CO2 concentrations, or scenarios and the authors should recognize that they are extracting information from models that by default show that CCS is important. The models, for example, don't explore rapid conversion to renewables and nuclear, in combination with reforestation, combined with ag improvements, high protein vegetarian diets, etc. A caveated statement of the value/importance of CCS would be more appropriate.
44567	SPM	19	9	19	19	Headline (l. 9-10) highlights "carbon dioxide removal technologies", but ensuing text addresses only bio-CCS. Consider also mentioning other CDR technologies.
45000	SPM	19	9	19	9	We suggest to replace 'determines' by 'influences' because other parameters determine the challenge for the end user.
45200	SPM	19	9	19	10	This headline is misleading. It implies CDR is the priority activity and mitigation is secondary, which surely isn't the main message of the paragraph. Suggest remove this sentence and replace with next sentence reworded to read "There are trade-offs between the rate of decarbonisation of energy supply and measures taken in energy end-use sectors."
45201	SPM	19	9	19	20	As referred to previously, given the extensive references to carbon dioxide removal throughout the SPM, it is essential that the limitations of this technology, and the uncertainty over its availability and scale, are clearly set out in the SPM. This issue is of such critical significance to the messages in the SPM that it deserves to be highlighted in a 'call out' box or similar
46890	SPM	19	9	19	19	Why is this not phrased the other way around: "The reductions in energy demand in the end-use sectors and the integration of renewable energies into the power supply system determine the need for carbon dioxide removal technologies." Rationale: Since the supply side is only a result of the demand for energy, this phrasing seems more appropriate. The message is: If we do not manage to reduce energy consumption considerably, then we will need to employ CCS and CDR technologies, which might have adverse impacts on sustainable development.
46891	SPM	19	9	19	19	Here the wrong impression is given that CDR defines mainly (or even only) CCS combined with bioenergy. In fact CDR covers a much wider set of approaches and technologies (e. g., ocean fertilization) that differ greatly from CCS and bioenergy. Moreover it should be mentioned that CDR technologies are still characterized by a high degree of uncertainty both for chances and risks. It is not only "barriers" but significant risks and questions related to the technological feasibility of CCS (TS, page 47, lines 26-39) and CDR (TS, page 32, lines 1-20). Please add these aspects to the text. (See also our general comment on CDR above.) In addition, please use the abbreviation "CDR", it is first used on page 13.
45884	SPM	19				Request to include not only 430ppm-530ppm but also assessment of the range 530ppm-580ppm where the probability of staying below 2.5 degrees is more than 50% in order to give policy makers wider options to compare.
45879	SPM	19	1	19	5	Appreciate if more detailed information on how behaviour, life style, culture influence on energy use and its emissions is provided.
45880	SPM	19	1	19	5	In using the wordings such as "high mitigation potential" numerical evidence have to be added so that readers could clearly understand such mitigation potentials.
45883	SPM	19	23	19	23	Appreciate if the content of "default technology assumptions" is provided. Also request to add explanatory text about the assumed technological condition in 2100 in this assessment.
45881	SPM	19	6	19	6	Appreciate if the specific examples or definition of the most developed countries is provided.

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45882	SPM	19	9	19	11	This part is misleading in that CDR is described as if it were the only technology to realize decarbonization. In this regard, this part should be replaced by the following sentences supplementing words in brackets in accordance with Chapter 7 Page 64;  "Non-biomass renewables, nuclear, as well as the availability of carbon dioxide removal technologies determine the mitigation challenges for the energy end-use sectors. However, when barriers to decarbonizing the supply side, including public acceptance issues, resulting from, for example, limited availability of CCS to achieve negative emissions when combined with bioenergy are high, a more rapid and pervasive decarbonisation of the energy-end use sectors would be required in achieving low CO <sub>2</sub> -eq concentration levels. "
47126	SPM	20				We think a statement on necessary improvements in access to energy is merited. For billions of people access to energy is one crucial condition for the improvement of livelihoods. Dependend on the specific circumstances, over time different options are best suited to realise access to energy, such as solar energy and enhance traditional biomass, in isolated rural areas, or gas with CCS, and concentrated solar power in urban area's.
45574	SPM	20	1	20	47	SPM.3.2.2: We think that some of the most common/promising renewable energy sources (for example wind, hydro and solar) should be described e.g. by including a separate paragraph in this section.
45695	SPM	20	1		47	very well written.
43953	SPM	20	1	20	3	Please split the first sentence into two: The energy supply sector is the largest contributor to global GHG emissions. The key drivers for this are the increasing demand....
45204	SPM	20	1	20	8	The impact of this paragraph would be significantly increased if the headline and first line were exchanged. i.e. the headline should read GHG emissions from the energy sector are projected to double or even triple by 2050 in the absence of climate action
45396	SPM	20	10	20	10	It is suggested to insert "mitigation" before "scenarios" in order to enhance clarity.
45700	SPM	20	10	20	10	the word 'mitigation' may be deleted.
45701	SPM	20	10	20	10	the line 'in achieving low CO <sub>2</sub> concentration stabilization level' may be added after strategies.
44303	SPM	20	11	20	11	This statement needs to list the three mentioned sectors in the correct order according to the size of their potential for mitigation as per chapter 6.8
45453	SPM	20	12	20	12	Which is Figure SPM3.11 ?
44575	SPM	20	12	20	14	The text is about projected electricity decarbonization pathways involving a near-term transition from coal to natural gas. The authors could note that this very transition is substantially underway in the U.S. - an instance where reality compellingly validates the modeling result.
45206	SPM	20	12	20	14	This doesn't make sense. What is replacing the coal that has seen a 'rapid reduction'? There is no mention of renewables or nuclear here, or the construction of CCS plant. What is 'near term'?
43750	SPM	20	12	20	14	This statement holds that the rapid decarbonization of electricity generation is realized by replacing coal-fired power plants with natural gas-fired ones that lack CCS facilities; however, this statement is inconsistent with descriptions in the underlying report (Ch6, P80, L20-22): "Virtually all integrated modeling studies indicate that the decarbonization of electricity is critical for mitigation, but there is no general consensus regarding the precise low-carbon technologies that might support this decarbonization." It is suggested to replace the statement with the following text: "however, the decarbonization of electricity generation could be resolved by different technical options depending on various factors, including regional circumstances, including both energy resources and links to other regional objectives (e.g. national security, local air pollution, energy security). [6.8.3]"
43955	SPM	20	14	20	14	Please consider adding from background material text that deals with longer term issues, including possible lock-in effects regarding natural gas without CCS.
44576	SPM	20	14	20	14	Text specifies that, in the near term, natural gas will deploy "without CCS". This is true with and without CCS, and is not particularly limited at this point. The authos should delete the words "limited" and "without CCS over the near-term."
44304	SPM	20	15	20	22	This statement lacks definition of RE and the RE adverse side-effects contained in chapter 7

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44714	SPM	20	15	20	22	It is mentioned that RE technologies have substantially advanced in terms of performance and cost. Examples of specific technologies would be appreciated; photovoltaic technologies and wind turbines (cf. chapter 7.5.3). Furthermore, the following findings/facts could be included in the SPM: - Only a small fraction of the RE technical potential has been tapped so far (cf. chapter 7.5.3) - In 2012, RE provided almost 21% of global electricity supply and accounted for just over half of the new electricity-generating capacity added globally, led by growth in wind, hydro and solar power (cf. chapter 7.5.3) - While there is no single dominant RE technology that is likely to be deployed at a global level, bioenergy, wind, and solar may experience the largest incremental growth (cf. chapter 7.5.3)
44729	SPM	20	15	20	22	A further key messages on RE from the TS 3.2.2 should be reflected: "The use of RE is often associated with co-benefits, including the reduction of air and water pollution, local employment opportunities, few severe accidents compared to some other energy supply technologies, as well as improved energy access and security."
44732	SPM	20	15	20	22	Expectations for the future potential for RE technologies (technical and economically) in addressing climate change would be important information, and also estimates of the increase in RE required (in e.g. 2020, 2030 and 2050) according to the cost-effective pathways for stabilizing the concentration of GHG in the atmosphere at 430-480 ppm. The following key message from SRREN, also included in [7.4.2], should be reflected "[IPCC SRREN] concludes that the aggregated global technical potential for RE as a whole is significantly higher than global energy demands".
44761	SPM	20	15	20	22	Why is there no information presented on how cost estimates evolved since AR4? Reference could also be made to Paltsev et al (2009): "The cost of Climate Policy in the United States", MIT Joint Programme on the Science and Policy of Global Change Report 173, April 2009, which discusses changes in the estimates of key parameters over time.
44577	SPM	20	15	20	22	Is market share annual or total? The implication is total. Please clarify the text.
45207	SPM	20	15	20	22	The overall statement is positive but is not supported by the detail. The detail largely dampens the original statement, whereas I would have thought some expansion on the positive aspects would be beneficial.
46901	SPM	20	15	20	17	This statement would benefit if it was made in two sentences.
45318	SPM	20	15	20	22	This paragraph should mention that in some regions, some renewable energy technologies are reaching grid-parity - or have reached a cost that is competitive with conventional energy supplies, irrespective of mitigation policies.
45702	SPM	20	17	20	17	the line 'to enable deployment significant level,' may be added after the word 'maturity'.
45703	SPM	20	17	20	17	the word 'sector with cobenefit' may be added after the word 'supply'.
44174	SPM	20	18	20	20	Suggest avoiding the use of highly technical terms such as "internalization of externalities". Suggest also clarifying whether "support" is the correct term for factors such as "carbon pricing" or "internalization of externalities" as this could be misunderstood.
45704	SPM	20	18	20	18	the line 'economically competitive with cost effectiveness of RE technology accounted for half of the electric supply with a growth in wind, hydro and solar power' may be added before the word 'Nevertheless'.
45576	SPM	20	19	20	19	Removal of subsidies of fossil fuels should also be mentioned in this context. Please consider to include "removal of fossile fuel sudsidies" after "high carbon prices".
45006	SPM	20	19	20	20	Sufficiently high carbon prices and the internalization of other externalities is described as "indirect support" for RE. We do not understand this conclusion : given the dominant position of general equilibrium thinking in this SPM, an economy with internalized externalities is the reference (minimum welfare losses). In this framework, internalization is a "switch" that reveals the economic reality that RE are least cost compared to risky and dirty energy sources like nuclear and fossil fuels (given the catastrophic climate and other risks, the applied prices of nuclear and fossil energy are significantly below their real economic costs). Could you consider referring to externalities in a different way, or explaining what is meant by "support" ?
44302	SPM	20	2	20	3	The statement "Largest contributor of GHG emissions" is biased towards fossil-fuel as no comparison is made for example with AFOLU. Also, There is no clear reference year to this conclusion.
45696	SPM	20	2	20	2	the line '1.7%per year from 1991-2000 to 3.1% per year during 2001-2010 (robust evidence, high agreement)' may be added after the word 'emissions'.
44572	SPM	20	2	20	8	Does the bold language refer to baseline or all scenarios? And the text should be clarified with some of the caveats we highlight in the following comments.
46897	SPM	20	2	20	8	The energy supply sector's emissions can also be reduced by reducing carbon-intensity, i.e. increasing the share of REs. Please add in lines 6/7 "... unless energy and carbon intensity improvements..."

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45317	SPM	20	2	20	4	This sentence is an important piece of information for policy makers.
44175	SPM	20	20	20	21	Suggest providing an example of the type of additional enabling policy that would be required.
45705	SPM	20	20			In context of renewable energy, after the word " increased" in line 20 the following line may be added : The ability of consumers to pay for higher cost renewable energy continues to be a barrier.
45007	SPM	20	20	20	21	"Additional enabling policies are needed to address their (RE) integration into future energy systems." This statement seems biased: when we observe the growing evidence that fossil fuel (and some alternative) systems are risky and dirty and therefore the most costly when the full costs are considered, and we have to get rid of such systems, the proper perspective is that the RE systems take over fully and that the expenses of this transition are charged on the polluting and risky systems (according the polluter pays principle). This perspective is significantly different from the soft "enabling policies"; it is absent from the assessment of the IPCC?
45706	SPM	20	21	20	21	'Integration into future energy systems' may be changed to 'integration with existing and future energy systems'.
45707	SPM	20	23	20	28	is there evidence on the share of nuclear from now upto 2030 or 2050 under baseline. If evidence exists similar to energy supply, industry,etc please provide the role of nuclear energy in global energy supply scenarios under the baseline.
44578	SPM	20	23	20	28	There is no mention of post-Fukushima policy revisions in many countries - a significant development since AR4. The authors should consider including this perspective since it is influencing energy policy in many places around the world.
45008	SPM	20	23	20	28	We suggest to add the information that the unit costs [of nuclear energy] are systematically increasing (Grübler, A., Energy Policy 2010; 38:5174-88). The language stating that "concerns about risks" are barriers does not appear neutral. The real barriers are the real risks: please rephrase. There is also literature that shows that nuclear power and RE supplies cannot match, but are opponents (Verbruggen, A., Energy Policy 2008; 36:4036-47); it means the two options cannot be juxtaposed. Due to its characteristics, nuclear power should be distinguished from renewable energy sources when talking about low carbon technologies. We think that this should be taken into account, because it is important for the design of mitigation policies.
45208	SPM	20	23	20	28	Do the barriers to widespread deployment of nuclear power not include cost?
46905	SPM	20	23	20	28	(This is a high priority comment of Germany) This paragraph on nuclear energy is important. Please make the following changes: - Referring to "risks" as "barriers" is not balanced. Please exchange "Barriers to an increasing use of..." with "Risks related to the use of...". - Please mention all risks/barriers to an increasing use of nuclear energy. If possible, please add "permanent disposal of high-level waste" as one barrier/risk. The permanent disposal is referred to in the SOD Ch7, page 27 (last paragraph). "Waste management security" does not reflect the challenges associated with the permanent disposal of high-level waste. - The environmental and social problems of uranium mining should be mentioned as well (see Table TS.3; Chapter 7). - Please improve the sentence "New fuel cycles and reactor technologies addressing some of these issues are under development". Many of these technologies will not be available in the foreseeable future. Chapter 7 takes this fact into account by stating more carefully that these "are under investigation" in contrast to the SPM which states "under development". Please use the wording from the underlying chapter (e.g. page 24, lines 39/40 and page 25, lines 36/37).
43751	SPM	20	23	20	28	This statement lacks objective descriptions on the mitigation effects and potentials of nuclear power. In the underlying report, nuclear power is referred to as an important mitigation technology "With low levels of life-cycle GHG emissions nuclear power contributes to emissions reduction today and potentially in the future." (Ch7, P25, L30-31), whose mitigation potentials are elaborated from different aspects, e.g., the sufficiency of material resources (Ch7, P17, L36-38), driving factors of development (Ch7, P62, L23-26), evolution of nuclear reactor technologies (Ch7, P23, L30-35), and policy stimulus (Ch7, P25, L25-26). It is recommended to add the following sentence at the end of the paragraph: ", which makes nuclear energy remain an option for future GHG emission reduction".
45577	SPM	20	24	20	24	Please consider to replace "an increasing" with "the". You may also consider to address that many nuclear power stations is located in low-laying areas near the coast or rivers that may require additional precautions related to sea-level rise and flooding.
45708	SPM	20	24	20	24	the word 'since 1993' may be put within the bracket.
45709	SPM	20	26	20	26	the word ' waste management security' may be replaced by the word ' unresolved waste management issues'.
44176	SPM	20	27		28	Is it possible to add here some additional information about when these new technologies are expected to come online, and what impact they might have?
47053	SPM	20	27	20	28	The text could read: "New fuel cycles and reactor technologies addressing some of these issues are under development AND DEPLOYMENT." Third generation reactors are already commissioned, e.g. in Finland and France as pointed out in Chapter 7, page 39, lines 42-44.

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45009	SPM	20	27	20	28	An estimation of when these technologies could be available would be useful.
45710	SPM	20	28	20	28	the line' and progress has been made concerning safety and waste disposal' may be added the word 'development'.
45578	SPM	20	29	20	32	Please consider to reorder the sentence so that it starts with its main message. This will increase the readability, e.g by rephrasing: "Near-term GHG emissions from energy supply can be reduced by replacing coal-fired power plants with highly ..... and power (CHP) plants; where natural gas can be made available and fugitive emissions associated with its extraction and supply are low.". It may be useful to qualify what is meant by "near-term" in this context. 2030? 2040? Models showing stringent mitigation scenarios illustrate the role of natural gas as a bridge technology and a reference to such modelling results would be useful.
44178	SPM	20	29		30	Suggest adding "by half" after "GHG emissions from energy supply can be reduced by". This emphasizes the important role that NG/NGCC can play, and is supported by the underlying report in section 7.5.1.
44177	SPM	20	29	20	32	The acronyms defined here are not used anywhere else in the SPM, so it would appear that there is no need to define them. As a general rule, it would be best to avoid acronyms except those that are used frequently throughout the document.
47127	SPM	20	29	20	34	Given the rapid development of shale gas exploration, we think it needs a statement. This would emphasise that some studies show extensive fugitive emissions (of around 10%), and stress that this implies that the GHG intensity would at least be twice that of coal.
44383	SPM	20	29	20	34	Proportion of natural gas power generation would highly depends upon load balancing services to meet peak demand. Currently, this is mostly accomplished through the dispatch of natural gas turbines to respond to rapid changes in supply or demand for electricity. Load balancing with natural gas produces significant emissions. If electric generation is predominantly intermittent renewable power, using natural gas to firm the power would likely result in greenhouse gas emissions that would alone exceed current level.(quoted statements from "California's Energy Future - The View to 2050")
44579	SPM	20	29	20	34	Consider adding text - reflecting Chapter 7 headlines - on opportunities to mitigate and/or redirect fugitive emissions from natural gas exploitation. Chapter 7 not only covers options for capturing and re-deploying such emissions, but further makes the case for captured gas to drive clean development in, e.g., Nigeria (p. 47, l. 31-35).
45209	SPM	20	29	20	34	Needs to be moved to follow directly on from 9-14. Again near-term needs explaining, as detailed here it suggests this is prior to 2050 as there would be fewer power plants than currently. How is this different from short-term which is mentioned elsewhere. Consistency is needed, or some sort of global definition.
45003	SPM	20	3	20	3	"a growing share of coal": this is true during the last years because of some large industrializing countries using coal power, and because carbon pricing policy is failing in most industrialized countries, but the sentence gives the impression that it is a "fatal destiny" - this does not seems appropriate, please check.
44179	SPM	20	32			Does "most stringent" mean the majority of stringent scenarios, or the scenarios which are the most stringent?
45397	SPM	20	32	20	32	It is suggested to insert "of the" before "stringent" in order to enhance clarity (the current language is ambiguous).
45010	SPM	20	32	20	34	The message from this sentence does not appear clearly: could you clarify ? (is the message that, in spite of its lower emissions, this technology must be phase-out relatively quickly to reach low emission scenarios ?)
44580	SPM	20	35	20	43	This bullet might also recognize the trade offs: lower efficiency/higher fuel burn (parasitic losses) and increased water consumption. These issues could be added to the sentence on lines 41-43.
44581	SPM	20	35	20	43	The text underplays recent advances (also a Chapter 7, pp. 25-27, omission): At least two large-scale North American projects will, within 2014, apply CCS to "a large, commercial fossil fuel power generation facility" - the Kemper County IGCC Project, Mississippi, USA (582 MW coal unit, capturing 3.5 MtCO <sub>2</sub> /yr) and the Boundary Dam Integrated Project, Saskatchewan, Canada (110 MW coal unit, capturing up to 1 MtCO <sub>2</sub> /yr). Per the Global CCS Institute, another 63 power sector projects are in pre-operational stages. Lines 36-38 should be re-written to read "... and are in use, including several large-scale commercial power and industrial applications. CCS power plants..."
45011	SPM	20	35	20	43	We would like to have clearer messages in this paragraph. Line 35 appears unclear: "could reduce": in which conditions? As a policy maker the basic question is: what can be the real contribution of CCS to mitigation? Does it pay off in carbon emissions to attempt this CCS on coal fired power plants? Is CCS meaningful compared to a fast development and deployment of RE? Clarity is also needed regarding the concerns mentioned in line 41: are these legitimate concerns, about real risks? If the risks are real, then the barriers are not the concerns about the risks, but the risks themselves.
46908	SPM	20	35			Abbreviation CCS is already introduced in page 13, line 36. Inconsistent to give the explanation later on page 20.

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43752	SPM	20	36	20	38	(1) The assessment of the performance of CCS technology is too optimistic in this paragraph. As a matter of fact, there are still many technical deficiencies and limitations in CCS. Thus, it is suggested to add relevant descriptions about technical limitations. (2) This section fails to reflect the conclusions in the Assessment Report accurately. It is suggested to replace "all of the components of integrated CCS systems exist and are in use today" with "all of the components of integrated CCS systems exist and are in use today by the hydrocarbon exploration, production and transport; and petrochemical refining sectors." (Ch7, P25, L42-43)
45951	SPM	20	37			exist and are in use ~ exist and are already in use TO A LIMITED EXTENT ((for sake of unambiguity))
45711	SPM	20	37	20	37	the word ' although' may be used in place of the word 'but'.
45454	SPM	20	38		39	with a price on CO2 emissions CCS fitted plants will not need compensation: their unabated competitors will face a higher operational cost due to their CO2 emissions: "... their unabated counterparts if the latter pay a high enough price for their CO2 emissions".
45398	SPM	20	38	20	43	The current text is not coherent: the sentence starting with CCS power plants will only become competitive ... has the message that CCS power plants will be deployed at large scale under a framework that reduces the costs for the operators. However, the following sentence identifies additional barriers that would need to be overcome. The solution would be to identify in one sentence the main barriers and to inform in another sentence about the likelihood to overcome those barriers. With respect to costs the issue is: what are the most cost efficient solutions for decarbonization of energy supply? The overall message probably will have to be that the prospects of CCS in the energy supply sector are not very good due to significant barriers. There might be more promising niche markets in other (industrial sectors) where less competitive technologies exist compared to the energy supply sector.
45952	SPM	20	38			become competitive ~ become FINANCIALLY competitive ((it is one barrier/condition, other barriers are mentioned in the last sentence ...))
45697	SPM	20	4	20	4	The word 'its' may be replaced by word 'GHG'.
45698	SPM	20	4	20	4	The bracket word 'robust evidence, high agreement' may be deleted.
45712	SPM	20	43	20	43	In bracket 'limited evidence, medium agreement' may be added after the word 'risk'.
44180	SPM	20	44	20	45	The acronym defined here is used in only one other place in the SPM (page 23, line 43). Readers will have forgotten the definition by the time they get there, so it would be best not to define the acronym and simply spell out "bioenergy CCS" in the places where this term is needed. As a general rule, it would be best to avoid acronyms except those that are used frequently throughout the document.
44181	SPM	20	44	20	47	Suggest adding a couple of lines to this paragraph to explain the 'medium agreement' for the bolded sentence. Does this medium agreement imply that some studies show achievement of net negative emissions is not possible even with BECCS? The importance of the availability of negative emissions technologies and achievement of negative emissions to the mitigation challenge has been emphasized earlier in the SPM; what is needed here is some understanding of what this means in terms of the scale of implementation.
45399	SPM	20	44	20	47	It would be relevant for policy makers to learn about the potential of other technologies than BECCS to result in negative GHG emissions. Do those alternatives have less technological challenges and risks? What is their technical potential? The status of development? What efforts would be needed to prepare the ground for such technologies?
47054	SPM	20	44	20	47	Please ensure consistency of the messages concerning BECCS in section 3.2.11 and section 3.2.3. In our view it would be good to include a reference in section 3.2.1. to the "scientific uncertainty" concerning potential, costs and risks of BECCS (section 3.2.3. only covered energy end-use sectors). Also, what does "limited evidence, medium agreement" related to? The fact that BECCS could result in net removal or that it is a net removal?
43954	SPM	20	44	20	47	It would be relevant for policy makers to mention something about the role of BECCS in mitigation scenarios in the text e.g. by adding the following sentence after the bolded text "BECCS features prominently in long-run mitigation scenarios (6.3.2 and 6.3.5)". From Chapter 11 page 82.
44582	SPM	20	44	20	47	This bullet could include some mention of the economics, land use and water implications, or discuss alternative biomass resources (where available) that address some of the other key issues of sustainable development.
45012	SPM	20	44	20	47	As it currently is, we wonder if this paragraph has added value to inform a policy-maker audience. The wording "challenges associated with" seems unclear - could you rephrase? How severe are those "challenge and risks"? What do we know about the potential for large-scale application? How could policymakers decide whether the possibility of net negative emissions (with BECCS or any other technology) can be taken into account or not? Should it be regarded as very risky, when compared to other options?

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46912	SPM	20	44	20	47	The underlying report clearly addresses the risks associated with large scale bioenergy deployment. This is missing in the SPM. Please add the sentence from the Executive Summary of chapter 11, page 6, lines 41-44: "Any large-scale change in land use, for biomass for energy, or for sequestration in vegetation, will likely increase the competition for land, water, and other resources, and conflicts may arise with important sustainability objectives such as food security, soil and water conservation, and the protection of terrestrial and aquatic biodiversity [...medium evidence; medium agreement]."
43753	SPM	20	44	20	47	BECCS (Combining bioenergy and CCS) is a kind of CCS technologies that bears great uncertainties for future development, including its early stage of development (Ch7, P27, L25-27), potential technical barriers and adverse side-effects related to the biomass feedstock usage (Ch7, P62, L23-26). It is recommended to integrate BECCS as part of the discussions on CCS, instead of discussing it in a separate paragraph.
45579	SPM	20	45	20	47	This sentence would be more useful if in addition possible solutions also are described e.g. By including a sentence like "Effective land-use planning and sustainability criteria therefore need to be integrated to large-scale projects." in the end of the para. (slightly edited from 11.13.7 page 100 line 28-29)
44893	SPM	20	45	20	47	The sentence that begins on line 45 should read "Technological challenges of BECCS are associated with the capture, transport and long-term geological storage of CO2". The controversy on the issue relies on matters related to the risks. There are no challenges or risks related to biomass feedstock. In fact, there are advantages to the simple use of bioenergy to implement carbon dioxide removal, such as in the production of biofuels through industrial distillation processes.
45953	SPM	20	47			there are also some barriers to the use of bioenergy (see also this draft SPM page 23 from line 38 especially the 2nd para from line 45 for indications on such barriers; and also better coherence of these two text pieces on bioenergy would be useful)
44573	SPM	20	5	20	6	It seems awfully low to state 14.4 Gt CO2/yr when energy CO2 is currently 65% of the annual ~50 Gt CO2e in global emissions highlighted earlier in the report. Can the authors explain the almost 100% difference? Is this only the power sector? If this is meant to reflect electricity supply only, the text should be re-written to reflect this (including the header on 3.2.2).
45004	SPM	20	5	20	6	The wording may suggest that significant energy improvements are improbable - please check and try rewriting.
45950	SPM	20	6	20	7	unless energy intensity improvements ~ unless energy intensity DECLINE ((for sake of unambiguity))
44574	SPM	20	6	20	7	The text calls for lower "energy intensity", but misses emissions intensity - more directly critical to decoupling emissions and economic growth. For comparison, Chapter 7 has increased its use of GHG intensity as a key metric, e.g. in comparing supply technologies (e.g., Fig. 7.7, p. 38) as well as regional trends (p. 14 text).
46898	SPM	20	6	20	7	The sub-sentence "unless energy intensity improvements can be significantly accelerated beyond the historical development" implies that energy intensity improvements are the only way to reduce energy consumption. The possibility to reduce activity is ignored. Please rephrase.
45575	SPM	20	9	20	11	Please consider to improve language and readability by starting the sentence with "Decarbonising electricity generation .....", and move the text about integrated modelling studies to after "in most scenarios from integrated modelling studies, it happens ....."
45699	SPM	20	9	20	11	Surprising that decarbonizing electricity is easier and cheaper than say energy efficiency improvements in buildings?
45005	SPM	20	9	20	14	"modelling studies" with "scenarios" seems to prevail over reality rooted studies. The lines 12-14 describes decarbonization as closure of conventional coal + the addition of some gas, without the focus on alternatives. The period to which that sentence applies should be mentioned.
45205	SPM	20	9	20	9	Does this headline need the words "In integrated modelling studies"? If these words were deleted would the headline not still be true? It would be more impactful
46900	SPM	20	15	20	22	Please keep this section as well as the order of the whole subsection 3.2.2. (Mitigation options starting with RE, nuclear and then gas, CCS and BECCS).
45315	SPM	20				This section should also reflect, in language, information from figure SPM.9 on the anticipated global share of low carbon energies in the energy supply. It would be important to clearly give the message that, even in high atmospheric concentration scenarios, the share of RE increases substantially by 2050.
45316	SPM	20				It is possible to reference table TS3 here? It is a useful summary.
45573	SPM	20	1	20	47	SPM.3.2.2: Issues related to the use of SF6 in energy supply equipment (for example switchgears) should also be mentioned in this chapter.
44892	SPM	20	1			Unlike other subsections of section SPM3.2 (see comment on section 3.2), the energy supply section does not offer a paragraph on the mitigation potential of the energy supply sector, in quantified terms. Considering "the energy supply sector is the largest contributor to global GHG emissions" this absence is regretful. Consider adding a paragraph on this issue.
46902	SPM	20	16	20	16	The Term AR4 has not been explained yet in the SPM. We suggest to explain it at its first occurrence.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
46903	SPM	20	17	20	17	Please stress the role of renewable energies as one main mitigation option. Please add "and one main mitigation option in the energy sector" [see TS, page 31, lines 13 to 16] after "..., making RE a fast growing category in energy supply".
46904	SPM	20	18	20	20	What is named here as a (needed) "direct or indirect support" for RE, can also be a stop of supporting fossil fuels. This should be stated explicitly.
46906	SPM	20	32	20	34	In this paragraph, reference is only made to power generation. It would be beneficial to complete the paragraph with a view to Combined-Heat-and Power (CHP) as mentioned in the headline of the section.
46907	SPM	20	35	20	36	The levels of evidence and agreement of the statement "Carbon capture and storage (CCS) technologies could reduce the life-cycle GHG emissions of fossil power plants" is not supported in the underlying report, as it is based on a few medium sized plants only (see also page 20, lines 36-38). In chapter 7.5.5 on CCS formulations as "These real-world MMV deployments are the beginnings of a broader portfolio of MMV technologies that can be matched to site-specific geology and project- and jurisdiction-specific MMV needs" (page 27, lines 1-3) and other speculative assumptions in this chapter show, that CCS has not yet proven to work safely at large scale and for long periods of time and thus the evidence is "limited". As "agreement" is coupled to environmental concerns and public acceptance when accounting for the actual opposition to CCS the agreement level must be set to "low".
46909	SPM	20	36	20	38	Please be precise and replace the sentence using language from the underlying report: "All components of integrated CCS systems exist and are in use, but to date only limited practical experience chiefly with industrial facilities could be achieved." (cf. second paragraph of chapter 7.5.5, page 25, instead of first highlighted sentence.).
46910	SPM	20	38	20	39	That "CCS power plants will only become competitive with their unabated counterparts, if the additional investment and operational costs are compensated" suggests that direct financial support is to be granted and CCS is needed. To sanction CO2 emission (cf. "7.8.2 Cost assessment of mitigation measures", page 40, lines 8-12: "...is compensated by sufficiently high carbon prices...") would supposedly be the more effective and realistic option while in that case switching over to renewable energies instead is increasingly justified: please omit or change to "CCS power plants will only become competitive with unabated technologies if the additional investment and operational costs are compensated by sufficiently high carbon prices (and direct financial support)".
46911	SPM	20	41	20	43	Regarding the associated risks, the main report mentions in chapter 7, page 26, lines 19 ff at first "concerns about the life-cycle toxicity of some capture solvents" - This is missing here, but should be part of SPM as well.
46899	SPM	20	9	20	12	While this section is on energy supply, it remains unclear why in this row it is only referred to electricity generation and not to heat generation as well.
44002	SPM	20	44	20	47	First of all, in order to make a consideration of this magnitude, it is necessary a higher level of evidence. Second, the proposed solution has a completely technological approach without addressing other equally relevant dimensions. Finally, we disagree with proposing solutions by means of technologies which do not resolve the causes of the problems and they are not permanent. In the particular case of Bioenergy, is important to consider their impact on the AFOLU sector.
44571	SPM	20	1	20	47	Section 3.2.2 on "Energy Supply" makes no explicit mention of the shale gas revolution - relevant to (existing) paragraphs on natural gas as a bridge fuel, and a key development since AR4. Consider adding text, flagging recent, revolutionary expansion of resource base in the U.S., and noting potential for such transformation to replay elsewhere.
45885	SPM	20	12	20	14	This part, regarding decarbonization of electricity sector, doesn't summarize body text 6.8 and 7.11 appropriately. In this regard, it should be replaced by sentences which summarize the said body text parts more appropriately. Otherwise, this part should be replaced by the following text: " Decarbonization of electricity generation is realized by a wide range of combinations of renewable energy sources, nuclear power and CCS-based technologies, while regional circumstances will be as important decision-making factors as economic costs."



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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
45886	SPM	20	15	20	47	<p>Suggest to add some information listed below for the accurate understanding of policy makers on renewable energy technologies.</p> <ul style="list-style-type: none"> <li>- Recent FIT policies in Europe and electricity price (policy analysis if available).</li> <li>- Importance of ancillary service, if the share of unstable RE is expanded, such as securing LFC advanced energy like fossil fuel and demand control through demand response.</li> <li>- Necessity of power line.</li> </ul> <p>*Recent FIT policies in Europe where RE policies are most advanced including the effect on electricity price if available analysis and assessments are provided.</p>
45889	SPM	20	29	20	34	<p>Although appreciate your effort to provide policy makers a clear cut explanation on this matter, emissions reduction effect through replacing old and inefficient coal-fired power plants by advanced efficient technologies which is stated in the body text should also be described given the current limitation of access to gas and economical viability for some regions in the world.</p> <p>In this regard and consistency with Chapter 7 Page 19, suggest lines 29-34 should be re-written as follows;</p> <p>"When natural gas is available and the fugitive emissions associated with its extraction and supply are low, near-term GHG emissions from energy supply can be reduced by replacing the current world-average coal-fired with highly efficient natural gas combined cycle (NGCC) power plants or combined heat and power (CHP) plants. In most stringent mitigation scenarios natural gas power generation without CCS is below current levels in 2050, and declines further in the second half of the century. More modest emissions reductions result when shifting from current average coal plants to the best available coal technology or less advanced gas power plants. "</p>
45887	SPM	20	44	20	47	<p>Parties at the Tenth Meeting of the Conference of the Parties to the Convention on Biological Diversity agreed that "no climate-related geo-engineering activities that may affect biodiversity take place, until there is an adequate scientific basis on which to justify such activities and appropriate consideration of the associated risks for the environment and biodiversity and associated social, economic and cultural impacts" (for the full document, please see: <a href="http://www.cbd.int/doc/decisions/cop-10/cop-10-dec-33-en.pdf">http://www.cbd.int/doc/decisions/cop-10/cop-10-dec-33-en.pdf</a>)</p> <p>To ensure consistency with above CBD COP10 Nagoya decision, propose the following sentence be added to page 20, line 47:</p> <p>"Considerations of trade-offs with water, land and biodiversity are crucial to avoid adverse effects."</p>
45888	SPM	20	44	20	47	Suggest to add the information about Uncertainty about costs and risks of BECCS as written in p.23 L42 in this SPM.
44398	SPM	20	18	20	20	The current wording shows a biased point of view on development of renewable energy. Regarding the issue of the barriers to renewables also Subsidies to fossil fuels and the lack of internalization of their externalities are important barriers to renewables deployment, which in some cases still need support for increasing their market shares. Renewables are steadily becoming a competitive option in liberalised energy markets.
44715	SPM	21				When describing the end-use sectors transport and industry, information on the share of final energy use would be appreciated (as is provided for the building sector which was responsible for 34% of final energy use in 2010)
45582	SPM	21	10	21	10	Please consider to include "renewable energy and " after "from".
46914	SPM	21	10			To which part of the statement does the medium evidence and confidence apply? To the time frame, the fuel type or the low-C source? Please specify.
44894	SPM	21	12	21	13	The sentence presents a biased view of the potential mitigation from biofuels nowadays already being implemented. Since there is evidence of mitigation potential from first-generation biofuels in the current technological stage, the sentence should read "The full mitigation potential of biofuels, some already competitive with gasoline, like ethanol made from sugarcane in the tropics, may be enhanced by technology advances."
45714	SPM	21	12	21	12	It is mentioned that "The mitigation potential of biofuels will depend on technology advances and sustainably produced feed stocks". "Land availability" may also be added after the word "technology advances".
45715	SPM	21	12	21	13	Biofuels are already accounting for a significant share of transportation fuels in many countries. This could be mentioned also.
44587	SPM	21	12	21	13	"The mitigation potential of biofuels will depend on technology advances..." This sounds like a euphemistic way of saying that without such advances biofuels cannot contribute to mitigation. If that's the message, then say so plainly. Otherwise the authors should rephrase the text.

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45014	SPM	21	12	21	13	As it currently is, the sentence "The mitigation potential ...feedstocks" does not appear to provide much information, and its wording could probably be improved. What is the potential for sustainable production?
46915	SPM	21	12	21	13	Please add an uncertainty statement at the end of this sentence.
44306	SPM	21	14	21	21	The implication on economies by reducing energy demand by 40% by 2050 should be discussed to be policy relevant. The title appears to be biased towards energy demand instead of discussing enhancing efficiency in energy use without impact economical growth, and should accommodate for that.
45455	SPM	21	14	21	13	The mitigation potential of biofuels also depends on population growth and the competition with food.
45400	SPM	21	14	21	21	The mixture of potentials up to 2050 and 2030 is confusing. It would be helpful to include only statements with respect to 2050 in one paragraph and have a different paragraph on 2030.
44829	SPM	21	14	21	14	Replace "plus" with "including"
44588	SPM	21	14	21	21	Combining technical (presumably efforts like fuel economy standards) and behavioral (presumably efforts like additional transit, smart cities, teleworking, etc.) lumps very different efforts with different challenges together. The authors should clarify the text accordingly.
45212	SPM	21	14	21	21	Suggest that this paragraph is more important the the preceding one on carbon in fuels, and the order of these should be swapped - efforts should first focus on improving engine efficiency, then address fuel
45213	SPM	21	14	21	21	this paragraph also needs to emphasise the importance of behaviour change measures to increase adoption of new technologies and reduce perceived barriers to change
45320	SPM	21	14	21	16	It is unclear how this fits with the need to decarbonise transport in developed countries by 2050.
45015	SPM	21	16			What is "a higher potential"? How much higher?
45016	SPM	21	17	21	17	"Energy efficiency and vehicle performance improvements range from 30-50%...": Could you provide a clearer wording? What must a reader understand by "energy efficiency" (what exactly is more efficient?) and by "vehicle performance improvements (what improvements of which performance?) ? (readers may wonder why there two different terms)
43681	SPM	21	18	21	18	This statement would benefit from an explanation of or examples of 'mode' and 'type'.
45583	SPM	21	19	21	20	This sentence is unclear on what aspects of behavioural mitigation options that are less certain: is it their mitigation potential or other aspect you refer to? Please rephrase so that this is made clear.
44830	SPM	21	19	21	19	Unclear sentence
45017	SPM	21	19	21	19	"increase potential in the short term": Could you be more specific? which potential (how is it defined)? What is here the short term?
43757	SPM	21	19	21	21	This paragraph emphasizes the mitigation potential of investments in new infrastructure, undermining that of behavioral mitigation options. In fact, behavioral mitigation can also lead to modal shifts. It is suggested to reference to the expression in Chapter 8 (Ch8, P4, L22), and replace the sentence "Behavioral mitigation options are less certain but can increase potential in the short term (SPM, P21, L19-20)" in the SPM with the following text: "Behavioral mitigation options are less certain but leading to avoided journeys and modal shifts." Moreover, it should be emphasized that behavioral mitigation measures and new infrastructure investments should be combined in implementation in order to be effective, and cannot be separated when analyzing its mitigation potentials. It is suggested to refer to the expression in Chapter 8 (Ch8, P65, L41-43), and replace the last sentence of this paragraph (SPM, P21, L20-21) with the following sentence: "Over the longer term, behavioral change as well as investments in new infrastructure and urban redevelopment can encourage modal shifts."
45210	SPM	21	2	24	33	Suggest each sub section (transport, energy, buildings etc) start with figure of that sectors GHG emissions: See Building section first line for good example
45018	SPM	21	21	21	21	Please specify the types of modal shifts.
45214	SPM	21	21	21	21	suggest 'model shifts' replaced with shifts to public transport, and more efficient ways of moving freight'
44184	SPM	21	22	21	23	It seems unnecessary to assign a confidence term to a statement that something is uncertain (unless you are uncertain about whether mitigation costs are uncertain, but we assume this is a given).
45401	SPM	21	22	21	22	This statement is not really informative - assessments of mitigation costs are uncertain in general. The point seems to be that the costs of mitigation options differ significantly but that costs alone are not the only relevant aspect of any mitigation option in transport that is relevant in controlling deployment rate. Poor understanding of those factors and how the willingness to act might change make any assessment of overall costs very difficult. In this context authors are reminded that it is the role of the IPCC to identify possible mitigation actions and the associated costs and other relevant factors. It is not expected by the reader that the IPCC is able to predict how societies will decide finally. Therefore the IPCC refused in the past to evaluate any likelihood to any of the scenarios.

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44831	SPM	21	22	21	26	Please mention/note co-benefits for clarity.
43956	SPM	21	22	21	22	A suggestion for the 1st sentence: Full societal economic costs and benefits of mitigation for.... The rationale: There are both positive and negative costs.
44589	SPM	21	22	21	26	Stating costs as "low or negative" is vague. Is it total costs, costs measured in \$/CO2 or GDP? If the authors mean "full societal" and GDP, why use the \$/CO2 metric as a comparator?
43758	SPM	21	22	21	26	In P21, L14-21, when discussing mitigation potentials, the potential of transformation of transportation means has been emphasized as a result of investments in new infrastructure and urban renewal. However, this paragraph fails to address the costs of these measures, especially the cost of related technological measures. It is suggested to add certain elaborations on the implementation cost and barriers of new infrastructure investments and add the following sentence at the end of this paragraph in accordance with the content of Chapters 8 and 12 (Ch8, P5, L28-30 and Ch12, P6, L1-5): "Investments in low-carbon transport infrastructure maybe high-cost and require governance, technical, financial, and institutional capacities, which can be limited or weak in developing countries."
44307	SPM	21	27	21	34	This statement needs to elaborate high investment costs in infrastructure for emerging markets as per Chapter 8, especially those countries who are dependent on transportation for their economies in order to provide policy makers with full range of issues and not be policy perspective
44185	SPM	21	27	21	28	Does this headline really require a confidence assessment? Or could it be considered as fact?
45215	SPM	21	27	21	34	This could be more specific and not gloss over some key information. "Sustainable urban planning offers tremendous opportunities" to develop non-motorised transport. This is especially true with the increasing trend towards urban living. Chapter 8 8.4.2, SPM 3.2.5
43759	SPM	21	27	21	34	When discussing regional differences of mitigation options, it should be considered that developed and developing countries are in different development stages. Moreover, it should be emphasized that although existing infrastructures in developed countries may have hindered its potential of transportation transformation, changes in transportation means can still be promoted through urban renewal, infrastructure update and lifestyle change. It is suggested to add the following content in accordance with the underlying report: (1) In accordance with Section 8.4, insert at the end of Line 30 the following sentence, "However, modal shift can still be achieved through urban renewal and behavioral changes; while for developing countries, the priority is to fulfill the demand for basic transportation from civilians, especially to provide equal, available, safe and speedy basic transformation service to the poor."; (2) In accordance with Chapter 8 (Ch8, P6, L4-6) in the underlying report, it is suggested to add "Developing countries have to prioritize goals for equity and emphasize accessibility, traffic safety and time savings for the poor, while reducing emissions, with minimal detriment to the environment and human health." before "For emerging economies..." in line 30; (3) In accordance with Chapter 8 (Ch8, P6, L12-14) in the underlying report, it is suggested to add the following sentence in Line 32, "Mechanisms to accelerate the transfer and adoption of improved vehicle efficiency and low-carbon fuels to emerging and developing economies, and reducing the carbon intensity of freight in emerging markets, could offset much of the growth in non-OECD emissions by 2030.", so as to emphasize the importance of technical mitigation measures in developing countries.
46916	SPM	21	28			Is "cultural barrier(s)" the adequate term here?
44832	SPM	21	29	21	30	Is this true, especially in longer term? The example of Freiburg indicates otherwise?
44895	SPM	21	29	21	29	Not only OECD countries have infrastructure limits. Replace "OECD" for "some".
44762	SPM	21	29	21	30	This sentence on the OECD countries is too negative compared with the reality. Amend it.
44305	SPM	21	3	21	7	This statement is biased towards fossil fuel used in transport sector as no comparison is made in respect to percentage of GHG emissions from transport sector (and compare with other sectors for example with AFOLU, buildings) it is not clear how this conclusion is made.
45580	SPM	21	3	21	4	Please consider to include for clarity "in the transport sector" at the end of this sentence.
44182	SPM	21	3	21	4	Since the authors have high confidence, should "could outweigh" be replaced with "will outweigh"? Having high confidence that something is a possibility ("could outweigh") seems to weaken the fact that the statement is being made with high confidence. If the authors are uncomfortable with "will outweigh" at high confidence, then perhaps the authors should say "will outweigh" with medium confidence rather than "could outweigh" with high confidence. This is a question of providing the confidence assessment that is the most informative to policy makers, and a direct statement made with lower confidence is, presumably, more informative than a broader statement made with higher confidence because former is easier to interpret.
43680	SPM	21	3	21	4	It would be useful to clarify whether the rapid growth in GHG emissions from increasing global passenger and freight activity could outweigh future mitigation measures from transport only, or all future mitigation measures.
43957	SPM	21	3	21	3	Please add a general text that gives the share of transport emissions, like there is on line 42 for buildings

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44584	SPM	21	3	21	3	The authors should specify what % of transport emissions are from passenger vs freight - road vs rail vs water vs air.
45319	SPM	21	3			It would be useful if this section could start with a definitive statement as for the buildings section on lines 42-44 on page 21.
43754	SPM	21	3	21	4	The statement is not consistent with that in the underlying report and the TS. It is suggested to replace the current sentence with the following text: "Reducing global transport greenhouse gas (GHG) emissions will be challenging since the continuing growth in passenger and freight activity could outweigh all mitigation measures unless transport emissions can be strongly decoupled from GDP growth (high confidence). (Ch8, ES, P4, L2-4)"
45584	SPM	21	30	21	30	Please consider to insert "and ship" after "advanced vehicle".
44896	SPM	21	30	21	30	The term "emerging economies" is vague, not widely accepted and usually includes countries whose urban growth is desaccelerating or reaching its peak. Delete "emerging".
45716	SPM	21	31			Please add "public transport" after transport infrastructure.....
45019	SPM	21	32	21	34	This statement is rather general; could you clarify how this prioritisation can (or does) improve 'economic and social prosperity'?
45955	SPM	21	33	21	34	services can improve economic and social prosperity ((put it in the mitigation context: .. besides avoiding a high-carbon transport development pathway))
44308	SPM	21	35	21	40	The recommendation to policy makers must be inclusive of all aspects including impacts of such policies on sustainable development and what are the social and quality of life implications.
44186	SPM	21	35	21	36	Does this headline really require a confidence assessment? As stated, this would appear to be a fact. However, maybe there is only medium confidence that transport emissions can be decoupled from GDP growth. If that is the case, perhaps that aspect could be said separately from the aspect concerning the need for policy in all regions.
44590	SPM	21	35	21	36	The authors should change the text that reads, "Strong and mutually-supportive policy measures are needed in all regions to decouple transport GHG emissions from GDP growth", to: "Strong and mutually-supportive policy measures will be needed for the transport sector to reduce GHG emissions significantly". This revised text better aligns the SPM with the Transport chapter (see chapter 8, page 6, lines 19-20). The sentence as currently written is problematic because it contradicts chapter 8, page 9 line 19 to page 10 line 1 stating that in some developed countries, transport GHG emissions are already decoupling from GDP growth.
43682	SPM	21	38	21	40	This statement refers to the influence of pricing structures on travel demand. Should it also mention the possible influence of these pricing structures on choice in means of travel e.g. A shift from private car use to public transport?
47055	SPM	21	38	21	40	"Pricing strategies, when accepted socially, can help reduce travel demand": This quote from the bottom of page 66 in Chapter 8 is taken out of context and picks up on one particular mitigation option from the transport sector (pricing out travel demand), which is not the most popular. Pricing strategies can be used to promote cleaner transport options without affecting demand, whereas other policy instruments (eg improved urban planning) can help meet mobility needs while reducing the demand for transport.
45020	SPM	21	38	21	39	'when accepted socially' seems unnecessary here as it is valid for all measures in most sectors - not specifically for travel demand?
45956	SPM	21	39	21	40	Freight businesses: of course it is far from being only a logistical issue; any other important message on freight transport from the report could be added here?
45954	SPM	21	4			could outweigh future mitigation measures ~ could outweigh future mitigation measures in the transport sector: ((for the sake of unambiguity))
44591	SPM	21	40	21	40	The authors should insert, "...intensity of their logistical systems BY E.G., [GIVE EXAMPLES]."
45585	SPM	21	41	22	25	Emissions of fluorinated greenhouse gases (CFCs, HCFCs, HFCs) from cooling equipment, air-conditioning and heat pumps are also relevant for the building sector. This should be dealt with in the text.
45717	SPM	21	41	22	25	Generally in this SPM buildings sector mitigation options are shown to be relatively less important than say decarbonizing power supply. However energy efficiency in buildings (lighting, appliances, air-conditioning, heating, etc) are shown to be easy to implement, generate a savings for the consumers and have high GHG mitigation potential. SPM seems to provide a contrary view to this by over stressing decarbonization of power generation.
45586	SPM	21	42			Should this be CO <sub>2</sub> - equivalent emissions (including methane and f-gases)?
44187	SPM	21	42	21	42	Is it possible to include estimates of the uncertainties in 2010 energy use and emissions figures? Are they really known to within 2 digit accuracy?
44833	SPM	21	42	21	44	should this sentence end with "in the baseline scenario".

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44592	SPM	21	42	21	42	This 34% figure appears to be inconsistent with Figure SPM.1 and Figure SPM.3 which show buildings to be 6% of direct emissions and 12% of indirect emissions.... Unless Figure SPM.3 is "just" CO2? Please rectify the inconsistencies between these two figures and the text.
44593	SPM	21	42	21	43	The first part of this sentence provides very useful context. It would be good to provide similar context as widely as possible.
44594	SPM	21	42	21	46	Is the CO2 emissions projection over all scenarios? The authors should clarify the text.
46917	SPM	21	42			Better to start "In 2010, the...", this is easier to read.
45718	SPM	21	43	21	43	the word ' from electricity' may be added after the word 'emissions'.
43683	SPM	21	46	22	2	It would be useful to distinguish between emissions associated with construction versus emissions associated with occupancy, particularly when raising the issue of lock-in risks.
45719	SPM	21	46	21	46	In bracket 'robust evidence' may be added after the word 'urbanisation'.
46918	SPM	21	46			Is "adequate housing" in this context the appropriate term (and not - unwillingly - misleading)?
43755	SPM	21	5	21	6	The number of "6.7 GtCO2/year in 2010" in this statement, as also mentioned in the TS (P48, L6), is inconsistent with that in the underlying report as "7.0 GtCO2/year" (Ch8, P4, L5 and L11). It is recommended to keep the consistency of emission data. According to the data from the underlying report (Ch8, P4, L5 and L11), it is recommended to replace the statement "transport CO2 emissions are projected to approximately double by 2050 from 6.7 GtCO2/year in 2020" (SPM, P21, L5-6) with the following text: "transport CO2 emissions are projected to increase from 7.0 GtCO2/year in 2010 to around 12 GtCO2/year by 2050."
45713	SPM	21	6	21	6	The value '6.7 GtCO2' may be replace by '7.0 GtCO2 or it may be verified'.
44585	SPM	21	6	21	6	Figure SPM.3 shows that transport is 10.4% of [total of CO2?] annual emissions, but Fig. SPM.1 shows annual emissions of 49.5 Gt CO2e. So, what's the difference between the calculated 5 GtCO2e and the 6.7 Gt CO2/yr presented in the text?
45013	SPM	21	6	21	6	Could you mention the assessed number of GtCO2 in 2050? The "/year" can be deleted when you refer to just one year (in this case the year 2010)
45581	SPM	21	8	21	8	In order to clarify that this is not only about fossile fuel reduction but also about swithing to other energy carriers you may consider to add "include switching to non-fossile energy sources and" after "carbon intensities"
44183	SPM	21	8	21	13	This headline seems unclear - presumably there can always be short- and long-term strategies, so this seems a nebulous statement. Also, the statement seems to be supported by three different kinds of evidence, only the last of which, concerning biofuels, might represent a strategic consideration. The first line of supporting evidence is simply to report that fuel switching, to fuels with lower carbon intensity, is already taking place. It is uncertain what that observation has to do with fuel switching strategy (is it clear that these changes are taking place with the objective of reducing carbon intensity?). A second supporting statement has to do with co-benefits - again, what is the link to the strategy for fuel switching? Overall, suggest this paragraph needs work.
44828	SPM	21	8	21	8	The sentence in bold is fairly unclear. Perhaps, "There are strategies to reduce carbon intensities both in the short term and in the long term".
45211	SPM	21	8	21	8	Headline text is not meaningful, Need a recommendation. Perhaps "There are immediate and long-term steps that can be taken to reduce the carbon content of fuels in the transport sector"?
46913	SPM	21	8			This passage appears to be too weak, several aspects could be added: 1) Mitigation potential of methane-based fuels is rather low. 2) Sustainable biomass potential will be most probably very limited. As biomass will be used in large regions also for (controllable) renewable power and heat generation biofuel potential is even more limited. 3) Therefore including low carbon electricity into the transport sector is probable a key option. 4) Electric mobility is the most efficient technology for this but could be complemented by techniques for low carbon hydrogen use, which have much higher well to wheel energy losses.
44586	SPM	21	9	21	9	As written, the sentence is reads awkwardly. Please revise.
43756	SPM	21	9	21	13	This statement comes mainly from TS (P49, L15-20) and focuses on the roles of methane-based fuels, electricity and hydrogenfels, biofuels in lowering fuel carbon intensities. However, in the SPM, it fails to reflect the great uncertainties in the decarbonizing effects of the above energy sources. It is recommended to add the following regarding to their mitigation potentials: "The total mitigation potentials of electric, hydrogen and some biofuel technologies are very uncertain" (TS, P49, L16-17)
44384	SPM	21	12	21	13	In addition to stating that bio-diesel utilization in the transport industry depends on technology development and supply, it would help to know the current and future bio-diesel supply trends of various countries. (ex: In South Korea's transport sector, biodiesel is supported by imports, so the main issue of mitigation is the lack of supply, rather than technological limitations (2013. quoting industry experts))

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44583	SPM	21	1	23	14	In general, each of these sectors also has non-CO2 emissions with readily available, relatively low-cost mitigation opportunities. None of this is presented in the SPM and should be.
45890	SPM	21	19	21	20	Would appreciate clarification on WHAT (options? effects?) "behavioral mitigation options are less certain" refers to. Request clarification.
44399	SPM	21	12	21	13	The sentence about the mitigation potential of biofuels is biased. Sustainable biofuels are now replacing fossil fuels by renewables and reducing GHG emissions in a very challenging sector for doing so: transport. We suggest to include the following sentence at the end of the para. "Biofuels have direct, fuel-cycle, GHG emissions that are typically 30-90% lower per kilometre travelled than those for gasoline or diesel fuels. Their potential for GHG mitigation depends heavily on the sustainable production of the feedstock used to produce those fuels".  (1) The first part of the proposed text quotes [8.3; page 21; lines 19-20].
47128	SPM	22		23		We think it would be useful to have a statement that in some industries (cement, steel, natural gas exploitation) flue gases contain higher concentrations of CO2, reducing the cost of capture and providing early opportunities for larger scale CCS application.
44692	SPM	22	1	24	30	CHAPTER 14, P. 22, LINE 1 - P. 24, LINE 30: The discussion on urbanization is interesting and could be brought forward into the SPM in capsule form (e.g., in SPM.3.2.5)
44310	SPM	22	10	22	12	This statement is low evidence and more clarification is needed on the difference between developed and developing countries.
45456	SPM	22	10	22	10	Aren't the difference in GHG emissions based on culture mediated by differences of behaviours and lifestyle ? Thus the phrase could be shortened by "Behaviour and lifestyle have..."
44190	SPM	22	10	22	12	This paragraph is too vague and does not have a clear message. The phrase "factor of three to five difference in energy use" requires further explanation/clarification.
44897	SPM	22	10	22	12	The information in this paragraph is already captured in (and redundant with) page 19, lines 1-8. Consider deletion for brevity.
44597	SPM	22	10	22	12	Authors do not seem to have accepted comments and additional references offered during the SOD review process that would better incorporate issues such as new building codes, advanced building design, occupant behavior, etc. It would be helpful to review those and incorporate here.
45216	SPM	22	10	22	12	A 3-5 factor of energy use improvement seems significant, could it be expanded beyond 3 lines?
46920	SPM	22	10	22	12	It is valuable to mention the considerable relevance of "lifestyle, culture and behaviour". It would be more valuable, to mention very briefly some (if possible to determine: the most relevant) measures within this category to deliver a more practical and usable set of information in terms of political applicability.
45588	SPM	22	11	22	12	Please exchange "three to five difference" to "a three to five fold reduction" to make this sentence more comprehensive.
44311	SPM	22	13	22	18	Barriers discussed in ch 9.6 and 9.7 are not explained although they are mentioned at the beginning of this statement.
44716	SPM	22	13	22	18	It is mentioned that barriers prevent the market uptake of cost-effective technologies and practices within the building sector. A suggestion is to provide a few examples of the strongest barriers, eg. Split incentives, lack of awareness, and inadequate access to financing (cf. chapter 9.8) and the most effective means to overcome these barriers.
44191	SPM	22	13	22	18	The bolded statement for this paragraph refers to "strong barriers", but these are not articulated in the supporting text of this paragraph. Suggest explaining this further.
47129	SPM	22	13	22	13	It would be useful to specify the nature of the 'strong barriers' indicated in this statement.
45403	SPM	22	13	22	18	The paragraph informs in the first, bold, sentence about strong barriers. However, the text below this sentence does not address any of those barriers. It is suggested to either delete the notion of barriers in the first sentence or to add another sentence in the text that provides some insights into those barriers.
43684	SPM	22	13	22	18	It would be informative to also summarise the barriers that are mentioned in the heading sentence.
44834	SPM	22	13	22	18	Mention also "comfort". Somewhere in the section on buildings you must mention the option of RES-integration in buildings as mitigation strategy.
43958	SPM	22	13	22	18	Please add text on barriers in this paragraph.
44598	SPM	22	13	22	13	Please clarify what types of "mitigation options" are referenced.
44599	SPM	22	13	22	18	This discussion should include reference to the finding that efficiency in buildings is often cost effective even without accounting for carbon or co-benefits. The discussion focuses on the co-benefits only, which are relevant, but most studies in building efficiency find that significant savings are available at negative cost due to cost savings alone, and the carbon savings and co-benefits are on top of that.

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45022	SPM	22	13	22	13	The chapeau of this paragraph announces "strong barriers", but nothing is said in the paragraph about these. Could you explain the nature of these barriers, as well as how and to what extent they can be overcome?
45321	SPM	22	13	22	15	The statement about barriers needs further explanation. It should be made clearer that such barriers can be overcome by measures such as those listed in lines 19-25.
45589	SPM	22	14	22	14	Please consider to replace "proliferation" with "development"
44600	SPM	22	14	22	14	"Strong barriers" such as what?
45457	SPM	22	15	22	17	"and reduced energy expenditures." should be removed as the phrase starts with the mention of co-benefits exceeding energy cost savings.
44192	SPM	22	15	22	18	Aren't 'reduced energy expenditures' the same as 'energy cost savings'? Suggest deleting 'reduced energy expenditures' on line 17. Also, please be explicit about what is meant by "energy/fuel poverty" - do you mean poverty that results from high, unavoidable, energy costs? Suggest also avoiding the use of technical terms like "monetizable co-benefits".
43685	SPM	22	15	22	18	How does reduced energy expenditure differ from energy cost savings? They sound like similar things.
46921	SPM	22	15	22	17	Sentence unclear: "energy cost savings" are the same as "reduced energy expenditures". Please revise.
44601	SPM	22	16	22	17	This is an awkward and confusing statement "... and include improvements in energy security, health, environmental impacts, productivity and net employment, energy/fuel poverty, and reduced energy expenditures. " The authors should consider re-writing and clarifying the text.
45590	SPM	22	17	22	17	What is energy/fuel poverty? Is it scarcity, or related to energy security?
44602	SPM	22	17	22	17	Economic analysis would suggest that mitigation focused in the buildings sector would not have productivity or net employment impacts across the economy (i.e., it is not clear why society would benefit from shifting labor towards the buildings sector from other economic sectors or why investment in buildings would increase productivity). The authors should clarify the text.
45591	SPM	22	19	22	21	The finding in line about building codes and applied standards seems to be relevant to address in the bold text.
44603	SPM	22	19	22	25	The bold language is not helpful as a key message. The authors should consider re-phrasing and including the finding regarding codes and appliance standards.
45023	SPM	22	19	22	20	Could you provide more specific information? What is "considerably advanced"? (to what extent is the implementation already "considerable", in the framework of the climate goals that were adopted at the international level, and taking into account the expansion of the building infrastructure?)
46919	SPM	22	2			Please add the following sentence to the end of this paragraph: "On the other hand, long-lasting low-emission products and building materials may avoid emissions through dematerialization."
44898	SPM	22	21	22	23	Delete from line 21 "In some developed countries...." to line 23 "...notably appliance standards. The phrasing suggests some countries are using both building codes and appliance standards, while others are focusing on the latter (the implication is that they should also implement building codes). In some developing countries, however, "building codes" fall under subnational jurisdictions, it is not a policy choice of the country.
44604	SPM	22	21	22	21	The authors should insert, "...the most effective instruments FOR EMISSIONS REDUCTIONS IN THE BUILDINGS SECTOR."
44605	SPM	22	23	22	25	This is a very important point, but as drafted the sentence is policy prescriptive, and should be re-written to note the benefits of such policy in a non-normative fashion.
44193	SPM	22	24	22	25	Regarding the phrase "...these need to be substantially strengthened and up-scaled...". Rather than using the word 'need' suggest saying that "Substantially strengthening and up-scaling these to further jurisdictions...is key to reach ambitious climate goals". Suggest also trying to avoid the use of technical jargon like "up-scaling" if possible.
45404	SPM	22	24	22	25	The wording "to further jurisdictions and building and appliance types" is unclear. This wording should be deleted or clearer examples of strengthening and up-scaling should be provided.
45959	SPM	22	24			these need to be ~ these codes and standards need to be ((for the sake of unambiguity))
44312	SPM	22	26	22	26	This section must be discussed before buildings and transportation.
45592	SPM	22	26	23	14	The sub-section on industry does not discuss process emissions from industry. This should be mentioned and it should be highlighted that some of these emissions are often difficult to mitigate. In many cases CCS in industry is the only currently known mitigation option because for some industrial processes the CO2 emissions are a product of chemical reactions in the production process itself and not a result of combustion of fuels.
44763	SPM	22	26	22	26	The concept of "Industry" should be precised here in view to delimit its extend (does electricity generation is part of industry, etc.): refer to the Sankey diagramme in Figure 10.1.

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44313	SPM	22	27	22	34	This conclusion lacks the historical perspective and must provide assessment of historic industrial emissions.
44195	SPM	22	27			Suggest using "baseline scenarios" rather than "baseline conditions" in order to be consistent with other parts of the SPM.
44717	SPM	22	28	22	31	It is stated that: "Direct and indirect CO2 emissions from industry are projected to increase from 13 GtCO2/year in 2010 by 50-150% in 2050 in the baseline scenarios assessed in AR5, unless energy intensity improvements can be significantly accelerated beyond the historical development." The last part of the sentence "unless energy intensity..... historical development" does not make sense and should be deleted. According to the baseline scenarios, that do not assume significantly improvements in energy intensity, the CO2 emissions are projected to increase by 50-150%. Using the word "unless" in the same sentence is confusing.
45593	SPM	22	29	22	29	This text gives the emmissions from Industry sector in Gt CO2. Previous relevant text in the SPM uses CO2 eq. For instance is the total emissions for 2010 given as 49 Gt CO2-eq in page 8 line 13, and on page 10 line 3 emissions from industry is stated as 30% of 49 Gt CO2-eq. This should be 14,7 Gt CO2-eq. This makes it difficult to compare with the 13 Gt CO2 stated in page 22 line 29. Please check for consistency throughout the SPM.
45721	SPM	22	29	22	29	the word 'to 20-24 GtCO2/year' may be added after the '2010'.
45722	SPM	22	29	22	29	the word 'showing a significant increase' may be added after the word 'AR5'.
44606	SPM	22	29	22	29	Figure SPM.3 says industry accounts for 28.5% of emissions, which is ~14 Gt CO2e (when using the annual # from Figure SPM.1). Why does the data from the text not align with the data in the figure? The authors need to rectify these inconsistencies.
44309	SPM	22	3	22	9	It is not clear what are the economical implications for such measures especially with the need for advanced technologies.
45587	SPM	22	3	22	3	Please consider to replace "proliferation" with "development"
44595	SPM	22	3	22	9	As written, the text is unclear. The authors should re-write the text to read: "Recent advances in technologies, know-how and policies offer opportunities to stabilize or reduce global building sector energy use by mid-century (Robust Evidence, High Agreement). Recent large improvements in performance and costs make very low energy new construction and retrofits economically attractive..."
44596	SPM	22	3	22	9	Adoption of building codes is only one approach to building energy load/mgmt; other examples should be added.
45405	SPM	22	31	22	34	The addition in brackets "(just over 40% if AFOLU ..)" is confusing because such addition has not been included in other, comparable paragraphs of section 3.2. It is suggested to use the same approach throughout this section and clarify this issue, e.g. with a footnote. This first paragraph is currently on page 20, lines 2 to 8, related to energy supply.
45458	SPM	22	32	22	32	Emissions of CO2 in 2010 from industry according from figure SPM.3 is nearly 30% and not just over 30%. This is confusing.
44607	SPM	22	32	22	32	Using data from Figure SPM.3, this should not state "over 30%", but "under 30%".
45723	SPM	22	33	22	33	the word 'high confidence' within the bracket may be added after '2010'.
44196	SPM	22	34	22	34	Suggest replacing 'upscaled to further jurisdictions' with 'adopted in further jurisdictions'.
45594	SPM	22	35	22	41	Issues related to intellectual property rights (patents) and technology transfer should also be delt with in this context.
44197	SPM	22	35	22	35	Suggest inserting "energy" before "sector" so that the bold sentence is self-contained.
44835	SPM	22	35	22	37	This is a bit vague. 25 % by when? Also, 25 % sounds quite conservative for non-energy intensive industries
44608	SPM	22	35	22	41	The 2nd sentence should reinforce the first, which it currently does not. As an alternative to re-working the paragraph that way, the authors should consider re-wording so that it's clear that the finding is about "Additional reductions." vs leading with "through innovation".
47056	SPM	22	38	22	39	The underlying evidence seems to be rather weak to make such a strong statement. Recommend that ".of approximately 20%..." is replaced by "further additional reductions."
45724	SPM	22	38	22	38	the word 'energy intensity' may be added after '20%'.
44836	SPM	22	39	22	41	A more concrete finding would be interesting here. That information programmes are more used than other means does not by itself provide very much keen information. What does this imply?
44385	SPM	22	39	22	41	Although information programs have been proven effective in sectors such as building and transport, they might not be the most prevalent approach for promoting energy efficiency in industrial sector (in developing countries in particular). One apparent disadvantage is that information programs generally do not provide enough economic incentives for corporations and the accomplished reductions in emission levels are technically difficult to estimate.
45725	SPM	22	39	22	39	the line 'before approaching technical limit in some energy intensity' may be added after the word 'realized'.
45726	SPM	22	39	22	39	the word 'low' may be replaced by word 'limited'.
45727	SPM	22	39	22	39	in promoting energy efficiency' may be added before the word 'information'.



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45217	SPM	22	39	22	41	a recommendation is needed - the statement of what is the prevalent approach is, on its own, inadequate.
45322	SPM	22	39	22	41	The prevalent measures used is interesting, but would be more useful to policymakers to know what the most effective measures in use are. Emissions trading could be one of the most effective tools used to reduce emissions from industry.
43760	SPM	22	39	22	39	Here the meaning of "information program" is unclear and can be misleading. It is suggested to replace "information program" with "the application of advanced technologies" in accordance with the underlying report.
44609	SPM	22	40	22	40	These may be the most *prevalent* approaches, but can anything be said about whether these are also the most *effective* approaches?
45728	SPM	22	41	22		At the end of the sentence the following may be added. Limited human and financial capacity, especially in small and medium enterprises will need to be addressed in order to exploit current & future best practices.
45595	SPM	22	42	22	44	Consider to include changes to new industrial processes in the list of options, because such a change could also reduce GHG emissions and not only the energy intensity. We believe that this sentence could be improved by dividing between options that are related to the production of products (energy, emission, and process efficiency), and the options that are related to the demand for the products (material use and product use efficiency, and service demand reduction).
44198	SPM	22	42	22	47	While the term "energy efficiency" will be well understood, terms such as "emissions efficiency" and other terms used in this sentence may not. Suggest rewriting this paragraph with more accessible language. Is it necessary to use both the terms 'product use efficiency' and 'product use intensity' here?
45406	SPM	22	42	22	42	The term emission efficiency is only used once in the full report. It is not a very common term. The SPM should avoid such specific terms and use wording that easier to communicate.
45407	SPM	22	42	22	47	The message of this paragraph is somehow strange given the efforts of industry to introduce the concept of carbon footprinting. Meanwhile this approach is used by many corporates as a tool to manage GHg emissions along the supply chain as demonstrated by the availability of meanwhile three tools, developed under the GHG-protocol, BSI (PAS 2050) and ISO (ISO 14067).
43686	SPM	22	42	22	47	The terms 'emissions efficiency', 'product service efficiency' and 'product service intensity' are unclear. Define and use consistent terms where applicable.
44837	SPM	22	42	22	44	What does "absolute reduction" mean? Zero-emissions? Rephrase?
44899	SPM	22	42	22	44	The use of less carbon intensive sources of energy is an important measure for the reduction of GHG emissions in the industry sector. Therefore, it should also be mentioned along with the options presented in the excerpt.
45729	SPM	22	42	22	42	the word ' in addition to' may be replaced by ' however, together with'.
45730	SPM	22	42	22	42	the word 'mitigation' may be inserted between the words ' other' and 'options'.
45731	SPM	22	43	22	43	the word 'in parallel' may be inserted between the words ' required' and 'to'.
46922	SPM	22	43	22	44	"Absolute reduction of GHG emissions"? It is not clear what this means. Maybe that other means do not result in net emission reductions?
45732	SPM	22	44	22	44	several emission reducing options are cost effective and profitable (medium evidence and medium confidence)' may be added after the word 'sector'.
45323	SPM	22	45	22	46	This is an important piece of information for policymakers as more research is needed here.
45957	SPM	22	5			improvements in performance ((performance of the technology?))
44386	SPM	22	5	22	5	very low energy construction → very low energy consumption
45402	SPM	22	6	22	6	It is suggested to delete the word "become" as it is confusing and not needed.
45720	SPM	22	7	22	7	...since AR4. (The following line may be added.)However capacity to design, construct and enforce building codes limits rapid deployment.
45021	SPM	22	7	22	9	The 50-90% energy use reductions give good feelings, but on what share of the established building stock can they be realised and under what conditions (technical, financial)? (this likely needs to be linked with the information on p22 line 13 about "strong barriers")
44189	SPM	22	8	22	9	With regard to "reduction in heating/cooling energy use", suggest it should be defined whether these improvements come as an overall reduction in absolute energy use, or in terms of reduced energy intensity. Also, are these figures averaged over a whole country or in individual buildings?
45958	SPM	22	8			with established building stocks ((i.e. those built decades ago with „loose“ energy building codes))
44188	SPM	22	1			Suggest it would be helpful if there was greater consistency in how information from the various sectors is presented across each sub-section. For example, information about the GHG trends presented at the beginning of each sub-section is highly variable and makes it difficult to relate one sector to the others.
44194	SPM	22	26	23	14	The "Industry" section needs to be reviewed again as many of the paragraphs do not make sense or are very awkward to read.
45891	SPM	22	11	22	11	For better understanding of non-native English speakers, suggest to insert "times" or "fold" before "difference" as written in Ch.9 p.7 L11.

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45892	SPM	22	35	22	41	Highly appreciate this paragraph covering various policy instruments such as economic instruments, regulatory approaches and voluntary actions. Very important to assess available, various policy instruments comprehensively as much as possible in order to advance global emission reduction effectively.
45893	SPM	22	42	22	44	Appreciate if the meaning of "absolute reduction of GHG emissions" is clarified. Also options of service demand reduction in the industry sector is unclear, thus suggest to rewrite the bold part such as "In addition to energy efficiency, there are other options such as emissions efficiency, material use efficiency, or product use efficiency to achieve GHG emission reductions in the industry sector."
44199	SPM	23	1	23	4	Suggest providing more information on the estimated contributions of HFC emissions as a proportion of total GHGs by 2050. It appears that this is done for several CO2-related sectors. Also, with respect to opportunities for reducing HFCs, this should be expanded to include substitution of HFCs by alternative technologies, and further mitigation of HFC-23 by-product emissions from HCFC-22 production.
47130	SPM	23	1	23	4	We would like to see a statement on the potential of a HFC phase-out (EU proposal F-gasses regulation).
47057	SPM	23	1	23	4	The option of substituting with low GWP refrigerants is omitted. The last sentence should read "reduction of HFC emissions by leak repair, refrigerant recovery, recycling OR SUBSTITUTION".
44900	SPM	23	1	23	4	If non-CO2 GHG emission are in the range of 0,9 GtCO2 eq in 2010, they can hardly be described as a "substantial" mitigation opportunity when the total of emissions in that same year was 49 GtCO2eq. Implying that policy makers should focus on non-CO2 mitigation may be seen as avoiding the most pressing issue of mitigating CO2 emissions.
44203	SPM	23	10	23	11	This seems to be a statement of a particular view of the best approach to waste management rather than an evidence-based assessment of the best options for climate mitigation. Could this be re-phrased as something like "The largest scope for GHG emission reductions in waste management is through waste reduction, followed by re-use, recycling and energy recovery"?
44901	SPM	23	10	23	14	There lacks a explicit mention to the possibility of converting waste to energy, in forms of bioenergy, biofuels, biogas or other biomass products.
44611	SPM	23	10	23	11	"The hierarchy...places waste reduction at the top..." This is obscure phraseology. Is the point that waste reduction has the greatest mitigation potential?
46924	SPM	23	10	23	11	Please provide information on the relevance of waste management for current emissions and its mitigation potential.
45597	SPM	23	11	23	13	It would be interesting if this could be quantified.
43763	SPM	23	14	23	14	In the part from P22, L26 to P23, L14, mitigation potentials and measures of the industrial sector are discussed. The barriers in mitigation potentials from the industrial sector is key to the realization of mitigation potential, but has not been discussed so far. It is suggested to add the following text at the end of this section in accordance with Conclusion NO.13 of ES (Ch10, P5, L40-48): "There is a broad variety of barriers to implementing energy efficiency in the industry sector. Unless barriers to mitigation in industry are resolved, the pace and extent of mitigation in industry will be limited and even profitable measures will remain untapped (robust evidence, high agreement) [10.9]."
45598	SPM	23	15	24	3	The AFOLU term is widely used in the report and this SPM. We believe that it would be clarifying if it is explained what the term "Forestry", as part of the AFOLU term entails, including to what extent it is similar or different from the forestry part of the term LULUCF. LULUCF is more commonly known to policy makers. This should also be included under "AFOLU" in Annex I/Glossary.
45599	SPM	23	15	24	3	It would be an advantage if there could be figures for the AFOLU emissions in 2010, 2050 (base line scenarios) and an estimate of the potential emission reductions from combined supply- and demand-side measures.
45408	SPM	23	15	23	31	These paragraphs give the misleading impression that GHG mitigation policy is a main driver of the emissions of AFOLU. It would be policy relevant to identify the main drivers of emissions of AFOLU in order to put any mitigation policy in the right context. The statement with respect to future emissions should be substantiated by an assessment of the main drivers and the corresponding assumptions on relevant parameters.
43959	SPM	23	15	24	3	Please use consistent terminology regarding AFOLU.
43967	SPM	23	15	24	3	Please also add some positive examples of the contribution of bioenergy to climate change mitigation. Examples of sentences that could be added include: "Bioenergy deployment is more beneficial when it is not an additional land use activity expanding over the landscape, but rather integrates into existing land uses and influences the way farmers and forest owners use their land" (Chap. 11, pp. 96). "The use of forest and agriculture residues is in general beneficial (Chap. 11, pp. 78)". Kpl. 11 s. 80 "Using biomass for electricity and heat .....are among the most cost-efficient and effective biomass applications for GHG emission reduction in modern pathways (Chap. 11, pp. 80)".
45352	SPM	23	16	23	23	Decrease in deforestation rates may be true for America, Europe etc but not the case in Africa especially sub-saharan Africa where there is little significant increase.

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45600	SPM	23	16	23	17	It would improve readability if it would be possible to give a reference year, rather than using "AR4", for instance year 2000. Please consider to replace "but" with "and".
44204	SPM	23	16	23	17	This is a confusing sentence. We think what this sentence means is that AFOLU emissions have stabilized and have decreased as a fraction of total anthropogenic emissions. However, as written this could be understood to mean that there are natural and anthropogenic components of AFOLU emissions and the anthropogenic fraction has decreased, and that would be wrong because AFOLU only encompasses anthropogenic emissions. Suggest re-phrasing.
44205	SPM	23	16	23	23	As per comments on other parts of the SPM, the use of FOLU vs. AFOLU here is unclear. Presumably, these different acronyms are intentionally used and the main message is that emissions from the agriculture sector have high uncertainty (therefore AFOLU emissions have large historical and projected uncertainties). Suggest using explicit language likes this to help the reader correctly interpret these sentences.
47058	SPM	23	16	23	17	This first sentence needs some clarification. Does this imply that the non-anthropogenic AFOLU emissions share has increased? Or do you mean AFOLU's share of anthropogenic emissions from all sectors has decreased?
45962	SPM	23	16			but the share of anthropogenic .. ((share in the overall emissions?))
44617	SPM	23	16	23	23	The projections are a function of scenarios. The authors should make this fact clear.
44618	SPM	23	16	23	23	Regarding the first AFOLU key finding, the referenced sections (6.3.1.4 and 11.2 do not fully support the finding as stated. Please revise.
44619	SPM	23	16	23	23	The authors should consider rewording this key finding to better reflect what is in the second key finding the Executive Summary of Chapter 11 (see ES of Chapter 11, page 4, lines 13-29). Perhaps: "The AFOLU sector is responsible for just under a quarter (~9-12 Gt CO <sub>2</sub> eq/yr) of total anthropogenic GHG emissions; these derive mainly from deforestation and agricultural emissions from livestock, soil and nutrient management [11.2, medium evidence; high agreement]. Annual GHG emissions from agricultural production in 2000-2010 were estimated at 5.0-5.8 Gt CO <sub>2</sub> eq/yr while annual GHG flux from forestry and other land use (FOLU) change activities accounted for approximately 4.3-5.5 Gt CO <sub>2</sub> eq/yr. Leveraging the mitigation potential in the sector is extremely important in meeting emission reduction targets [11.9, robust evidence; high agreement]. While there is a large range in global FOLU flux estimates, most studies indicate a decline in FOLU CO <sub>2</sub> emissions in recent years, largely due to decreasing deforestation rates (particularly in the [Brazilian] Amazon region). Most projections suggest declining annual net CO <sub>2</sub> emissions in the AFOLU sector in the long run [11.9]."
45024	SPM	23	16	23	16	Please check: "but the share of anthropogenic" should probably be "and their share in anthropogenic"
45219	SPM	23	16			replace "but the" with "and its"
46927	SPM	23	16	23	23	What are the current emissions from the AFOLU sector? How much of these emissions stem from agriculture and how much from the FOLU sector? Please provide numbers of current emission levels.
45327	SPM	23	16			This should be since a specific year rather than AR4.
45326	SPM	23	16	23	23	The emissions trend for non-CO <sub>2</sub> gases associated with agriculture should also be provided.
44365	SPM	23	16			Suggest that "and" would be a better word than "but" to link the two components in the sentence.
44364	SPM	23	16	23	17	This headline statement does not make it clear whether this is all greenhouse gases or CO <sub>2</sub> only. The rest of the paragraph seems to be about CO <sub>2</sub>
45963	SPM	23	18	23	18	"FOLU" should be replaced by "AFOLU" here and maybe all other places where FOLU appears.
43764	SPM	23	18	23	19	The discussion believes that decreased deforestation is the most significant cause for emission reduction from FOLU. However, according to relevant conclusions in the underlying report (Ch11, P6, L11-12), it is the increased afforestation combined with decreased deforestation that lead to net emission reduction in the FOLU sector. It is suggested to add "and increased afforestation" after "deforestation rate".
44366	SPM	23	18			Unless there is a clear reason for sometimes using the term FOLU, we suggest the more common term AFOLU should be used throughout the SPM.
47059	SPM	23	19	23	19	How is "significant uncertainty" defined here and how does it compare to other sectors? Better to quantify here rather than provided qualitative statements.

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44902	SPM	23	19	23	20	The uncertainties associated with historical and projected baselines have very different causes and reasons, while this phrase suggests ("as well as") their uncertainties are equivalent. Uncertainties in historical baselines are associated with insufficient data and/or lack of availability of satellite images - they can therefore be improved through larger and/or better data sets and image availability. Projected baselines, on the other hand, are inherently uncertain for they depend on models and their respective assumptions, and still need historical data to validate the models. The sentence should be rephrased to reflect this "However, there is significant uncertainty in projected baselines AFOLU emissions and lack of data availability may increase uncertainty of historical baselines".
44200	SPM	23	2	23	3	The expression "have been in the range" used with a specific number does not make sense. Suggest simply stating "were 0.9 Gt CO <sub>2</sub> eq in 2010".
45733	SPM	23	2	23	3	for the statement 'Non CO <sub>2</sub> GHG emissions have been in the range of 0.9GtCO <sub>2</sub> eq in 2010' reference need to be mentioned.
44610	SPM	23	2	23	2	The authors should insert, "...opportunities for non-CO <sub>2</sub> gases, PRIMARILY FLUORINATED COMPOUNDS SUCH AS HFCs, SF <sub>6</sub> , etc."
45601	SPM	23	20	23	23	Please clarify interactions between AFOLU emissions and the residual land sink. Please site Figure TS: 4 in WG1). Please also site WG1 6.3.1 "Forest area expansion and increased biomass density of forests that result from changes in land use change are also carbon sinks, ...), and WG1 6.3.2.2.
45735	SPM	23	20	23	20	'medium evidence, high agreement' within bracket may be added after the word 'emissions'.
44206	SPM	23	21	23	22	This statement about the terrestrial system becoming a net sink by the end of the century is unclear. The terrestrial system is currently a net carbon sink. The authors have not taken into consideration the natural terrestrial carbon sink. Suggest instead that what is meant here is that anthropogenic activities in the agriculture, forestry and land-use sectors could result in a net sink before the end of the century. Recommend replacing 'terrestrial system' with 'AFOLU sectors'.
47060	SPM	23	21	23	22	"...net annual baseline CO <sub>2</sub> emissions...a net sink by the end of the century." This seems inconsistent with the WGI report. In particular, the WGI SPM, p. 26 says "The future evolution of land carbon uptake is less certain. A majority of models projects a continued land carbon uptake under all RCPs, but some models simulate a land carbon loss due to the combined effect of climate change and land use change."
45025	SPM	23	21	23	22	Please check the wording : is this really about "the possibility of the terrestrial system becoming a net sink", which may mean that it includes the sink due to increased GHGs in the atmosphere and its change following changes in concentrations as well as global warming, or solely the sink due to AFOLU activities, in the absence of any other change?
45459	SPM	23	22	23	22	"the possibility of the terrestrial system becoming a net sink before the end of century." it is already the case nowadays (as the terrestrial system account both for land-use change and the terrestrial sink which take approx one forth of CO <sub>2</sub> emissions over the last decade). see GCP annual report. The phrase should be rewritten to focus on land use change and forestry only.
43962	SPM	23	22	23	23	Please replace "and the possibility of the terrestrial system becoming a net sink before the end of the century" with "due to decline in land use, primarily deforestation, in most of the baseline scenarios, which leads to a decrease in CO <sub>2</sub> emissions from the land use sector". Please also add a new sentence at the end of the paragraph: "However it should be noted that the terrestrial system, including forests, already is a net carbon sink (see: Ballantyne, A. P., Alden, C. B., Miller, J. B., Tans, P. P., & White, J. W. C. (2012) and Pan, Y., Birdsey, R. A., Fang, J., Houghton, R., Kauppi, P. E., Kurz, W. A., ... & Hayes, D. (2011)).
45353	SPM	23	24	23	31	This measure can suit the reality of its application if to many countries or governments the demarcation of land use policy is kept in place. E.g currently in many sub-saharan countries there is no clear cut land use policies, maps etc for demarcation of land use to foster less climate change impacts.
44724	SPM	23	24	23	24	It seems to read that reducing forest management is a cost-effective option. Either swap around so it reads "options are forest management and reducing deforestation" or add e.g. "options are reducing deforestation and enhancing sustainable forest management" or similar.
45602	SPM	23	24	23	24	"...reducing deforestation and forest management". Please consider ..... "reducing deforestation and improving (or enhancing) forest management". Is "deforestation" really to be considered as a forestry (forest management) option?
44207	SPM	23	24	23	31	This paragraph is difficult to understand. Suggest reviewing and revising. Technical terms such as "supply side" are difficult to understand and hard to relate back to the main bolded headline statement for this paragraph. If possible, it would also be helpful to include information on how these statements on mitigation potential in AFOLU apply to different regions or developing/developed countries.
47061	SPM	23	24	23	26	This sentence does not accurately capture the issue and we suggest that it should be deleted. A full cost/benefit analysis of land mitigation depends on many assumptions regarding the value of state intervention and non-marketed benefits. Furthermore, the issue for policy makers is not necessarily which forestry/agriculture mitigation options are the most effective but whether it is cost effective to mitigate/adapt in this sector instead of or in addition to other sectors.

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44860	SPM	23	24	23	24	unclear message, it seems that it is cost effective to reduce forest management - please insert enhanced or continuous before forest management
44904	SPM	23	24	23	29	This paragraph has several important issues. The glossary defines "carbon price" mainly as a "required payment to some public authority" associated with cap and trade allocations or carbon tax measures. However, this does not seem to be how it is used in this paragraph. In AFOLU, forests in particular, one would expect the economic mitigation potential of supply side measures to be achieved in the presence of payments and incentives to actors in the supply side, and not to "some public authority". Because the term carbon price is usually associated with market based approaches, its use here is highly controversial. AFOLU is the only sector which has been explicitly excluded from the most successful emission trading schemes on the grounds of concerns towards environmental integrity. Why is then AFOLU the only sector in section 3.2 that has a "carbon price" analysis? This suggests a prescriptive policy bias towards market based approaches to the forest sector that should not have place in IPCC and is far from concluded. Policy measures and options to reduce deforestation, incentivize forest management and best practices in agriculture are much more comprehensive than carbon pricing; they include "command and control" measures, tax incentives, direct transfers, results based payments, payments for environmental services, requirements for loans, etc. If, however, the intent here (and in chapter 11) is to attribute an economic cost to mitigation actions in this sector, the term "carbon price" should be changed to "financial costs" or "positive incentives" throughout the text. Alternatively, the definition could be expanded to reflect this appropriately, for instance, "carbon price is the expected economic cost, usually in the form of a financial incentive, results based payment, direct transfer, tax rate or on some emission permit exchange, for the emission of 1 tonne of carbon dioxide into the atmosphere."
45964	SPM	23	24	23	24	According to my experience as a forest scientist, it is not so much "forest management" where there are major opportunities, rather, properly conducted afforestations. If the aim of "forest management" is to preserve carbon in forests, this aim is more likely to be achieved by non-professional, non-forestry means but by other (social etc.) means.
43960	SPM	23	24			The sentence can be misunderstood to recommend also reducing forest management (in addition to deforestation). If you add the word "developing" before the words "forest management" the misunderstanding can be minimized.
43961	SPM	23	24	23	25	Although it is a widely used notion, deforestation is actually not a forestry activity. It is most often an agricultural activity that removes land from forestry land use. Please therefore delete "forestry" and "in agriculture" and add AFOLU after "cost-effective".
44620	SPM	23	24	23	26	This statement of the key finding does not appear in the ES of Chapter 11. There is also no assigned level of evidence/confidence/agreement and there probably ought to be.
44621	SPM	23	24	23	31	This paragraph could incorporate the regional perspectives from Chapter 14.3.5, for example: "Studies reveal large differences in the regional mitigation potential as well as clear differences in the ranking of the most effective options." (Ch. 14, p. 32, lines 1-2).
44622	SPM	23	24	23	31	The authors should consider rewording this key finding to better reflect what is in the 6th key finding the Executive Summary of Chapter 11 (see ES of Chapter 11, page 5, lines 27-50). Perhaps: "Economic mitigation potential of supply-side measures in the AFOLU sector is estimated to be 7.18 to 10.60 (full range: 0.49-13.78) GtCO <sub>2</sub> eq/yr at carbon prices up to 100 US\$/ tCO <sub>2</sub> eq, about a third of which can be achieved at <20 US\$/ tCO <sub>2</sub> eq [11.6, medium evidence; medium agreement]. These estimates are based on studies that cover both forestry and agriculture, and do not uniformly reflect mitigation options or all greenhouse gases. Agricultural mitigation options at higher prices(100 USD/t CO <sub>2</sub> eq) include the restoration of organic soils; at lower carbon prices (20 USD/t CO <sub>2</sub> eq) the emphasis is on cropland and grazing land management. There is considerable regional diversity in policies to reduce deforestation: in LAM and MAF reduced deforestation policies dominate, while forest management and afforestation dominate in OECD90, REF and Asia [11.6, medium evidence, strong agreement]. Recent studies suggest demand-side measures, such as changes in diet and reductions of losses in the food supply chain, have significant albeit uncertain potential to reduce GHG emissions (0.76-9.31 Gt CO <sub>2</sub> eq/yr by 2050) [11.4, limited evidence; low agreement]."
44623	SPM	23	24	23	31	This key finding is taken from the 6th key finding of the ES of Chapter 11 (page 5, lines 27-50). The authors need to be consistent with respect to the number of significant digits when they employ rounding - here they use whole numbers, one decimal, and two decimals. It also needs to be made clear that the mitigation potentials of the demand side measures are "technical potentials" not "economic potentials."
46931	SPM	23	24			Please add "fostering sustainable" before 'forest management' (only sustainable forest management is an option for mitigation).
45328	SPM	23	24			Insert "increasing" forest management.

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45329	SPM	23	24	23	31	The use of \$100,\$20/ton CO2 to assess the mitigation potential of different options fails to identify the cost neutral/beneficial agricultural mitigation options for non-CO2 gases such as improved fertiliser/manure management, water management techniques and improved reproductive & plant & animal health measures. It would be beneficial to illustrate that some of the mitigation potential in the AFOLU sector is cost neutral or even beneficial to improving food production.
43765	SPM	23	24	23	24	The description of "The most cost-effective forestry options are reducing deforestation and forest management" is inconsistent with relevant content in the underlying report (Ch11, P11, L1-5; P52, L13-20; P53, Figure 11.18) as well as the conclusion presented in P23, L35 of the SPM. It is suggested to add "afforestation" after "management".
43766	SPM	23	24	23	31	Ensuring food security is a crucial concern of all countries, especially developing countries. Thus, it should be the prerequisite when choosing mitigation measures for the agricultural sector. To assess the obstacles faced by different mitigation measures in the AFOLU sector is crucial to ensure the feasibility of mitigation measures. It is suggested to do the following edits in accordance with the underlying report (Ch11, ES): (1) add the following text after the sentence in bold: "However, there are potentially many barriers to implementation of available mitigation options."; (2) add the following text in the end of this paragraph: "Agriculture is frequently central to the food security, especially in developing countries where it often accounts for a significant share of production. The greenhouse gas mitigation is just one of many that are vital to human wellbeing (robust evidence; high agreement). [11.1] Consequently, mitigation options need to be chosen under food security guaranteed in AFOLU sector. Many barriers to implementation of available mitigation options also should be considered and estimated, which include accessibility to AFOLU financing, poverty, institutional, ecological, technological development, diffusion and transfer barriers (medium evidence; medium agreement). [11.7, 11.8]"
47131	SPM	23	25	24	3	We think a statement on the reduction potentials of N2O and CH4 in land use would be merited.
44861	SPM	23	25	23	31	is there examples from the underlying chapter on what kind of real world policy instruments that could unlock these mitigation potentials?
45330	SPM	23	25			Unclear what "low carbon prices favour cropland and grazing land management" means. Extend this line to include improvements to animal husbandry & animal health and improvements to fertiliser and manure management
45603	SPM	23	26	23	31	It would be helpful to indicate the importance of improved governance and regulatory frameworks
44624	SPM	23	26	23	26	What does "economic mitigation potential" mean? The authors should define this term.
46932	SPM	23	26			The term "economic mitigation potential" should here be clearly classified against the term "mitigation potential", possibly by giving examples. In addition, the term "supply-side" in the context of this particular section SPM 3.2.4 should also be explained or defined.
45604	SPM	23	27	23	27	In table 11.8 in Chapter 11 an interval of 0.49-10.6 Gt CO2eq is presented for emission reductions from supply-side measures in AFOLU whilst in the SPM an intervall of 0.49-14 Gt CO2eq is used. Please clarify.
45736	SPM	23	27	23	27	the value '7.2 to 11' may be replaced by the value '7.18 to 10.60'.
44625	SPM	23	27	23	27	Why has the upper range of the economic mitigation potential of supply side measures gone up from 10.6 Gt in the SOD to 14 Gt CO2e/yr here in the FGD?
44626	SPM	23	27	23	27	It is not clear where the stated range for the economic potential of supply side measures comes from (i.e., 7.2-11 versus a previously cited full range of 0.49 - 14). The cited mitigation potentials in this finding seem to come from table 11.8 of chapter 11. All of the mitigation potentials stated in this finding should come from this table for consistency's sake.
45605	SPM	23	29	23	31	The potential of emission reduction by demand-side measure is presented as 0.76-9.3 Gt CO2eq. Could it be clarified if this includes CO2 from reduced demand for crop/grazing land with the possibility for carbon sequestration or bioenergyproduction on this spare land? In table 11.4 is given an estimate of 1.5-15.6 Gt CO2eq/yr for the combined effect of some supply-sided and demand sided measures that includes CO2 from carbon sequestration and bioenergy on spare land.
44903	SPM	23	29	23	31	A statement with limited evidence and low agreement and a range with a difference of 11x the lower and higher value hardly merits mention in a summary for policy makers. Delete from line 29 "demand side measures..." to "food production (0.76-9.3 GtCO2eq/year by 2050) in line 31"

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44765	SPM	23	29	23	31	Generally the assessment of the evidence and agreement of demand-side measures seems very low, particularly considering the large potential of a reduced consumption of ruminant meat and a reduction of food waste. Recent scientific findings estimate the technical potential as very high and are in large agreement (e.g. Bellarby et al. 2013, Garnett 2011, Kastner et al. 2012, Rosa and Dietz 2012, Smith et al. 2013, Stehfest et al. 2009). Disagreement could maybe be attributed to the degree of implementation that can be achieved. Behavioral and socio-cultural barriers might exist indeed and should be addressed. However, these barriers are not in the main focus in this text and the potential expressed in numbers and indicated e.g. in Figure TS.30, relates to the technical potential. Assessment of evidence and agreement as given in line 31 should therefore be separated in assessment of the technical potential and assessment of the potential of implementation. In my opinion the technical potential of demand-side measures receive far too less attention in this text. The potential lies in the fact that the whole production and food chain is affected by demand-side measure while supply-side measures often concern a small part of the production process. Furthermore supply-side measures might lead to significant pollution swapping or negative side effects, where mitigation measures for one emission source might well lead to higher emissions from another emission source. This makes supply-side measure much harder to assess and it does not seem logical why evidence and agreement of supply-side measures should be rated higher than demand-side measures. Bellarby, J., R. Tirado, et al. (2013). "Livestock greenhouse gas emissions and mitigation potential in Europe." <i>Global Change Biology</i> 19(1): 3-18. Garnett, T. (2011). "Where are the best opportunities for reducing greenhouse gas emissions in the food system (including the food chain)?" <i>Food Policy</i> Volume 36 ( Supplement 1): S23-S32. Kastner, T., M. J. I. Rivas, et al. (2012). "Global changes in diets and the consequences for land requirements for food." <i>Proceedings of the National Academy of Sciences</i> 109 (18): 6868-6872. Rosa, E. A. and Dietz, T. (2012). "Human drivers of national greenhouse-gas emissions." <i>Nature Climate Change</i> 2 (8): 581-586. Smith, P., H. Haberl, et al. (2013). "How much land based greenhouse gas mitigation can be achieved without compromising food security and environmental goals?" <i>Global Change Biology</i> : <a href="http://dx.doi.org/10.1111/gcb.12160">http://dx.doi.org/10.1111/gcb.12160</a> Stehfest, E., L. Bouwman, et al. (2009). "Climate benefits of changing diet." <i>Climatic Change</i> 95 (1-2): 83-102.
44627	SPM	23	29	23	31	The focus on food is too narrow; other stressors on forests and other natural lands is immense and should be refelcted in the text here, as well.
46934	SPM	23	29	23	29	"Changes in diet" is only understandable, if the reader knows that this phrase refers to a reduction of animal products. It would be better to be clear and re-phrase this section into: "Demand-side changes, such as a reduction of animal products in people's diet and ... "
45596	SPM	23	3	23	4	The issue regarding reduction of HFC by leak repair, refrigerant recovery and recycling is just as relevant for the chapters on buildings and transport. We propose that this chapter deals with emissions of f-gases related to production (cooling agents, aluminium), as well as the use of f-gases in production (metals, electronics) and (large) cooling appliances.
43687	SPM	23	3	23	3	The acronym HFC should be defined in the first instance.
45218	SPM	23	3	23	4	replace "have been in the range" with "were" (no range is given)
46923	SPM	23	3	23	4	The information that leak repair, refrigerant recovery and recycling is one opportunity to reduce non-CO2 GHG is not given in the SPM as stated in chapter 10.7. Taking into account the relevance of the different options described in chapter 10 to reduce non-CO2-emissions the example chosen is not appropriate. We propose to re-phrase the last sentence of this section into: "Key opportunities comprise e.g. the reduction of HFC-23 emissions by process optimization in the HCFC-22 production or by thermal destruction and in addition a substitution of HFCs used as refrigerants, foam blowing agents or solvents by alternatives [10.4]."
43761	SPM	23	3	23	4	The key opportunity in reducing non-CO2 GHG emissions lies in reducing HFCs emissions through modification of leakage and recycling and reusing of refrigerant, as well as reducing emissions of CH4 and N2O from the industrial production process as reflected in various tables in the underlying report (Ch10, P13, Figure10.4; P16, Table 10.3). However, the current expression only indicates HFCs as the key opportunity for emission reduction, which is half-truth. It is suggested to modify "Key opportunities comprise e.g. reduction of HFC emissions by leak repair, refrigerant recovery and recycling" as "Important opportunities comprise e.g. reduction of HFC, CH4 and N2O emissions", and to add further elaborations regarding difficulties in reducing non-CO2 emissions as the follow: "The reduction of non-CO2 GHGs also faces numerous barriers. Lack of awareness, lack of economic incentives and lack of commercially available technologies are typical examples." [10.7] (Ch10, ES, P6, L13-15)
45965	SPM	23	31			(0.76-9.3 GtCO2eq/year by 2050) ~ (for various measures the full range: 0.76-9.3 GtCO2eq/year by 2050)

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44628	SPM	23	31	23	31	The authors should delete this statement. "Findings" with "limited evidence" and "low agreement" should not be elevated to an SPM unless it is a groundbreaking discovery of extreme importance, etc. - which is not the case with this finding.
44314	SPM	23	32	23	35	This statement needs to provide assessment of technology needs and benefits in agriculture in order to be comprehensive and meaningful for policy makers.
43707	SPM	23	32		37	It is important to differentiate here according to the Warsaw decisions on forestry policy incentives between results based payments and alternative options such as joint mitigation and adaptation approaches for the integral and sustainable management of forests. The former implies ex post payments while the latter is related to financial public transfers (ex ante and ex post) for joint mitigation and adaptation outcomes.
44208	SPM	23	32	23	37	The bolded statement in this paragraph state that policies "need" consider both mitigation and adaptation. Suggest re-phrasing this as "are more effective when they". The supporting paragraph also does not clearly identify why this is the case. Adaptation is not even mentioned in the paragraph, so it is difficult for the reader to make a clear link with the bolded statement. Suggest revising.
44905	SPM	23	32	23	33	The term "need to account" is highly prescriptive and should be rephrased to "can be enhanced through both mitigation and adaptation".
45966	SPM	23	32	23	33	Isn't subsistence a very important issue here? I believe yes, so any mitigation and adaptation program needs to be linked up with seriously considering subsistence of local populations.
44410	SPM	23	32	23	32	We would suggest replacing the first "and" with "as well as" to get: "Policies governing agricultural practices as well as forest conservation and management need to account for both mitigation and adaptation."
44776	SPM	23	32	23	37	Actions related to REDD+ initiative, depending on the mechanism used to engage key stakeholders, may not be reflected positively on the agricultural sector. This warrants an analysis of the causes that have prevented REDD+ to be a real option for the agricultural sector.
44629	SPM	23	32	23	37	The text here reads as policy prescriptive and should, therefore, be revised accordingly.
44630	SPM	23	32	23	37	This key finding is taken from the 7th and final finding in the ES of Chapter 11 (see, respectively, page 6, lines 1-10, and page 7, lines 1-5). Some edits are needed to make the wording consistent with the ES of Chapter 11: (1) In Line 32: change "medium agreement" to "high agreement"; (2) In Line 32: change "very cost effective" to "cost effective"; (3) In Line 37: change "limited evidence, medium agreement" to "medium evidence, high agreement"; and (4) In Line 37 change [11.3.2, 11.10] to [11.5, 11.10]
45331	SPM	23	32			Policies governing agricultural practices and forest conservation and management "can contribute to both mitigation and adaptation"
44367	SPM	23	32	23	33	The statement would read better if "to account for both mitigation and adaptation" were slightly reworded as follows: "to take into account both mitigation and adaptation".
45737	SPM	23	33	23	33	'medium evidence, high agreement' within bracket may be added after the word 'adaptation'.
45606	SPM	23	34	23	34	"Soil and forest carbon stocks" will be a more proper term than "soil carbon storage".
44209	SPM	23	35	23	36	This statement could be interpreted as promoting a particular policy ("REDD+ can be a very cost effective policy option ..."), which would conflict with the IPCC objective to provide policy relevant but policy neutral advice. Perhaps this statement could be recast using REDD+ as an example of a cost effective policy. At minimum, given the medium evidence/agreement, this could be recast "REDD+ could be a very cost effective...". Also, not all readers will be familiar with the acronym REDD+. As a general rule, it would be best to avoid acronyms except those that are used frequently throughout the document.
44838	SPM	23	35	23	37	Perhaps true IF Implemented right but is it wise/appropriate to single out the REDD+ example?
44766	SPM	23	35	23	35	Define REDD+ (with a footnote).
45738	SPM	23	35	23	37	Policy makers are very keen on the potential, role and cost effectiveness, policies and experience so far on the REDD+ activities - please provide for more details on REDD+.
43963	SPM	23	35	23	35	Please define REDD +
46938	SPM	23	35			Please add a definition of REDD+.
44368	SPM	23	35			The acronym REDD+ should be spelt out or simply replaced with "reducing emissions from deforestation and forest degradation"
45607	SPM	23	36	23	36	Consider to include "and adaptation" after "environmental". Some AFOLU mitigation measures (e.g. REDD and reforestation) can be important adaptation measures (e.g. reducing soil erosion and run off and the risk of local flooding).
44906	SPM	23	36	23	36	REDD+ is inherently sustainable, for REDD+ assumes the implementation of safeguards. The qualifier "if implemented sustainably" is therefore not needed.
44315	SPM	23	38	23	40	This statement must also include the adverse socio-economic impact of such measure.
45354	SPM	23	38	23	44	Bioenergy can be easily spoken but for almost a decade has proven failure in its popularity usage amongst communities in Africa and Asia especially India. So taking or considering it as a mitigation measure takes us back to unrealistic



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44210	SPM	23	38	23	44	Suggest that this paragraph on bioenergy needs to more thoroughly explain the evidence base, as there are a several medium/low evidence/agreement statements in this paragraph. The expression "could play a critical role" seems very strong given the low levels of agreement or evidence described in the supporting paragraph for this statement. The statement on lines 40-41 would presumably not need evidence/agreement qualifiers, since the paragraph is stating that the scientific debate is unresolved.
44907	SPM	23	38	24	3	Brazil reiterates its previous comments on the manner which IPCC AR5 has addressed bioenergy, in particular biofuels. AR5 has consistently ignored literature that provides clear co-benefits of the use of bioenergy, besides its mitigation benefits, choosing instead to focus on caveats and so called indirect effects. There is no justifiable need to single out this form of renewable energy from a negative perspective. There have been no significant advancements in literature since the SRREN to justify the existence of appendix 11.13. Appendix 11.3 is extremely biased and not scientific sound. Several countries have questioned the value of appendix 11.3, more recently in IPCC 37 (Batumi, October 2013). We regret to see that nevertheless the authors have chosen to keep it in the report. It is most surprising that such an appendix, which has been severely questioned by several parties, could merit two whole paragraphs in the SPM, both singling out bioenergy in terms of requirements, needs, conditions, etc. The debate on ILUC involving bioenergy emissions is controversial and remains unresolved, as stated, but nevertheless has guided the authors. The extract about "policy conditions" is unduly prescriptive and goes beyond the capacity of an IPCC Assessment Report, once appropriate policy conditions are to be defined in the national level, according to countries' particular circumstances. Moreover, policy conditions do not apply only for bioenergy activities, but to any economic activity subject to emissions control policies: there is no need to single-out bioenergy in this aspect. To affirm there is "robust evidence, high agreement" that "large scale bioenergy deployment could increase emissions" only confirms a biased, generalistic approach to the matter and serves to the discredit of IPCC. If needed at all, both paragraphs can be greatly improved and resumed by being replaced with "Bioenergy may play a critical role in stabilizing climate change. Clear and comprehensive national policy frameworks, such as land use planning, may enhance the mitigation potential for bioenergy. Sustainable biomass for energy, in combination with improved cookstoves, biogas and smallscale biopower could further reduce GHG emissions and improve livelihoods and health. The debate about the marginal emissions of some bioenergy pathways, in particular around land-mediated equilibrium effects (so called indirect land use change), remains unresolved."
45967	SPM	23	38	24	3	It is suggested in the first para that there is still a debate ongoing on the marginal use of bioenergy. If this is the case, which I believe is, then it is not possible to claim that bioenergy could play a "critical" role, even if.... I suggest that the non-bold sentences be taken as the main messages of the para, and the current text in bold is deleted. The same is true for the next para: the sentence in bold should be deleted as it is not a main message, and the rest should be the main message. It is especially the claim in lines 23/48-24/1-3 sound worrying, and should be highlighted as relevant claims / see also bioenergy text on page 20 ((better coherence?))
43964	SPM	23	38			It could perhaps be more appropriate to say "a critical role in the mitigation of the climate change" than "in stabilizing climate change".
44631	SPM	23	38	23	44	This key finding is taken from the 10th key finding in the ES of Chapter 11 (page 6, lines 24-40). Some edits are needed to make the wording consistent with the ES of Chapter 11: (1) In Line 40: change "medium evidence, medium agreement" to "robust evidence, medium agreement"; (2) In Line 42: change "medium evidence, low agreement" to "robust evidence, high agreement"; (3) In Line 43: change "subject to considerable scientific uncertainty" to "highly uncertainty"; and (4) In Lines 43-44: delete "(low evidence, medium agreement)" since no assessment is given for this statement in the ES of Chapter 11.
44632	SPM	23	38	24	3	This is the final key AFOLU finding in the SPM. It is not a stand-alone key finding in the ES of Chapter 11, but is part of the 10th key finding in the ES (page 6, line 35-40). A couple of edits are needed to make the wording consistent with the ES of Chapter 11: (1) On Page 23, Line 46: Delete "(robust evidence, high agreement)." It's not that the assessment is incorrect, but rather that it is a new assessment of the material not made explicitly in the ES of Chapter 11 or in the text of section 11.13. The authors need to check if this is consistent with the guidance they were given for choosing key findings to highlight in the SPM; and (2) On Page 24, line 2: Change "(robust evidence, high agreement)" to "(medium evidence, medium agreement)".

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44633	SPM	23	38	24	3	The authors should consider replacing this key finding with the 11th key finding in the ES of Chapter 11 (page 6, lines 41-49). The point that good policy is needed to avoid conflicts with or minimize negative impacts on other social and environmental goods is valid for all the mitigation approaches discussed in Chapter 11. The finding is reproduced below for the authors' consideration: "Large-scale changes in land use, for biomass for energy, or for sequestration in vegetation, will likely increase the competition for land, water, and other resources, and conflicts may arise with important sustainability objectives such as food security, soil and water conservation, and the protection of terrestrial and aquatic biodiversity [11.4, 11.7, 11.13, medium evidence; medium agreement]. In some cases land-based mitigation projects may provide land, water and biodiversity co-benefits [11.7, medium evidence; medium agreement]. Sustainability frameworks to guide development of such mitigation projects need to consider competition for land [11.8, medium evidence; limited agreement]. Risks could be reduced by focusing on multifunctional systems that allow the delivery of multiple services from land [11.7, medium evidence; high agreement]."
45220	SPM	23	38	23	38	Suggest moving the message from p68 of the TS into the SPM as a new paragraph before line 38 [shortening to just the first 3 sentences for the SPM]: "The mitigation potential of AFOLU is highly dependent on broader factors related to land-use policy and patterns (medium evidence, high agreement). The many possible uses of land can compete or work in synergy. The main barriers to mitigation are institutional (lack of tenure and poor governance), accessibility to financing mechanisms, availability of land and water and poverty. "
45332	SPM	23	38	23	44	Should there be consistency with the level of agreement across the paragraph (medium versus low agreement)?
45960	SPM	23	4			emissions by leak repair ((HFC leaks to be repaired in the whole cycle of the HFC production-transport-use? explain for the sake of unambiguity))
45734	SPM	23	4	23	4	the word ' proper disposal and replacemnt by alternative refrigerants' may be added after the word 'recycling'.
45608	SPM	23	40	23	44	Information about the marginal emissions of bioenergy pathways is very important. The description here is too limited and seems to focus on indirect effects which will be very different from project to project. We believe that it would be better to use text from Technical Summary p.70 line 22-35. It would be helpful if the text could discuss the potential for near term substitution of fossil fuel with bioenergy. Furthermore, we believe that it would be useful to include a description of some of the challenges related to AFOLU, e.g. as in 11.4.1, p.30 line 14-16.
44211	SPM	23	40	23	42	Excessive technical jargon is used in this sentence ("marginal emissions", "land-mediated equilibrium effects", "indirect land use change"), making the supporting text for the headline sentence difficult to understand for many readers. Suggest revising.
43688	SPM	23	40	23	42	The paragraph 'The scientific debate ... remains unresolved (medium evidence, low agreement).' As written, this text implies that there is medium evidence and low agreement that the scientific debate remains unresolved. Presumably this is not the intended meaning. Authors need to reword.
44767	SPM	23	40	23	40	The assessment of evidence and agreement seems not very realistic. The recent scientific literature treats bioenergy much more ambiguous than other options such as demand-side measures. Furthermore, the assessment is strongly dependent on the type of bioenergy (e.g. first generation vs. second generation, residues vs. planted biocrops). The possible negative side effect are not easy to assess and often neglected. Alternative land use should be considered in the case that the substrate for bioenergy is actively grown for this purpose. But even if bioenergy should be gained from "residues", alternative use of these residues should always be considered, such as mulching for soil carbon increase or use as compost for fertilization (Smith et al. 2012, Wilhelm et al. 2004). These side effect ad significant uncertainties assessment of the potential of the use of bioenergy. A possible way forward would be to clearly separate the assessment of (i) bioenergy from actively grown plant biomass for this purpos, (ii) bioenergy from plant "residues" or "waste biomass" (e.g. animal manure) and (iii) bioenergy such as wood, animal manure and other biomass used directly for cooking and/or heating. In my opinion all three options are very different in their mitigation potential, impact on land use, ecological, economical and social side effects, as well as barriers of implementation. Mixing theses three options exacerbates a transparent assessment of the (scientific) evidence and agreement of evidence. Smith, W. N., B. B. Grant, et al. (2012). "Crop residue removal effects on soil carbon: Measured and inter-model comparisons." Agriculture, Ecosystems & Environment 161 (0): 27-38. Wilhelm, W. W., J. M. F. Johnson, et al. (2004). "Crop and soil productivity response to corn residue removal: A literature review." Agronomy Journal 96 (1): 1-17.
45739	SPM	23	40	23	40	the word 'medium' may be replaced by word ' robust'.
44634	SPM	23	40	23	44	As written, the text is obscure and contains jargon unlikely to be understood by a policymaker. The authors should clarify the language so it's comprehensible to a lay-reader.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
47062	SPM	23	41	23	41	This is too technical. Explain what "land-mediated equilibrium effect" is or delete whole subclause.
45221	SPM	23	42	23	44	Referencing 11.13 is quite vague (24 pages) for BECCS. Could be more specific?
45222	SPM	23	42	23	44	Suggest combining the bioenergy and CCS (BECCs) mentions by moving the sentence from p23 line 42-line 44 to p20 line 47. Our justification for this is that BECCS is low maturity so mentioning twice in the SPM is excessive.
44768	SPM	23	43	23	43	Define BECCS (with a footnote).
43965	SPM	23	43	23	43	Please define BECCS
46943	SPM	23	43			Please add a definition of BECCS.
44212	SPM	23	45		46	Suggest the authors consider adding a note to the bold headline about the potential negative effects of not having the right policy conditions in order to better explain this statement.
44777	SPM	23	45	24	3	it is important to promote the development of policies to regulate the use of land for bioenergy production in order to safeguard food production.
44635	SPM	23	45	23	48	The text here contains language that can be read as being too prescriptive: "sustainable bioenergy production" is not defined, and potentially could be achieved by many means, not just "a clear and comprehensive policy framework".
45333	SPM	23	45	24	3	Can the integration of biodegradable wastes (and animal waste) into energy streams be included?
45609	SPM	23	46	24	3	It seems unbalanced to discuss advantages for small scale and disadvantages for large scale bioenergy projects. We believe that large scale deployment also could be beneficial if they are implemented in a sustainable manner. It would be helpful if the text could describe the potential and conditions for these co-benefits also for large scale bioenergy projects. It would also be appropriate to describe the level of bio energy deployment (and land use assumptions) included in the different RCP scenarios in order to illustrate to what degree bioenergy contribute to stabilization scenarios.
45740	SPM	23	47			Add "Energy access to poor" after GHG emissions.....
45741	SPM	23	47	23	47	the word also may be inserted between the word 'and' and 'improve'.
45742	SPM	23	48	23	48	the 'of 2.7 billion rural inhabitant may be added after the word 'health'.
43966	SPM	23	48	24	3	The text in the parenthesis is relatively abstract ("e.g. price on fossil and terrestrial carbon, land-use planning, etc"). If the the words "considering indirect land use-emissions and actual fossil fuel substitution" were added to the text in the parenthesis, the sentence would be more understandable. So the full text in the parenthesis would be "(land-use planning, price on fossil and terrestrial carbon also considering indirect land-use amissions and actual fossil fuel substitution)". See Technical Summary, page71, lines 1-2.
44201	SPM	23	5	23	7	It is not sufficiently explained how technologies that are applicable to both small and large enterprises necessarily "help to reduce GHG emissions". Is the intended message that there can be efficiencies found if GHG reducing technologies are shared between different enterprises? Suggest clarifying. The term "crosscutting" at the beginning of this sentence is also confusing as it is not clear what it is referring to.
44202	SPM	23	6	23	6	The acronym defined here is not used anywhere else in the SPM, so it would appear that there is no need for it to be defined. As a general rule, it would be best to avoid acronyms except those that are used frequently throughout the document.
43762	SPM	23	7	23	9	"Industrial symbiosis/eco-industrial parks" is a typical case for promoting cross-level and cross-industry cooperation as well as sharing infrastructure and information, and has already been implemented widely in countries such as China, Japan, Denmark, Sweden, Australia, and Korea. It is suggested to add "Industrial symbiosis/ eco-industrial parks" after "e.g." in Line 9.
45961	SPM	23	8			waste heat, ~ reducing waste heat,
44764	SPM	23	15	24	3	Agriculture should be trated separately. It is very usefull to have an estimate of the mitigation potential and of the measures in this sector.
46925	SPM	23	15	24	3	Unfortunately the chapter was deeply revised. The clear demand-side/supply-structure is lost. Demand side measures concerning behavioural changes were cut. Furthermore there are several cases of inconsistencies with the Executive Summary of chapter 11, especially with regard to evidence and agreement and highlighting main results.
46926	SPM	23	16	23	17	In the Executive Summary the first sentence is rightly not highlighted. We suggest to delete the second part of the sentence, which gives no important information and the highlighted sentence from Executive Summary after "high agreement" as follows: "the AFOLU sector is responsible for just a quarter (~9-12Gt CO2eq/yr) of anthropogenic GHG emissions mainly from deforestation and agricultural emissions from livestock, soil and nutrient management [11.2, medium evidence; high agreement]."
46928	SPM	23	17	23	19	Please add in line 19 after "deforestation rates": "whereas emissions from "A" (Agriculture) slightly increased." Rationale: logical conclusion from statements in lines 16 to 19.

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46929	SPM	23	20	23	20	Please check whether "AFOLU" is the right term here. The sentences above are about FOLU and the projections of this sector. We assume it should read FOLU here as also suggested in the Executive Summary page 4, lines 23 - 29.
46930	SPM	23	20	23	23	The reference given here (Figure 6.5) should be checked. Figure 6.5 is about LUC not about AFOLU. If so, this reference should be deleted.
46933	SPM	23	27	23	27	The original numbers given in chapter 11 (7.18, 10.60, 0.49, 13.78) should be rounded consistently. It could read "as about" or 7.2, 10.6, 0.5, 13.8 or 7, 11, 0, and 14 respectively.
46935	SPM	23	30	23	30	Please delete "uncertain" and insert wording from SOD SPM "the barriers to implementation are substantial" this explains the uncertainty. Please delete after "significant" the insertion "but uncertain", and re-phrase this part of the sentence into: "... significant impact on GHG emissions from food production, because the barriers to implementation are substantial." Rationale: This explains the uncertainty.
46936	SPM	23	34	23	35	In the Executive Summary, page 6, lines 7–8, it reads "high agreement". Please correct.
46937	SPM	23	35	23	35	In the Executive Summary, page 7, line 3, it reads "can represent a cost-effective..." therefore delete "very".
46939	SPM	23	37	23	37	In the Executive Summary, page 7, line 4, it reads "medium evidence, high agreement" please correct here.
46940	SPM	23	38	23	42	Please re-phrase the section as follows: "Bioenergy could play a critical versatile role in stabilizing climate change, if provided the conversion of high carbon density ecosystems (forests, grass- and peat-lands) is avoided can be stopped and best-practice land management is implemented would be applied globally (medium evidence, medium agreement). The scientific debate about the marginal emissions of most bioenergy pathways, in particular around land-mediated equilibrium effects (such as indirect land use change), remains unresolved is ongoing (medium evidence, low medium agreement). The potential, costs and risks of BECCS are subject to considerable scientific uncertainty (low medium evidence, medium agreement). [11.13.]" Rationale: The scientific debate is not so much about whether or not indirect effects occur, but rather how their impacts can be located, quantified and attributed, e.g. to bioenergy production, and how the existing risks can be mitigated. This means, the debate on iLUC factors and appropriate ways to avoid indirect effects remains unresolved. Given the considerable risk involved into massive further propagation of bioenergy use (e.g. for BECCS) provided highly ambitious assumptions (land conversion stopped, global best practice land management etc.) are not met potential, cost and risks of BECCS are of high certainty. Accordingly, evidence for high risk of BECCS promotion is not low but medium given the high risks of indirect land use change and other marginal effects of poorly planned bioenergy interventions.
46941	SPM	23	40	23	40	In the Executive Summary, page 6, line 26, it reads "robust evidence", please correct.
46942	SPM	23	42	23	42	In the Executive Summary, page 6, lines 32-33 it reads "robust evidence, high agreement" please correct here.
46944	SPM	23	45	23	46	Priorities should be turned around: Primarily, sustainability frameworks must prove to be effective, and then sustainable potentials can be realized. Please re-phrase the introductory, highlighted sentence into: "A clear and comprehensive policy framework, which is proven to be effective in practice, is essential for realizing sustainable bioenergy potentials."
46945	SPM	23	48	24	3	It is not understood how the absence of the policy condition "price on fossil and terrestrial carbon" could increase emissions from large scale bioenergy deployment.
44003	SPM	23	10	23	14	Select options of waste management in the lower hierarchy only due to its level of availability, discourage better options on the design and implementation stages. It is proposed not to underestimate those other options that could be appropriate for different countries or regions.
45894	SPM	23	5	23	9	This part, which focuses only on cross-cutting technologies, is not sufficient. In addition to them, effectiveness of advanced technologies in major emitting sectors (e.g., coke dry quenching in steel production, Page 24 Chapter 10) should be appropriately described in the SPM.
44612	SPM	23	15	24	3	There are a number of instances where the authors alter the key AFOLU findings in ways that are inconsistent with the presentation of the same points in the Executive Summary of the Chapter 11. The Executive Summary and the SPM need to be consistent. Generally speaking, the Executive Summary at the front of each chapter should highlight a broader set of key findings and the SPM should highlight a subset of these finding that have the most support and have the most potential for influencing policy. Findings not included - and clearly highlighted - in the Executive Summary, should not be included in the SPM.
44613	SPM	23	15	24	3	One striking feature of the SPM summary of the AFOLU chapter is the relatively low level of confidence, evidence, and agreement that are assigned to the many key findings. The statement characterizing the demand-side mitigation measures (page 23, lines 29-31) is particularly weak.
44614	SPM	23	15	24	3	This summary of the AFOLU chapter is cited as "limited evidence, low agreement". By contrast, the summaries of the other chapters typically characterize their key findings as "robust evidence, high agreement". Where possible, the points highlighted in the SPM should have relatively strong support.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44615	SPM	23	15	24	3	The levels of confidence, evidence, and agreement assigned the key points in the SPM often do not match the levels of confidence, evidence, and agreement assigned the same key points are assigned in the Executive Summary (ES) of Chapter 11. The authors need to take great care to not misrepresent the key findings from the underlying chapters.
44616	SPM	23	15	24	3	The authors should use more care in differentiating agriculture, FOLU, and AFOLU.
45895	SPM	23	24	23	26	The Agriculture, Forestry and Other Land Use (AFOLU) sector is a main driver of GHG emissions, responsible for approximately one quarter of anthropogenic GHG emissions. Moreover, grassland fires, loss of wetlands, or calving of permafrost soils are some of the largest GHG emission sources. Page 23, line 24-26 covers grazing land and organic soil, but the reference seems a little vague and believe it would help readers understand the sources being referred to here is was written more concretely. Recommend more clarity with this sentence and also request that attention be made to clearly stating whether or not grazing lands include savanna or unmanaged grasslands and also whether organic soils referred to here include wetlands which are not used for agricultural purposes. If AFOLU does not include savanna, unmanaged grasslands and agricultural wetlands, request that conservation measures for these lands be evaluated in future studies, as grassland fires, loss of wetlands and thawing of permafrost are also major sources of GHG emissions and should be evaluated in the future.
44400	SPM	23	40	23	44	On text backed by "low evidence" or "low agreement", it is proposed to be deleted the text between "The scientific debate [...]" (line 40) to "[...] [11.13]" (line 44).
46951	SPM	24		24	7	Please provide information on the current fraction of the global population living in urban areas. Please add after [... to almost double, ... ] "with a share of X percent of the global population".
44213	SPM	24	1	24	2	For consideration: Should there also be a mention of potential impacts on food security?
43968	SPM	24	1	24	3	What kind of bioenergy deployment is meant here; wide-spread use of small-scale applications or wide-spread use of large-scale applications" or perhaps both?
46946	SPM	24	1	24	33	Maybe it is worth talking about 1) the CO2 net emission of cities and 2) that CO2 is not the appropriate measure to identify a city as a green city. It is more about quality of living and of the environmental conditions and if a city implements mitigation and adaptation efforts.
44369	SPM	24	1			Delete "etc" - this is not necessary after "e.g."
45460	SPM	24	11	24	12	« Continuing infrastructure expansion could produce cumulative emissions of 3000-7400 GtCO <sub>2</sub> up to 2100. » should be rephrased. It seems that it draws on a misquotation of Davis and al. In Chapter 12. The point of those author was that 496Gt of CO <sub>2</sub> will be emitted over the next 50 years by existing infrastructure (power plants, engines,...) and that their is a large opportunity of mitigation considering that BAU would lead to 3000-7400 GtCO <sub>2</sub> emissions on top of it due to new « infrastructures ». It is not the emissions contained in roads, building,... as could be understood from this shortcut.
45610	SPM	24	11	24	12	Please consider illustrating how this cumulative GHG emissions relate to the overall global policy goal of limiting global warming below 2 degrees, for example as percentage of the relevant carbon budget from AR5 WGI SPM. For it to be likely that global warming is limited to 2 degrees Celsius, the cumulative global CO <sub>2</sub> emissions over the period 2011-2100 should be in the range 630 - 1180 GtCO <sub>2</sub> (ref Table SPM.1).
44215	SPM	24	11	24	11	Suggest it would be helpful to add some context for the statement that 'Urban areas are expected to triple between 2000 and 2030'. Chapter 12's executive summary says that expansion of urban areas is twice as fast as urban population growth. This information and some additional information about the drivers of this expansion, would be useful.
43769	SPM	24	11	24	11	The prediction of expanding urbanization does not fully cites the conclusion in the underlying report but only the maximum value. It is suggested to refer to the underlying report (Ch12, P22, L10-12) that "They forecast that between 2000 and 2030, urban areas will expand between 0.3 million to 2.3 million km <sup>2</sup> , corresponding to an increase between 56% to 310% (see Table 12.3 and Angel et al., 2011; Seto et al., 2011, 2012)" and replace "triple" in the SPM with "56% to 310%".
43770	SPM	24	11	24	12	Here the estimated cumulative emission is 3000-7400 GtCO <sub>2</sub> eq, inconsistent with that in the SPM.1. Moreover, the estimation is based on one single research, thus is of great uncertainty and little reference value. It is suggested to revise the sentence as follows: "To a certain extent, the continuing infrastructure expansion with urbanization could produce cumulative locked-in emission."
45611	SPM	24	12	24	12	Please consider to insert the sentence in line 17-18 after "...up to 2100." in line 12. We believe that this paragraph should reflect lock-in.
44216	SPM	24	12	24	12	Suggest that the cumulative emissions numbers given here be presented in the same way as in Table SPM.1 (i.e., for the same accumulation period - 2011 to 2100 - and representing the same percentile range across scenarios). The range that is given here may raise questions since the upper bounds are above bounds that are given in the table (which represents global, and not just urban, emissions).
44387	SPM	24	12	24	14	I don't understand why the following sentence is needed in this paragraph: "Currently, average per capita emissions embodied in infrastructure are more than five times higher in industrialized than in developing countries." I suggest that sentence is deleted or changed.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44645	SPM	24	12	24	14	This statement should be deleted. It is not relevant in the context of the header, which speaks to the next two decades.
44908	SPM	24	13	24	14	Replace "industrialized" by "developed", for clarity.
46948	SPM	24	15	24	21	The conclusions of SPM-section 3.2.5, lines 15-21, which indicate the most effective elements of urban development policies in favour of urban mitigation, are very important. Please keep paragraph.
45750	SPM	24	16	24	16	the word 'high' may be added in place of the word 'robust'.
45612	SPM	24	17	24	18	Please consider to move this sentence to line 12, as we believe that lock-in is even more relevant to the text about infrastructure.
45613	SPM	24	17	24	18	The importance for urban areas to increase or maintain sustainability (e.g. preserving ecosystem services, implementing low carbon solutions) should be added here, cf. TS p. 72 I. 25-26: Please consider to include this sentence from TS "For rapidly developing cities, options include shaping their urbanization and infrastructure development towards more sustainable and low carbon pathways."
45751	SPM	24	17	24	17	successful implementation of urban mitigation strategies can provide co benefit (high evidence, high agreement)' may be added before the word 'infrastructure'.
43689	SPM	24	19	24	19	The use of the phrase 'high land use mixes' is unclear. Does this mean that land use needs to be mixed and varied on small spatial scales?
46949	SPM	24	19			Please explain the term "high land use mixes" or provide an example.
45743	SPM	24	2	24	2	the bracketed words 'robust evidence, high agreement' may be replaced by 'medium evidence, medium agreement).
45614	SPM	24	20	24	20	We propose that "public transit" is substituted by "public transport".
45224	SPM	24	20	24	20	is the word "supportive" necessary?
44217	SPM	24	22	24	22	Should "reduction" be replaced by "avoidance"? The statement is about future emissions - which means emissions that have not yet been made, and thus there are presumably options to avoid future emissions (as opposed to reducing emissions relative to current levels).
44646	SPM	24	22	24	27	The phrase "can be limited" is confusing. Does this mean now? Perhaps rephrase the text to read "...are important."
44647	SPM	24	22	24	27	Findings from Sections (14.3.6, 14.4.3) could be elevated to this part of the SPM.
43771	SPM	24	22	24	23	The reference to "largest" in the topic sentence only appears in the ES, and lacks support from the underlying report. It is suggested to replace "largest" with "important", to avoid subjective judgment on this matter.
43772	SPM	24	22	24	27	This paragraph only emphasizes the mitigation potential in countries under rapid urbanization, but does not touch upon the mitigation strategies in developed countries that have achieved urbanization. Apart from building new infrastructures, Ch8 & 12 in the underlying report have also mentioned mitigation potentials brought by urban redevelopment, and infrastructure upgrade and improvement in industrialized countries. Moreover, according to "average per capita emissions embodied in infrastructure are more than five times higher in industrialized than in developing countries (see Line 12-14, P24, SPM).", it can be concluded that the mitigation potential of urban redevelopment in developed countries can be quite large. Thus, it is suggested to add the following sentence before "The bulk of" in Line 24, "In mature cities, refurbishing or repurposing of old infrastructure offers primary mitigation opportunities (Ch12, P30, L35-37)." In addition, because of their weak capacity, developing countries need financial and technical support to implement mitigation measures that involve spatial planning. Thus, it is suggested to add the following sentence at the end of this paragraph: "International sources of funding will facilitate urban mitigation efforts and avoid the lock-in effect of carbon-intensive urbanization in developing countries.", in accordance with Section 12.6 of Chapter 12.
45409	SPM	24	24	24	24	It is suggested to substitute "can be limited" by "can be a limiting factor".
45752	SPM	24	24			Suggest replacing "Can be limited" by stating good governance, technical, financial, etc "are required".
45753	SPM	24	24	24	24	the word 'high' may be added in place of the word 'robust'.
45754	SPM	24	25	24	25	the word 'where these capacity be limited or weak' may be added after the word 'countries'.
45755	SPM	24	26	24	26	the word 'a city's' may be deleted.
44218	SPM	24	28	24	33	We assume that in many cities, the focus of the plans is more on adaptation than mitigation, so perhaps the headline should be nuanced a bit to recognize that this is the case. Also, it would be useful to say something about where these thousands of cities are located - are the primarily in developed countries, or is this also happening in developing countries? The sentence about reducing urban sprawl could also reflect that there are co-benefits for biodiversity and ecosystems
44648	SPM	24	28	24	33	The authors could include the integration of regional mechanisms to this piece of the SPM to realize connectivity in infrastructure, energy, trade, technology (14.5)
46950	SPM	24	28	24	33	Add after "(...) and even less evidence as to the GHG impacts." (line 30): "Therefore measures are needed to quantify the net CO2 balance of a city and to combine GHG mitigation strategies with other mitigation co-benefits". In addition, please add to the reference list "[12.9]".

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
47063	SPM	24	29	24	30	"There is little systematic reporting...". Is this true? ICLEI has gathered and published GHG data from hundreds of cities worldwide. This recent development should be acknowledged.
45335	SPM	24	29	24	30	This is an important message for policymakers
45744	SPM	24	4			sub-heading may clarify that the section specifically deals with urban only.
44637	SPM	24	4	24	33	Regarding Section 3.2.5, this section seems short given the relative importance of infrastructure and spatial planning over the coming decades.
44638	SPM	24	4	24	33	Section SPM.3.2.5 would benefit from adding the finding from the executive summary of Chapter 12, that successful implementation of urban climate change mitigation strategies can provide co-benefits (Ch. 12, p. 6, lines 37-41). Policymakers are very interested in strategies that provide multiple benefits.
44214	SPM	24	5	24	5	What is a "megatrend"? Please avoid the use of technical jargon. Why not simply say "Urbanization is transforming ..."?
45745	SPM	24	5	24	5	the word 'global' may be added after the word 'urbanisation' is a'.
45746	SPM	24	5	24	5	the word 'human settlement' may be added after the word 'transforming'.
45747	SPM	24	5	24	5	the word 'robust' may be added in place of the word 'medium'.
44639	SPM	24	5	24	5	The authors should choose a word other than "megatrend", which is jargon and not likely to be comprehensible to a policymaker.
45223	SPM	24	5	24	5	"megatrend" isn't in the glossary, replace with a conventional word or phrase.
45748	SPM	24	6	24	6	increase to 5.6-7.1 billion or 64-69% of world population' may be added after the word 'expected to'.
45749	SPM	24	6	24	6	the word 'almost double' may be deleted.
44642	SPM	24	6	24	11	There are two statements here which, although not necessarily contradictory, are eyebrow-raising: "By 2050, the global urban population is expected to almost double." (Line 6). Also, "urban areas are expected to triple between 2000 and 2030." (Line 11). Are both of these correct? It seems puzzling that urban area would expand much more rapidly than population.
44640	SPM	24	6	24	6	The authors need to provide a baseline for this statement. Consider: "By 2050, global urban population is expected to almost double FROM CURRENT LEVELS."
44641	SPM	24	6	24	7	It would be good to re-order this statement, putting the description of the present state first, followed by the projection of the future.
45026	SPM	24	6	24	6	"By 2050, the global urban population is expected to almost double". Relative to when? (you may simply add "... double between X and Y, as already done in line 11 of the same page)
43767	SPM	24	6	24	7	The expression here of "around 70% with low evidence" is inconsistent with that of "more than half" in the Technical Summary (P71, L24-25) and Chapter 12 of the underlying report. It is suggested to modify the number in accordance with the TS and the underlying report as: "Urban areas account for more than half of the global primary energy use and energy-related CO2 emissions (medium evidence, high agreement)."
44839	SPM	24	7	24	7	Does 70 % refer to direct and indirect energy use. Presumably both. Please clarify.
44643	SPM	24	7	24	7	What about *total* GHG, though - not just energy CO2 (which is 65% of the problem)?
44840	SPM	24	9	24	14	Triple in area, number, population or what? Does the 3000-7400 Gton include indirect emissions and assume current emission factors for steel, cement and other building materials? Further - what mechanisms are you referring to?
44644	SPM	24	9	24	14	As this paragraph describes, there is robust evidence in Chapter 12 supporting the assertion that the next two decades present a window of opportunity for mitigating urban GHG emissions because most of the world's urban areas have yet to be constructed and the infrastructure construction itself could produce very large amounts of GHG emissions. Although Chapter 12 describes how spatial planning during infrastructure construction can mitigate GHG emissions during the subsequent use/operation phase of urban infrastructure, Chapter 12 does not describe strategies to mitigate GHG emissions during construction itself (e.g., the production of infrastructure materials such as concrete and metals). The authors should consider adding a sentence to the end of this paragraph directing readers to other chapters that discuss opportunities for mitigating GHG emissions during urban infrastructure construction. For example, the section on buildings (SPM, page 22, lines 5-7) states, "Recent large improvements in performance and costs make very low energy construction and retrofits economically attractive. [9.3]"
45334	SPM	24	9	24	11	This is an important message for policymakers
43768	SPM	24	9	24	10	The degree of evidence for the topic sentence is inconsistent with that in the TS report (P72, L9) and underlying report. It is suggested to replace "robust evidence" with "limited evidence" in the end of the sentence.
46947	SPM	24	2	24	2	In the Executive Summary, page 6, line 40, it reads "medium evidence, medium agreement". Please correct here.

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44636	SPM	24	4	24	33	Section 3.2.5: Policymakers are very interested in strategies that provide multiple benefits and that provides compelling incentive and rationale for action, however, this is left out of the SPM for Chapter 12. The authors should consider adding the following paragraph to SPM 3.2.5 addressing the opportunity for climate change mitigation strategies to provide significant economic, social/health, and environmental co-benefits. The following suggested language/paragraph is an augmentation of the last summary point of the Executive Summary of Chapter 12 (Page 6, lines 37-41) and would fit after the paragraph on bundled instruments, at line 22. "Successful implementation of bundled urban climate change mitigation strategies can provide significant economic, social/health and environmental co-benefits, providing additional motivation for undertaking GHG mitigation activities [12.8; Table 12.6]. Co-benefits include: lowered morbidity and mortality from air pollution [12.8.1]; energy cost savings and greater energy security [12.8.2]; preservation of open space and reduced ecosystem impacts [Table 12.6]; physical and mental health benefits of community livability and walkability [12.8.3], and; increased property values. Strategies that also reduce urban heat island (UHL) effects can, in turn, mitigate the UHL-caused exacerbation of other problems, such as increased energy demand for building air conditioning, increased smoggy days, and morbidity/mortality from heat and poor air quality [12.8.4]."
43465	SPM	24	6	24	6	Provide the current population figure of the global urban population.
45974	SPM	25		29		Concerning mitigation policies, the concept of "key category analysis", applied in GHG inventories, should be applied. In other words, it would be nice to see a discussion on the relative potentials and costs of the various aspects of policies covered in this section. A prioritization in discussing options would certainly contribute to the (hopefully) positive effect of the section on policy makers.
45968	SPM	25	1			SPM.2 and this SPM.4 are introduced with some kind of an abstract (being very useful for the readers of the SPM), however, such an intro is missing from the SPM.3 (page 13)
44317	SPM	25	10	25	23	This statement on "low carbon economy" is biased towards fossil-fuel based energy systems. AFOLU and other sector shall be discussed in SPM. There is also no agreement or definition for what a low carbon economy is.
45615	SPM	25	10	25	10	Please consider to include "substantial shifts in" after "... implies" We believe this will reflect better the scale of transformation needed. Another alternative is to reflect some of the most relevant (median) numbers from the paragraph in bold statement.
44842	SPM	25	10	25	23	Can the number for end-use efficiency be related to total investment in end-use technologies (vehicles, buildings, factories etc)? What is the additional investment in relation to total investments? Presumably the change is smaller than what you show for the shift away from fossil in energy supply investments.
44909	SPM	25	10	25	23	It is important to clarify whether the transition in investments will occur naturally or if it would be induced, for the scenario of stabilization of GHG concentration to be reached.
45973	SPM	25	10	25	23	apparently the energy efficiency investments have the most crucial potential for 2010-2029 as seen also in figure SPM.12, but the annual estimate for the energy efficiency investments in transport, buildings and industry is not comparable with the median for en. efficiency for other sectors in that figure
45757	SPM	25	10	25	10	to limit warming to 2 degree celsius require considerable different patterns of investment' may be added after the word 'economy'.
45336	SPM	25	10	25	23	This is a very important message for policymakers. However, the multitude of brackets makes it hard to read. Suggest splitting into two sentences with the first sentence containing the high level statement. E.g. "Investment in conventional technologies associated with the energy supply sector would decline by 30bn USD per year over 2010-2029, while investment in low carbon electricity supply would rise by 147bn USD per year". Then suggest placing ranges in a footnote. The explanation and the median percentages could be included in a new sentence.



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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
43773	SPM	25	10	25	23	This section is about analysis on the investment needs for low-carbon transformation, but fails to fully reflect information enclosed in the underlying report. It is suggested to improve this section from following aspects. Firstly, apart from new investment modes needed for low-carbon economy transformation, the need for "new" and "additional" investment should be added. Secondly, add descriptions regarding the regional distribution characteristics of investment needs for low-carbon economy transformation, and particularly the investment needs of developing countries. Thirdly, add elaborations on the special and key role of public finance played in low-carbon economy transformation under the broad framework of international cooperation on climate change. To sum up, detailed suggestions are as follows: (1) There is no agreed definition of "climate finance" yet, thus it is suggested to add the sentence "There is no agreed definition of 'climate finance' (BOX TS.14) in this paragraph. (2) Provide the specific amount of investment needed for low-carbon transition in developing countries. (BOX TS.14) (3) The expression of "several USD 100 billion" at L19, P25 is inaccurate, and should be replaced by "USD 336(1-641) billion"; (Ch16, P15, L31-32) (4) The expression of "global total annual investment in the energy system is presently about USD 1200 billion" lacks evidence from the underlying report. It is suggested to either provide related reference or delete this sentence. (5) Add ", of which only a small share flows to developing countries" after "343 to 385 billion per year" at L21-22, P25. (6) when addressing financial inflows to developing countries, official data from the UNFCCC rather than that from a single research paper should be used. Thus, it is suggested to replace "around USD 35 to 49 billion..... (medium confidence)" in L22-23 with "a total of USD 58.4 billion for the period 2005 through 2010, an average of nearly USD 10 billion per year". (Ch16, P11, L31-32)
45971	SPM	25	11	25	12	that is the RCR480 and RCR530 scenarios only (as suggested in above comment on usefulness of introduction of the "Reference Concentration Ranges"
43969	SPM	25	11	25	12	Please move "(without overshoot)": "...stabilize atmospheric concentrations (without overshoot) in the range...."
45758	SPM	25	12	25	12	the word 'without overshoot' may be deleted.
44221	SPM	25	13	25	18	This is a very long sentence. It contains interesting information, but would be more useful to readers if it was split up or perhaps presented in a visual format.
45760	SPM	25	13	25	13	i.e. those without additional mitigation policies' may be added after the word 'scenarios'.
45759	SPM	25	14		15	It is proposed that investment for extraction of fossil fuels would reduce globally. However, investments on fossil fuel extraction would help to extract not only crude oil that may be polluting, but also gas. Hence the estimate to reduce investment in this sector may be misleading and could be dropped.
44843	SPM	25	15	25	17	Would it be reasonable to also express the median values in bn USD rather than in percent? Confusing.
44649	SPM	25	15	25	15	"30 (2-166)" What does the range exactly represent? Seems like an awfully big range. The authors should clarify.
44650	SPM	25	15	25	15	Is this "-20%" per year? Or is it over the entire 2010 to 2029 timeframe?
46955	SPM	25	15	25	17	RE, nuclear and CCS cannot be summarized as equally valuable low-C-electricity supplies, because they imply significantly different risks. Please provide individual numbers.
45761	SPM	25	16	25	16	the word 'emissions generation technology' may be after 'low'.
45762	SPM	25	16	25	16	the word 'carbon electricity supply' may be deleted.
45972	SPM	25	17			billion USD per year (median: +100%) ((the median is expressed in % ? while the investment indicator is given in terms of USD))
44222	SPM	25	18		20	The stated estimate for increase in investment in buildings, industry and transport is not substantiated in the chapters noted at the end of the paragraph. Please include appropriate references for this information.
44844	SPM	25	19	25	19	"are expected to increase" or "would increase"?
44651	SPM	25	19	25	19	"...are expected to increase by several USD 100 billion per year". The authors should clarify the text to read: " several hundred billions of USD per year".
45411	SPM	25	20	25	21	It would be helpful to describe also the assumption in the models with respect to the expected change (increase) in overall investments in the energy system and in addition it would be important to highlight also the change (if any) in the share of investments in the energy system. This would help to put those investments into context and help any reality check with the underlying assumptions of the scenarios.
45763	SPM	25	20		23	point made is not clear; Is current climate finance too low? Is its share in annual investment inadequate?
46956	SPM	25	20	25	22	These numbers on the investment in the energy system and the numbers on climate finance need more explanation. Please 1) add after "(...) global total annual investment in the energy system" (line 20) "excluding energy efficiency measures" and after 2) "(...) estimated at USD 343 to 385 billion per year" (line 22) ", of which around 95% was invested in mitigation."

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45461	SPM	25	21	25	21	what do the authors mean by 'climate finance'? Mitigation only, or including adaptation (the way climate finance is understood under the UNFCCC)?
44223	SPM	25	21	25	22	The term "climate finance" may not be known to all readers. Suggest avoiding jargon such as this.
45410	SPM	25	21	25	23	It should be clarified whether "climate finance" and "total climate finance" addresses only mitigation or also adaptation and whether the scope covered by the figures differs, given the different wording.
44416	SPM	25	21	25	23	The financial values in this sentence are seriously doubted. The overall financial flows can only be included if there is a statement of the share of these flows that is "new and additional". WRI reports, for example, suggest that much fast-start funding did not meet this criterion. Is the range of \$35 to 49 billion ANNUAL? Fast-start funding up to 2012 was on average \$10 billion, and South Africa is not aware of any evidence of this tripling; on the contrary, public finance has diminished since 2012, not increased.
44911	SPM	25	21	25	23	Given that scientific literature on climate finance is very limited, that there are no agreed definitions to climate finance, that quantitative data are limited and that accounting systems are highly imperfect [Chapter 16, page 3, lines 4-7], the estimate provided in lines 21-22 of the SPM is questionable from several perspectives. By including domestic flows and the full value of the financial flow rather than the portion attributed to the emission reduction [Chapter 16, page 6, lines 22-28], the estimate overlooks the perceived implementation deficit of the finance commitments made by Annex II parties under the UNFCCC. Annex II reports to the UNFCCC indicate an average of USD 10 billion per year, between 2005 and 2010 [Chapter 16, page 11, 30-33], a figure at least 34 times lower than the USD 342-385 billion provided. It is suggested to exclude the reference to the estimate. The lack of a precise definition of climate finance should not be an excuse to implicitly ratify an estimate (by inserting it on the SPM) largely based on double counting of climate finance. The additionality of financial resources is an essential feature of effective climate finance and a commitment under the UNFCCC (Article 4.3), and the displacement of ODA to climate finance mechanisms could hamper other important imperatives [Chapter 13, page 54, lines 15-19]. Different financial commitments should be accounted for separately. It is questionable therefore that the report suggests, without any specific scientific reference, that UNFCCC funding vehicles can be counted as ODA [Chapter 13, page 53, lines 24-26]. It must be recalled that under the Monterrey Consensus on financing for development, developed countries reiterated the target of 0.7 per cent of GNP as ODS to developing countries. Additionality of climate finance to ODA should at least encompass that financial resources directed to climate change are additional to the 0.7% target.
44769	SPM	25	21	25	21	What precisely is meant by climate finance in this context?
45337	SPM	25	21			A specific year should be stated instead of using the term 'current'.
47064	SPM	25	22	25	23	This sentence is potentially misleading. It invites a comparison between the overall total of public and private finance with the total flow of public finance only. We therefore suggest that you delete this sentence ("around USD... countries (medium confidence)") and replace it with the key statement in the executive summary of Chapter 16: "The total climate finance currently flowing to developing countries is estimated to be between USD 39 to 120 billion per year."
44770	SPM	25	22	25	23	What about the difference to the total climate finance of USD 343-385 billion per year? Is it private climate finance? Flowing to which countries?
44910	SPM	25	24			Please clarify why data on OECD countries is not presented in this figure, which is illustrated in terms of "World" and "non-OECD".
46957	SPM	25	24			This figure needs more information, e.g. (1) reference level of needed and expected investments, in particular for 2010 and 2029; (2) what is the comparison exactly about: between the years 2010 and 2029 only in absolute figures, or a medium or median value for the whole period; (3) what does "total electricity generation" at the x-axis stand for? - as a sum of all other areas, incl. the negative trend for fossil power plants? (4) It would be pivotal to present an additional column on the total net additional investments of "Electricity Generation".
44652	SPM	25	25	25	25	Figure SPM.12: In the first line of the caption, the authors should include: "...in mitigation scenarios (2010-2029) TO ACHIEVE 430-530PPM."
44653	SPM	25	31	25	34	Figure SPM.12: The authors should strongly consider the risk of presenting a figure in the SPM that is based on such a minimal body of literature. For example, there seems to be some inconsistency between the numbers here and the projected rate of growth in demand in OECD and non-OECD countries as reflected in the underlying text.
46952	SPM	25	4			One could delete "a wide range that includes", it does not add substantial content to the sentence.
44841	SPM	25	5	25	7	The sentence "This diversity of... individual policies." seems more as something of discussion than a part of the introduction to the section. Relocate?
45969	SPM	25	5	25	7	This sentence says "are", however, in addition to be merely analytical, I believe that the formulation should ALSO suggest ways that the international community SHOULD take in order that UNFCCC and other climate goals are achieved.
45756	SPM	25	6			why use of the word large? Implication not clear.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44219	SPM	25	7			The term "special challenges" is vague - what does "special" imply? Suggest clarifying.
44220	SPM	25	8			The "It" at the beginning of the last section should be changed to "The Section" since the subject in the previous line was different.
43708	SPM	25				There is the need to incorporate in this section the following policies: i) Establishment of a global carbon budget in order not to exceed an increase of 2 ° C in global average temperature which is of 44 gigatonnes of Carbon Dioxide Equivalent (GTCO2e) by 2020 (followed by a steep decline) establishing the distribution of the budget considering the rationale established in the presentation of Martin Khor "Equity is the Gateway to Environment Ambition" published by the South Centre presentation at the UN Framework Climate Change Convention (UNFCCC) Ad Hoc Working Group on Long-term Cooperative Action (AWG-LCA) and the Bolivian presentation in the Workshop on Equity, Bonn, 16 May 2012; ii) Fulfillment of commitments under the Kyoto Protocol. The Bolivian proposal aims to strengthen the Kyoto Protocol (KP) as a system of rules, methods and accounting rules, including comparability and governance, in order to have a reliable compliance system for emission pledges, however the reluctance of countries to be part of the second commitment period has created greater uncertainty as to how to monitor voluntary pledges of emission reduction; iii) Challenges of Adaptation and Mitigation are inextricably associated to Development, considering that the actions for mitigation have social and economic implications and are associated with and conditioned by a context of development and poverty. The extent and timing of mitigation commitments by developing countries will certainly impact their actions in integral development and poverty eradication. In short, to establish mitigation actions in developing countries, implies in parallel, creating conditions of security and food sovereignty, education, health, energy for people, provision of water and sanitation, provision of services and infrastructure communication, job creation, provision of housing, compensation for loss and damage caused by extreme weather events, adaptation actions, among others; and iv) Equity, the right to development and common but differentiated responsibility (CBDR). This vision considers the fact that poverty and hunger are still a grim reality in developing countries, so it is not ethically correct to leave developing countries to assume responsibility for the costs of mitigation from climate change.
43709	SPM	25				The emphasis in this section about sectoral and national policies is on cap and trade, carbon taxes and market based approaches. There is the real need to create an effective balance between market and non-market based policies. The latter are based on the effective transference of finance, technology and capacity building from developed to developing country Parties. As it is right now the document is an apology of carbon markets which is not the real situation of the markets. The issues about the drawbacks of carbon markets have been presented by Bolivia in the workshop about markets in Bonn, may 2012.
46953	SPM	25	13	25	15	It does not become clear whether the statement on conventional technologies is exactly on the two categories "total fossil power plants" and "extraction of fossil fuels". We propose to write "i.e." instead of "e.g." if this is the case. Reading the graph (Figure SPM.12) it seems that the 30 billion median might be only for the fossil power plants. We propose to keep the statements in this paragraph clearly distinct between the electricity sector and the other sectors. That would also better reflect the graph.
46954	SPM	25	14	25	16	The use of the term "electricity" and "energy" seems to be inconsistent: "energy supply sector" is compared to "low carbon electricity supply". Please change the latter phrase into "low carbon energy supply".
44316	SPM	25	1			While a large segment of discussion relied on regional cooperation and development, this section lacks discussion on regional cooperation and relevant strategy in SPM.
45901	SPM	25		25		To clear indication of when to OECD, recommend to add the year to "non-OECD" as "non-OECD 1990".
45896	SPM	25	10	25	20	Request to include not only 430ppm-530ppm but also assessment of the range 530ppm-580ppm where the probability of staying below 2.5 degrees is more than 50% as indicated in Table.1 in order to give policy makers wider options to compare. Also SPM itself referred to the range -580ppm in comparison with -480ppm at the page 16.
45897	SPM	25	11	25	11	Clarification is needed for the sentence "Mitigation scenarios that stabilize atmospheric concentrations in the range from 430 to 530 ppm CO2eq by 2100 (without overshoot)". Does this mean that all the scenarios in the range from 450ppm to 530ppm are stabilization scenarios at a given point in time? It is confusing for policy makers in the relation with Table.SPM1
45898	SPM	25	14	25	14	Although appreciate your effort to provide clear-cut description here, suggest to delete the example in the bracket (e.g. fossil fuel power plants and fossil fuel extraction) because there are advanced fossil fuel power generation technologies available and such labelling could be misleading to policy makers seeking a effective and feasible option to address climate change based on given conditions.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
45899	SPM	25	21	25	21	<p>It is very important information that here exist no internationally agreed definition (Buchner 5 et al., 2011)(Ch.13, p.54) on climate finance. We will highly appreciate if this description is added to SPM.</p> <p>Also would like to ask for clarification on the confidence readings of this paragraph. Provided as "medium confident" however only Buchner et al. (2012; 2013) is referred at the corresponding part in the body text.</p> <p>[The corresponding part in the body text referred in our comment.]</p> <p>In the follow-up to the Copenhagen conference, the term "climate finance" has been coined for 4 financial flows to developing countries, but there exists no internationally agreed definition (Buchner 5 et al., 2011)(Ch.13, p.54)</p> <p>The estimate by Buchner et al. (2012; 2013) of current climate finance of USD 28 343 to 385 billion (2010/11 USD) per year using a mix of 2010, 2011 and 2012 data, corresponds 29 roughly to this concept.(Ch. 16, p.7)</p>
45900	SPM	25	23			Wonder if reference to underlying chapter correct.
45970	SPM	25	9			in this section no word is on policies and means to generally promote SCP (e.g. mitigate energy consumption, where appropriate); only indirectly e.g. "reduction of subsidies to fossil fuels" (page 27) comprises this aspect
44224	SPM	26	1			Is it possible to be more specific than "a considerable increase"? If so, suggest including this here.
44845	SPM	26	1	26	4	EU and member states have a pretty good idea.
44654	SPM	26	1	26	4	Chapter 14.3.4, 14.3.5 could be referenced in order to integrate region specific strategies to add flexibility.
45618	SPM	26	11	26	13	We believe that this text gives a rather negative description of interactive effects, while for instance SPM page 16 line 29 to page 17 line 6 illustrates that the scenarios that are associated with low concentrations reduce the cost of energy security and health benefit objectives.
45768	SPM	26	11	26	11	the figure no '6.6 to 12.8' may be deleted.
44656	SPM	26	15	26	21	The authors could include discussion of regional cooperation on energy costs of climate stabilization (could be included from 14.1.3, 14.2).
45225	SPM	26	16	26	16	"Although economic theory suggests that economy-wide market-based policy are generally more effective than sectoral approaches ...". At very least need to say "neoclassical economic theory". Behaviour economics & transactional economics (first domain), evolutionary economics and endogenous change economics (third domain) do not support this assertion – nor do the sectoral chapters of the underlying report.
46959	SPM	26	16	26	21	The paragraph on page 26, lines 36-43 covers more precisely the subject of market-based instruments than the paragraph starting on page 26, line 16. Therefore we suggest to delete the entire paragraph from page 26, lines 16-21, as it emphasizes the alleged predominance of market-based instruments in comparison to sectoral approaches, the reference of which we cannot track from the overall report.
43774	SPM	26	16	26	21	To make sector-specific policies effective, it should conform with national economy-wide policies. Thus, it is suggested to add "Sector-specific policies need to be coordinated with national economy-wide policies." after ".....in complementary packages." in line 21, page 26.
44847	SPM	26	17	26	18	For balance you must add elsewhere that "Experience suggests that sector specific policies are more effective for reaching various goals than economy-wide market-based policies."
45028	SPM	26	17	26	20	<p>What are the impacts of this finding (economic theory versus the reality of political economy) on the practical meaning of the many economic theory based models and model results adopted in AR5 WG3 and in this SPM?</p> <p>Could you clarify and expand on these "political economy obstacles" and their consequences, in view of making the SPM more relevant for policymakers?</p> <p>Political economy appears highly relevant for climate policy.</p>
46960	SPM	26	17	26	20	The mixing of the feature "market-based" with "economy wide" is not adequate as there are many examples of market-based, sectoral approaches (e.g. SOx trade in the US, green certificates). So there should be two separate statements on "economy wide" and on "market-based" if authors feel that the evidence is sufficient to make a statement on these at all. Or delete "market-based".
46961	SPM	26	17	26	20	Isn't this a mix of market-based approaches and sectoral approaches? One could think about also highlighting functioning models (e.g. such as feed-in tariffs), as shown the Special Report on Renewable Energies (SRREN).

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46962	SPM	26	17	26	20	The theoretical superiority of market based, economy wide approaches in terms of cost effectiveness has been stressed in all Assessment Reports, but the practical evidence is very limited. So the phrasing of the sentence "Although economic theory suggests..." does not seem to be justified, because it reads like politics are not capable to correctly implement market-based approaches. A phrasing like "Market based instruments often fail to realise in practise the advantages in cost-effectiveness as economic theory accrue to them" would be more appropriate. Even totally delete any reference to theoretical superiority seems appropriate, because it may guide decision makers into the wrong direction otherwise.
44227	SPM	26	18	26	19	We recommend that this statement be more balanced with respect to presenting the benefits and obstacles to sector-specific and economy-wide measures. The underlying chapters point out several benefits to implementing sector-specific policies, and these should be better captured in this section of the SPM.
46963	SPM	26	18	26	19	What is meant with "political economy obstacles"?
45769	SPM	26	19	26	19	the word 'narrower' may be deleted.
44318	SPM	26	2	26	3	The statement shall explicitly discuss countries (high or low income) or OECD in SPM
44225	SPM	26	2	26	2	It is not clear if the "plans and strategies" are in the early stages of development or in the early stages of implementation - I assume the latter, but it would be helpful if that could be clarified.
45764	SPM	26	2	26	2	the statement 'Resource to address climate change need to be scaled up considerable in future (medium evidence,high agreement)' may be added after the word 'AR5'.
45462	SPM	26	21	26	21	"Complementary packages": rather write "package of complementary measures".
45619	SPM	26	21	26	21	Please consider adding the following sentence at the end of this paragraph: "Sector-specific policies can be effective in a broader context due to differences in competitiveness and risk of carbon leakage between sectors."
45770	SPM	26	21	26	21	the word 'policy' may be added after the word 'complementary'.
45771	SPM	26	21	26	21	the figure no. may need to rectify by '[15.1, 15.2, 15.5, 15.8, 15.9]'.
44320	SPM	26	22	26	24	This statement should also include reference to social and economical impact of regulatory approach in addition to environmental impact and cost effectiveness
45620	SPM	26	22	26	31	The bold statement of this paragraph is unclear on whether regulatory approaches and information measures are environmentally effective. This might be because regulatory approaches and information measures are dealt with in the same paragraphs, while they are very different, and we believe that the environmental impacts of regulatory instruments are better documented than the effect of information approaches. We believe that this paragraph should deal with the effect of regulatory instruments and information approaches separately.
43690	SPM	26	22	26	24	There are concerns regarding the cost-effectiveness associated with regulatory approaches to environmental issues which are underplayed in this statement. Some studies have found that market-based approaches are the most cost-effective, as they provide flexibility to businesses and individuals to choose how to reduce emissions without government involvement. Suggest providing a broader comment that opportunities to use energy more efficiently must be found throughout the economy in order to lower emissions. There is a vast array of possible options or responses that could be made in each sector of the economy to achieve this aim.
45772	SPM	26	22		23	what is the basis for claiming these as effective if both environmental impacts and cost effectiveness are debated?
46965	SPM	26	22	26	24	This statement reads contradictory in itself: On the one hand regulatory approaches are "environmentally effective", but on the other hand the "extent of environmental impacts" is not clear. Proposal: Delete second part of the sentence.
45339	SPM	26	22	26	31	Regulatory approaches will work but may need to be applied on a multi-lateral basis. If regulation increases production costs in one area, a loss of competitiveness may result in 'leakage' in other areas (e.g. Energy costs in EU versus US)
45340	SPM	26	22	26	31	Considering regulatory and informational measures together in one paragraph is not helpful as the certainty regarding their rate of implementation, effect and impact are quite different in both cases. Suggest dealing with these two issues separately where regulatory approaches such as mandatory standards are quite effective with a high degree of certainty, whereas it is harder to have the same certainty regarding the impact of informational measures.
46966	SPM	26	23			Please specify in the text, whether you refer to a scientific debate or a political debate.
47065	SPM	26	25	26	15	Based on findings in Ch.11, section 11.7, forest protection is another obvious area where mitigation activities can help achieve other public objectives, which are otherwise ineffectively pursued or poorly funded (such as clarifying land tenure and land use rights or conserving biodiversity). The sentence could be modified to read: "... such as air quality and forest protection, are often weak...".

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44848	SPM	26	26	26	31	The part "..., the scientific literature is divided..." should be deleted for balance. There are always winners and losers. Why emphasise potential negative effect on private costs? There can also be positive private costs. Also remove the sentences on rebound. They are misleading. Rebound effects can be handled easily through other measures and their existence should not be an argument against improving energy productivity. Productivity improvements is an engine of growth and it is awkward to use this argument against energy efficiency. It is like saying that we should not promote labour productivity.
45029	SPM	26	26	26	27	Negative private costs are difficult to understand for policy makers. Please change for "private gains". More fundamentally, there is no disagreement on the existence of an efficiency gap. Many well documented examples of cost-effective investment opportunities in energy efficiency exist (see box 3.10 in full text) There is disagreement on the magnitude of the efficiency gap. Therefore we suggest to change the sentence to: "the scientific literature is divided on the extent to which energy efficiency measures can be realised with private gains." - assuming that this is in agreement with your findings.
44228	SPM	26	27	26	27	Suggest avoiding the use of technical terms like "negative private costs", as they are not understood by many readers.
46967	SPM	26	27			What does "negative private costs" mean? Benefits? Please revise text.
45030	SPM	26	29	26	29	We suggest substituting "energy user bills" for "energy prices"; rebound will also happen when prices remain constant
45765	SPM	26	3	26	4	(medium evidence,high agreement) may be deleted .
45027	SPM	26	3	26	3	Please check the wording "inadequate evidence to assess their impact" : is this consistent with other parts of the SPM and underlying report?
46958	SPM	26	3	26	4	This statement is very negative as it implies that there is no information on the usefulness of national and sub-national plans and strategies, including that they could have negative impacts, e.g. an increase of emissions. Please revise and use a more neutral formulation, e.g. "inadequate information on their effectiveness of reducing future emissions"
45463	SPM	26	30	26	30	would it be useful to indicate the range of the rebound effect, maybe via a table with details sector by sector?
45621	SPM	26	30	26	30	Please consider introducing this sentence at the end of the paragraph: "Economic instruments such as CO2-taxes and tradable emission permits can reduce the risk of rebound effects."
44657	SPM	26	30	26	30	Is this discussion about the rebound effect applicable to ALL sectors? Or just residential? Or just some other one? The authors should clarify this point.
45464	SPM	26	32	26	34	this statement may be valid in static terms, but given that caps are always renegotiated, and that they will be set based on knowledge of estimated mitigation costs, the recent experience of declining renewable energy costs suggests that it will be easier to ask for more stringent reductions down the line. There is a dynamic element associated with complementary policies like this one which cannot be ignored.
44730	SPM	26	32	26	34	The statement that renewable energy subsidies would have no further impact on total emissions if a cap and trade system had a sufficiently stringent cap, seems too simplified. To achieve the deep emission reductions required in the long term, nascent technologies will need to be developed and commercialized with targeted and timely support. Cap and trade, which benefits mostly technologies that are already mature, won't alone suffice.
45622	SPM	26	32	26	34	We suggest adding: "...within the commitment period" at the end of this sentence in line 34. Additional instruments or regulations can influence future caps, by influencing costs, ability to reduce emissions and thereby willingness to agree on stricter caps.
44229	SPM	26	32	26	35	Suggest this short paragraph could be deleted. It doesn't say very much (the effects of combining mitigation policies may or may not be additive).
44849	SPM	26	32	26	35	Remove, or at least rephrase. It is very simplistic to say that other policies have no effect if there is a cap. First, society has multiple environmental and other goals to deal with. Second, other policies (e.g., on renewables and efficiency) may facilitate agreement on lower future caps. For mitigation we are talking about emissions in 2030, 2050 and 2100 not near term (unambitious) caps. The example given in the second sentence of this paragraph is problematic because the renewable subsidies may be a part of a technology policy (as discussed on page 27) and it may therefore have an impact on total emissions in the long run. The sentence should therefore be removed or rewritten. It could for example read "For instance, if a cap and trade system has a sufficiently stringent cap then other policies such as renewable subsidies have no further impact on total emissions in the short run. However, the subsidies may be motivated as part of a technology policy (described below) and thus be effective in a longer time perspective."
44912	SPM	26	32	26	32	There is no acknowledgement of neither the evidence nor the confidence for the sentence in bold.
44919	SPM	26	32	26	35	This paragraph is highly valuable to policy makers, given the high diversity of policy options available.

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45975	SPM	26	32			Adding a mitigation policy to another may not necessarily enhance mitigation. ~ Adding a mitigation policy to another MAY ENHANCE mitigation in specific cases. ((it would be more purposeful to highlight the positive, "synergic" opportunities as e.g. indicated in the 2nd example in this para))
44658	SPM	26	32	26	35	The examples do not support the bold statement. Should this bullet not speak to the findings/literature on policy portfolios?
45031	SPM	26	32	26	35	This § on proper policy and instrument mix should be improved. We think that the sentence "if a cap and trade system has a sufficiently stringent cap then other policies such as renewable subsidies have no further impact..." is too hypothetical and wrongly focused. Suggestion: "Well-designed renewable support systems have proven very effective in several countries for the development and deployment of wind and solar technologies. Their success suggests that cap and trade systems are not the only useful tools in realizing low-carbon energy systems." (this latter statement reflects observed facts, rather than assigning priority to theories). In addition, it might be inadequate to suggest that a renewable target is an unnecessary complementary policy under a cap and trade scheme, as it might have specific benefits, possibly including longer-term mitigation.
46968	SPM	26	32	26	34	(This is a high priority comment of Germany) This paragraph on mitigation policies does not accurately summarize chapter 15 and appears rather one sided. We recommend referring to the original section of the summary of chapter 15, which also mentions (in brackets) the potential benefits of renewable subsidies: "The emission abatement effects of a carbon tax are additive with other policies such as subsidies, whereas those of a cap-and-trade policy are not (high confidence). If a national cap and trade system has a sufficiently stringent cap then other policies such as renewable subsidies have no further impact on total national emissions (although they may affect costs and possibly the viability of more stringent future targets)."
47066	SPM	26	33	26	34	How much evidence is there in support of this sentence: "For instance, ... on total emissions". We suggest replacing "have no further impact" by "might for a given cap have no further impact". Additional policies can still influence the time profile of emission reductions, which may matter from a carbon budget perspective. They can also foster innovation which facilitates a more stringent cap or make the achievement of a stringent cap more socially acceptable by leading to lower carbon prices.
44659	SPM	26	33	26	34	"renewable subsidies have no further impact..." Can this be said definitively, or is qualifying language ("may have no further impact") needed?
45341	SPM	26	34			Perhaps 'price-leveraging' rather than 'carbon tax' would be more appropriate and take in a number of leveraging measures/policies.
45773	SPM	26	35	26	35	energy production and distribution' may be added after 'renewables'.
47067	SPM	26	36	26	40	The part on stringency of caps in emission trading systems misses out information on some of the lessons learned in the EU ETS. For instance, the cap in phase 3 (2013-2020) is indeed not stringent in the short term, but this was mainly due to the impact of the economic crisis and the large inflow of international credits. This has to be captured in this part, which at present is not included. Suggested text: "The unexpected low prices are likely to be driven by structural factors: economic crisis, offset regulations, interaction with other policies and regulatory uncertainty [14.4.2]. Revised designs are being considered and, by reducing uncertainty, could facilitate more stringent emission caps."
44920	SPM	26	36	26	43	It is not clear whether the phrase in bold takes into consideration recently developments in cap and trade systems, since the number of countries and regions using them are not growing. In the absence of tight (and ever growing) caps, cap and trade would have limited environmental effect both in the short and long run. Consider rephrasing for "cap and trade systems for GHGs are being developed in a number of countries and regions. However, their environmental effect may be limited in the absence of tight caps and/or restrictions to emission allowances.
44660	SPM	26	36	26	43	The authors should check the accuracy of the bolded statement. The effectiveness of early cap and trade is also a function of permit allowances, etc, not just the cap level.
46970	SPM	26	36			You may mention here the possible important role of an efficient cap and trade system: to enable expansion of low carbon technologies at least of those that are already mature (e.g. wind onshore and PV in electricity market) and along with that replacement of well-established fossil technologies having currently lower generation costs.
46971	SPM	26	38	26	40	Please keep the sentence, it is an important one.
45342	SPM	26	38			I would question why evidence is considered to be limited. There are a limited number of existing "cap and trade" systems but each of these provides evidence to support this statement. The evidence is therefore very representative of the small number of experiences.
45032	SPM	26	39	26	40	What is the meaning "political feasibility" in this sentence? Can a more explicit wording or examples be added ? What is "distributional equity in the allocation of permits"?

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45766	SPM	26	4	26	5	Between line 4 & 5 the following paragraph may be added: Non-Climate centric policies often have strong climate co-benefits. Renewable energy and energy efficiency policies often introduced to address energy security concerns or water management policies introduced to address water scarcity or water supply volatility concerns, lead to strong mitigation or adaptation benefits. In emerging economies and least developing countries these policies also helps in creating institutional and market infrastructure that lock in the climate friendly development strategies.
45623	SPM	26	40	26	43	Banking of allowances has been a feature of most cap and trade systems from the beginning. The revised designs seem to go more in the direction of supply management or price stabilization mechanisms. We propose to replace "banking of allowances" with "price stabilization mechanisms".
44230	SPM	26	40	26	10	Suggest avoiding technical terms such as "distributional equity", which are not understood by all readers.
45465	SPM	26	41	26	42	The observation about systems introducing floors and ceilings which could facilitate the adoption of more stringent caps: may be more accurate to say that it is done 'with a view to facilitate'. As is said earlier in the paragraph, there are many political factors that play out, and one cannot rule out that if the price ceiling is set too low, the effectiveness of the measure when it comes to mitigation would be re-assessed significantly.
44921	SPM	26	42	26	43	It may be reasonably argued that such revisions increase uncertainty for economic actors, since they are effectively market interventions. Consider rephrasing for "...jurisdictions, but it remains uncertain whether they could facilitate the adoption of more stringent emission caps"
46972	SPM	26	42			Please specify which kind of uncertainty would be reduced.
44321	SPM	26	44	27	5	In order to comply to the mandate of this report "not to recommend a particular goal but to assess the options available at different levels..." This paragraph needs to be deleted. This is extremely policy descriptive; SPM should avoid suggesting specific policy approach.
44850	SPM	26	44	26	45	This is not in agreement with lines 1-4 on the same page (p 26)
44661	SPM	26	44	26	49	The bolded statement, as written, is misleading. Fuel taxes may or may not have been put in place for emission reductions. The bolded statement implies "economy wide " carbon taxes. If this is just about fuel taxes, then it does not follow for any or all carbon taxes. The authors need to revise the text accordingly.
45033	SPM	26	44	27	5	This § deals with "Carbon taxes ..." as the bold text indicates. Therefore we suggest to keep the contents focused on taxes, and delete the text in brackets on p.27, line 2 'auctioned emission allowances under a cap and trade system', because it may confuse readers when mixing the instruments taxes and emissions trading. Also the words 'free allocation of allowances' is not in place here and confusing, and could be replaced by e.g. 'tax exemptions'.
45624	SPM	26	47	26	48	This statement is not very precise. It would be useful to know over which time-period this 50% reduction have taken place over.
44913	SPM	26	47	26	47	There is no other specific reference to actors other than Europe or European Union, which does contribute to the comprehensive aspect of the SPM and such restrict references should be removed.
45774	SPM	26	47	26	49	the statement starting from 'In Europe to [15.5.2] may need to be reconsider.
43775	SPM	26	47	26	49	The conclusion that fuel taxes in Europe have contributed to reductions in carbon emissions from the transport sector of roughly 50% lacks support from the underlying report. It is suggested to replace "In Europe where.....this group of countries" with "The short-run response to higher fuel prices is indeed often small – price elasticity estimates range between -0.1 to -0.25 for the first year. However long-run price elasticity is quite high: approximately -0.7 or a range of -0.6 to -0.8." ( Ch15, P27, L16-17 )
44231	SPM	26	48	26	48	Is this a reduction relative to a baseline scenario with no such taxes? Or a reduction over time? Suggest clarifying.
44319	SPM	26	5	26	15	This conclusion is one sided although it explicitly speaks about co benefits and adverse effects in the title. However it doesn't provide any insights on Was there any assessment of the negative impact of such plans and strategies.
45616	SPM	26	5	26	7	It would be useful if any of the results of the analytical attention could be reflected in this bold statement. We propose to delete "Since AR4" as we believe that this statement is valid over a longer time period than since AR4.
44226	SPM	26	5	26	15	It is not clear what is meant by "growing political and analytical attention" and "have attracted attention in the scientific literature" and these expressions read as very speculative. Suggest discussing more concretely in terms of the literature available, etc. Similarly, on lines 11-13, suggest further developing the reference to 'analytical and empirical underpinnings '.
44417	SPM	26	5		15	This paragraph on co-benefits is useful. However, it should point that for countries, like South Africa, development is the primary benefit, and mitigation is considered a co-benefit of development.
44846	SPM	26	5	26	7	Good statement



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44388	SPM	26	5	26	15	Mentioning the lack of previous literature on the trade-offs of mitigation policies points to a potential field for further research. Since the issue of trade-off could be politically contentious, it would be worthwhile to give some insight on how such a study can be conducted with the least amount of bias.
45767	SPM	26	5	26	15	Any evidence of co-benefits driving climate policies? If yes please include.
44655	SPM	26	5	26	15	Discussion of lock-in effects should reference sections 14.1.3, 14.3.2.
45338	SPM	26	5	26	15	Region-specific sustainability indices weighing regional impacts of co-pollutants and/or adaptation/biodiversity/economic impacts could be spelled out more explicitly.
45617	SPM	26	8	26	11	We feel that concrete examples of co-benefits could be mentioned to a larger degree. Often co-benefits are connected to energy security, ecosystem services and health, and we suggest mentioning this as examples in line 8: "Co-benefits, such as for ecosystem services, energy security and health, are often explicitly referenced in climate and sectoral plans and strategies: ..."
46964	SPM	26	20	26	21	Please rephrase: "The latter may also be implemented to overcome sectoral-specific market failures or to rapidly target low hanging fruits, and may be bundled in complementary packages."
46969	SPM	26	36	26	43	Please insert in line 43 "To achieve long term abatement-targets, a cap and trade system could be more suitable than a tax because of the maximum emissions quantity (cap). [14.4.2, 15.5.3]." Moreover, in line 38, please insert "Due to this, also evidence of cost-effectiveness as main economic rationale for implementing cap and trade systems is scarce so far for climate-policy related systems, although previous systems for other pollutants have been found to yield substantial cost savings." Rationale for these suggestions: The motivations for the jurisdictions, which have already implemented a cap-and-trade-system or are currently preparing for this, should be given. Contrary to the main report [15.5.3], the SPM describes only some critical aspects of cap and trade-systems, but leaves out the advantages, such as the certainty of achieving a reduction target and the flexibility from the possibility to trade. Without mentioning the key advantages of a cap and trade system, the SPM would give a rather imbalanced picture of cap-and-trade-systems.
45902	SPM	26	1	26	4	To facilitate the use of SPM in energy branch, we would like to suggest adding some texts on energy security issue, which is one of the most critical issues in the policy-decision process in this part since this part is a general statement on national and sub-national policy making.  Thus, suggest to inset the text in [ ] from the body text Ch.7.9.1 p.46 to the end of this paragraph, sentence should be added after line 4 of SPM Page 26.  There has been a considerable increase in national and sub-national plans and strategies to address climate change since AR4. These plans and strategies are in their early stage in many countries, and there is inadequate evidence to assess their impact on future emissions. [With regard to such plans and strategies, elements such as energy security are taken into consideration, particularly in developing countries where energy systems dramatically expand to support economic growth and development.](Ch.7.9.1, p.46,L9-L13)
44006	SPM	26	16	26	21	Sectoral or economy-wide approaches should be determined by each country. It is requested to rewrite this paragraph in order to avoid being prescriptive.
45903	SPM	26	17	26	17	Although appreciate your effort to provide clear-cut description here, request to rewrite the part L17 for the reasons below.  (1) Economic theory is a wide concept which include positive economics, therefore request to replace "economic theory" with "basic economics" in the body text ch.15.5.8., and also to delete "generally" (2) "Sectoral approach" has the distinct meaning in the UNFCCC negotiations, thus should be replaced with a more general term such as "sector specific policy instruments"  Although basic economics suggest that economy-wide market-based policies are more cost-effective than sector specific policy instruments.
45904	SPM	26	29	26	31	Description on rebound effect is neutral, and thus be maintained as it is.
44007	SPM	26	32	26	35	The wording is ambiguous. Also, the example given is prescriptive. It is recommended to clarify the level of evidence and agreement of this finding.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
45905	SPM	26	36	26	39	Highly appreciate this description for providing very important back ground information for policy making. Suggest to add more detailed information from the body text for further understanding of policy makers. Specifically, we propose to insert the description below from the body text ch.14.4.2 between line 40 and line 41 in order to give the more clear understanding of the last sentence in the paragraph.  "The experience shows that the unexpected low prices in the preceding trading scheme are more likely to be driven by structural factors such as the financial and economic crises , the change of offset regulations, the interaction with other policies , and regulatory uncertainty and lack of long-term credibility." [14.4.2]
44005	SPM	26	5	26	15	A more precise and quantitative analysis of co-benefits in developing countries is suggested since these are important aspects within the sustainable development framework.
44401	SPM	26	16	26	17	We suggest using the same wording from the TS "Sector-specific policies have been more widely used than economy-wide, market-based policies (medium evidence, high agreement)."
44402	SPM	26	22	26	22	We suggest the inclusion of Table TS.8: Sector Policy Instruments. The Table brings together evidence on policy instruments discussed in Chapters 7 to 12 is very relevant to be included in the SPM. "Table TS.8 presents a range of sector specific policies that have been implemented in practice. [15.1, 15.2, 15.5, 15.8, 15.9]"
44403	SPM	26	32	26	35	Please include the evidence and agreement status of this para, or delete the paragraph.
45778	SPM	27	10	27	10	Figure no. [15.5.2] may be replaced by [15.5.3]
45627	SPM	27	11	27	12	The meaning of this sentence is not clear. Please consider to rephrase this statement to: "Potential adverse side-effects of mitigation due to higher energy prices can be avoided, for example by improving access of the poor to clean, reliable and affordable energy services."
45628	SPM	27	11	27	21	This paragraph is very important for the equitable perspective and very relevant both for policy makers and for public support for this type of measures.
44234	SPM	27	11	27	12	This bolded statement is difficult to understand and currently reads as though access to clean, affordable energy is the adverse side effect referred to at the beginning of the sentence. Suggest rewording to place the example at the beginning or end of the sentence.
47132	SPM	27	11			Replace sentence 'The contribution of RE to energy access can be substantial' by 'the contribution of non- or low CO2 emitting sources to energy access can be substantial'. 'The contribution of RE to energy access can be substantial' is an unbalanced statement in this specific context of improving access to electricity and other energy services for the billions of poor. Not only renewables can contribute substantially, but also clean fossil sources, possibly in combination with CCS, and nuclear energy.
45779	SPM	27	11		12	language editing recommended; sentence is complex.
43970	SPM	27	11	27	13	The meaning of the sentence is unclear, please clarify it.
46976	SPM	27	11	27	12	The first sentence in bold does not appropriately represent the content of the paragraph. In addition, it is unclear and its construction is confusing. The initial statement would gain much, if it was more focussed on the major adverse side-effect, which is deteriorating energy access of the poor. As it stands now, the reader is left with the impression that there is a large number of potential problems linked to higher energy prices since it stresses the potentially many side-effects instead of saying that the one major and perceived side effect can be addressed with other means.
45035	SPM	27	15	27	17	The statement "Approximately ... health implications" mixes two issues: access to electricity and use of traditional fuels, and we do not think that it is sufficiently clear. Please separate the two issues in two separate sentences, taking into account that electricity for light and power is a very different problem than the supply of heat.
44235	SPM	27	18	27	18	Suggest inserting 'to electricity' after 'universal access', if this is what is meant.
44323	SPM	27	19	27	21	In order to comply to the mandate of this report "not to recommend a particular goal but to assess the options available at different levels..." This statement on RE needs to be deleted. A Range of potentials and actions that correspond to different national circumstances should be discussed and not use this context to promote a single option.
45466	SPM	27	19	27	19	On the role of RE in energy access, it would be useful to stress that this is particularly true where connection to a centralised electricity grid is difficult or overly costly.
44236	SPM	27	19	27	20	Replace two instances of 'energy access' with 'access to electricity'. Traditional solid fuels are a form of energy, but I don't think that is what is meant here.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44237	SPM	27	19	27	21	Suggest some revisions to this sentence: (1) Clarify what is intended with the phrase "universal energy access". Traditional fuels are a form of energy; therefore, some additional specificity is required here. Should "energy" be replaced with "electricity"? (2) The way the statement is worded suggests that methane is distinct from SLCFs (which more correctly should be short-lived climate forcers (SLCFs). In fact, SLCFs include black carbon (co-emitted with particulate matter), methane, ozone and some HFCs. Suggest rewording the statement to: "Achieving universal electricity [if that is what is meant] access reduces emissions of short-lived climate forcers, including black carbon and methane, and yields negligibly higher GHG emissions".
44238	SPM	27	19	27	21	It would be helpful if a calibrated uncertainty assessment (using the evidence/agreement scales or a confidence term) could be provided for this statement.
45976	SPM	27	19			The contribution of RE to energy ~ The contribution of renewable energy to energy .. ((it would be better to minimise the use of abbreviations in the SPM))
46977	SPM	27	19	27	21	Please mention the net effect on GHG emissions.
44922	SPM	27	2	27	2	the statement only applies to "auctioned emission allowances" if the prices are high enough (ie, no "grandfathering" through low allowance prices.
45977	SPM	27	20			universal energy access ~ universal access to clean, reliable and affordable energy services .. ((or to electricity))
45344	SPM	27	20			After "universal energy access", insert "through low carbon and renewable energies". This is an important message.
44324	SPM	27	22	27	29	This statement should include reference to technology transfer barriers
45780	SPM	27	22	27	22	in GHG mitigation' may be added after the word 'policy'.
44662	SPM	27	22	27	29	Is this bullet about renewables only and grid integration or technology policy? Technology policy has also supported many other supply and demand technologies---CFLs, LED lights, and MANY more. The last sentence of this paragraph should be revised to read: "... photovoltaic panels, CFLs, LED lights and many more. However, policies have also raised new issues such as challenges in market integration of new technology as well as questions around overall cost effectiveness."
45228	SPM	27	22	27	29	Does this paragraph not deserve greater prominence in the SPM? The SPM currently seems unbalanced, with multiple references to carbon pricing and cap and trade systems, but little mention of innovation policy, which is a core component of mitigation policy in all sectors
44239	SPM	27	24	27	25	It would be useful to have some more information here about the market failures in question and how policies can address them.
45781	SPM	27	24	27	24	figure no. [15.6] may be added after the word 'programs'.
44731	SPM	27	25	27	29	This suggests that technology support policies (for wind and solar) would have introduced challenges for grid and market integration. A more forward looking way to express the same thing would be to say that the successful uptake of solar and wind is now driving the modernisation of grid and market.
44771	SPM	27	25	27	25	Write: "... to innovation and diffusion."
46978	SPM	27	26	27	29	In regard to the part "... but have raised question...": These questions do not arise solely with technology policies, but address a general challenge with integrating renewable energies. So these challenges should be mentioned with the technical integration of RE in general, but not here in connection with technology policies solely. Please delete second part of sentence, starting with "but have raised questions..." starting in line 26 to the end of this paragraph.
45467	SPM	27	27	27	29	This part combines two different questions: one about the physical integration of variable RE in electricity grids, the other about incentives, and how time of use pricing can provide economic incentives to adjust to supply and demand conditions on the grid - i.e. a different organisation of retail markets. It may be useful to split the two sets of issues, and, why not, broaden the description of the solutions in the market side.
44851	SPM	27	27	27	27	Again you raise the issue of economic efficiency but you never raise the issue of environmental effectiveness. A good example may be stand-by losses. Carbon pricing and energy taxes would not influence stand-by losses in electronic equipment. What brings down such waste of energy, and at low/no cost, has been voluntary agreements and efficiency standards.
45629	SPM	27	28	27	28	Please insert after "innovation": "and support for dissemination". Rationale: innovation alone will not secure the implementation of new technologies.
46973	SPM	27	3			Please define "social costs".
44325	SPM	27	30	27	40	Clarity is required on whether the investment directed to all sectors (building, industry, AFOLU) in SPM. Also, what about the role of public finance in providing support for mitigation. Private sector shifts the burden of financing to developing countries.

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43711	SPM	27	30		40	After the contributions of the private sector to mitigation is important to highlight also the effort by indigenous communities and local populations recognizing the role of collective action in this endeavour, as it has been recognized by the Convention of Biological Diversity for issues related to the conservation of the biological diversity in the decision of the COP11 of Hyderabad-India.
44923	SPM	27	30	27	33	Please see comment on page 25, lines 21-23
45782	SPM	27	30	27	30	The word 'central' may be replaced by word 'crucial'.
44663	SPM	27	30	27	40	The authors should check language/syntax: "IN 2010 and 2011 and on average...?"
46979	SPM	27	30			Please provide a confidence level of this statement.
43777	SPM	27	30	27	40	This paragraph should provide a balanced discussion on the roles of both public and private finance since in the realm of low-carbon finance, it is the public instead private sector that plays a central role. Although private finance has a larger scale, due to the possibility of market failures, direct investment and incentive politics from the public sector are crucial to leverage and stimulate private investments. In addition, the elaboration on factors that may affect private sector is incomplete. Therefore, it is suggested to make the following edits: (1) The topic sentence in bold should be changed to "Although large scale of climate investments came from private sector, the public sector is crucial in helping these private investments happen. (Ch16, TS, P4)"; (2) Replace all the sentences after "...imperfect." with "In a range of countries a large share of private sector climate investment relies on low-interest and long-term loans as well as risk guarantees provided by public sector institutions to cover the incremental costs and risks of many mitigation investments."
45468	SPM	27	31	27	32	The attribution of figures (percentages) respectively to 2010, 2011, 2012 or to two-years periods is not fully clear
44240	SPM	27	31	27	33	Given the caveat on uncertainty that is given on lines 32 and 33, we suggest caution in quoting figures to 2 digits or to attempt comparisons between overlapping two year periods. Would it be enough to say that it has been estimated that about two-thirds of global mitigation finance came from the private sector during recent years (2010-2012). The expression "highly imperfect" is also quite imprecise, which makes the interpretation of this statement more difficult.
45413	SPM	27	31	27	32	The following wording is suggested for the sake of clarity: On average, in 2010/11, about 74% of global mitigation finance came from the private sector and at about 62% in 2011/12 (limited evidence, medium agreement).
43691	SPM	27	31	27	33	This sentence unclear, and given the limited evidence and lack of agreement there seems to be a lack of precision. Suggest re-phrasing this as 'Although data is scarce and accounting systems imperfect, limited evidence suggests the percentage of global mitigation finance from the private sector was about 74% in 2010 and 2011, and 62% in 2011 and 2012.
47068	SPM	27	31	27	31	Define "mitigation finance".
44852	SPM	27	31	27	32	This is unclear. Two different percentages seem to refer to 2011. The sentence would overall seem to be in need of rephrasing.
44914	SPM	27	31	27	33	If the accounting systems are highly imperfect estimates in the SPM should not be quoted.
44772	SPM	27	31	27	32	Precise from which countries to which countries these investments and flows took place.
45036	SPM	27	31	27	33	Could you rephrase to facilitate reading? Besides, we think that there is a lot of data, but perhaps not published, accessible for third parties?
46980	SPM	27	31	27	32	Percent numbers are contradictory: 74% or 62% in 2011? By deleting "and" in line 31 after "2011" the sentence and the context might get correct. See also chapter 16, page 9, line 19.
45783	SPM	27	32	27	32	figure no. '[16.2.1] (medium evidence , high agreement)' may be added after the word 'agreement'.
44241	SPM	27	34			Regarding "...complement climate investments", does this refer to private investments? If so, it should be specified.
45784	SPM	27	38	27	38	figure no. '[16.3]' may be added after the word 'policies'.
44232	SPM	27	4	27	4	Suggest replacing "allowances" with "emissions allowances" to help clarify this statement for readers.
44326	SPM	27	41	27	49	This has to do with the provision of financial support. Also, developing countries have a priority to adaptation, given their limited resources.
44242	SPM	27	41	27	41	An assessment that something is "taking shape" seems a bit colloquial for an SPM. Suggest that this be rephrased. E.g., that "Regional mitigation initiatives are being developed [or, are underway] ...".
44243	SPM	27	41	27	42	Regarding this statement that regional initiatives focused on mitigation having a small impact on mitigation, in the underlying chapter it clarifies that regional initiatives, such as the Asia-Pacific Partnership (APP), or the Energy and Climate Partnership of the Americas, include a number of countries as opposed to all countries (i.e. global). Suggest clarifying this in the SPM because this could be interpreted to include provincial/state level mitigation efforts.
44853	SPM	27	41	27	49	Misleading to imply that power-pools and gas grids are initiatives focused on mitigation. These have other goals and motivations but may have CC mitigation as a co-benefit.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44915	SPM	27	41	27	42	There is no other specific reference to actors other than Europe or European Union, which does contribute to the comprehensive aspect of the SPM and such restrict references should be removed.
44664	SPM	27	41	27	42	The statement provides an unbalanced assessment of significant recent developments in regional and national initiatives. In the US, actions at the federal level such as President Obama's Climate Action Plan establishes a comprehensive strategy for climate change mitigation. In China, active policies investing in renewables and efficiency are changing trends. In Saudi Arabia, major new commitments on solar power are among the largest in the world and are likely to change technology prices. If retained, the bold text should be revised to read: "Regional initiatives focused on mitigation are taking shape in many areas, but to date, are having a relatively limited impact on global mitigation." However, the bold text, even revised does not reflect the material in the paragraph that follows, which focuses on the applicability of regional agreements outside of the countries in which they were designed. The authors should consider this when revising this paragraph.
45630	SPM	27	43	27	44	This statement is very important for successful implementation of environmental measures and very relevant for policy makers.
45785	SPM	27	44	27	44	figure no.' [14.4.2]' may be added after the word 'regions'.
44322	SPM	27	6	27	10	This paragraph needs to be deleted. Subsidies are country specific measures for development and poverty reduction and should not be used to address emission reduction.
43710	SPM	27	6		10	The discussion about the redution of subsidies in fossil fuels can not be considered as one of the policies because there is disagreement among the Parties in this specific policy becuase of its social consequences.
44710	SPM	27	6	27	10	This is a key finding and should be highlighted more in this document
45626	SPM	27	6	27	10	This paragraph is very important for the equitable perspective and very relevant both for policy makers and for public support for this type of measures.
45625	SPM	27	6	27	7	The term "negative social costs" can be a bit confusing. Suggest replacing with "social economic benefit".
44233	SPM	27	6	27	7	The term "negative social cost" is difficult to understand, as we assume this is actually a technical way to describe a social benefit. Suggest replacing "achieve significant emission reductions at negative social cost" with "achieve both significant emissions reductions and social benefits".
45412	SPM	27	6	27	10	Quite important and clear and elegant wording that should not be lost.
45775	SPM	27	6		10	content of para does not support statement about achieving "significant emission reduction."
45034	SPM	27	6	27	6	To make the text easier to understand, we suggest replacing "at negative social cost" by "while increasing social benefits"
45227	SPM	27	6	27	10	This section would benefit from some numbers. 15.5.2 suggests estimates of emissions reductions from a few percent up to 18 per cent of global GHG emissions could be achieved through subsidy removal - these are huge numbers
45226	SPM	27	6	27	7	Is there a clearer way to say "negative social cost"? Perhaps "while at the same time providing benefits to society at large, and the poor in particular"
46975	SPM	27	6	27	10	The underlying report is more specific on the impact of fossil fuel subsidies (chapter 7, page 72, lines 18-24): "The phase-out of inefficient fossil fuel subsidies as discussed during the G20 meetings in 2009, 2010, 2011, and 2012 will have a visible influence on global energy-related carbon emissions (Bruvoll et al., 2011; IEA, 2011g, 2013b). Removing these subsidies could lead to a 13 percent decline in CO2 emissions and generate positive spill-over effects by reducing global energy demand (IMF, 2013). In addition, inefficiently low pricing of externalities (e.g. environmental and social costs of electricity production) in the energy supply sector introduces a bias against the development of many forms of low carbon technologies (IRENA, 2012a)." Please add this important information.
45343	SPM	27	6	27	10	This is an important message for policymakers
43776	SPM	27	6	27	10	There is no internationally agreed definition of fossil fuel subsidies. Although several international multilateral mechanisms including the G20 have been discussing over this topic for long, no consensus is reached yet. Furthermore, fossil fuel subsidies should be treated with caution since it is closely related to energy security, and need for poverty eradication and development needs of countries with lower socio-economic development level, as well as to the basic needs of the socially vulnerable. It is suggested to delete this paragraph.
45776	SPM	27	7	27	7	The word ' political economic barrier' may be deleted.
45777	SPM	27	7	27	7	(robust evidence,high agreement)' may be replaced by '(high confidence). [15.5.2]'

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43713	SPM	27				In this section is important to include also the proposal from Bolivia regarding the establishment of non-market based mechanisms as important instruments to foster mitigation jointly with adaptation, including the establishment of the Joint Mitigation and Adaptation Mechanism for the Integral and Sustainable Management of Forests (see Bolivian submissions) in the discussion of various approaches and non-market based approaches at the UNFCCC. The main issues to point out are the following: a. Non-market based approaches should be established, including policy and regulatory measures in developed countries for the transfer of technology and capacity building in developing countries; b. Sustainable consumption and rational use of natural resources has to be promoted taking into account the life cycle of materials; c. It should be established national action programs to support the development and strengthening of endogenous capacities and technologies in developing countries; d. It should be established a mechanism operating under the guidance of the COP to guide and operationalize the payment of climate debt, support mitigation actions that are not based on carbon markets and support programs for the strengthening of endogenous capacities; e. A joint mechanism of Adaptation and Mitigation in the context of Integral and Sustainable Forest Management should be approved as an alternative to market-based approaches, operating under the guidance of the COP, according to Bolivian submissions to the UNFCCC.
43714	SPM	27				Also, it is important to include in this section the following issues as part of sectoral and national policies: Harmony with nature must be promoted by a holistic and comprehensive approach to sustainable development in the context of efforts that help to restore the health and integrity of Mother Earth. b. The overall objective of reducing greenhouse gases and timeframe thereof must be based on historical responsibility and the full implementation of the Convention. c. Equity must be reflected in the reduction of emissions within a fair and equitable system of allocating emissions. d. Annex 1 countries must take the lead in making deep emissions cuts binding and providing funding and technology in the short, medium and long term, reflecting their historical responsibility. e. Annex 1 countries should commit to aggregate emissions reductions of between 40% and 50% by 2020, based on 1990 levels. Developing countries should contribute equitably to the achievement of the comprehensive development objective, considering their specific needs and national circumstances, ensuring their access to sustainable development and improvements in living standards of their population, and committing developed countries to provide the required support for mitigation and adaptation efforts that these countries should execute under Article 4.7 of the convention. f. Adaptation programs should be supported with the same priority as mitigation actions. g. The provision of financial resources from developed countries to developing countries should have a system of measurement, monitoring, verification and reporting, particularly for public funds. h. There must be accelerated and operational procedures of technology provision from developed countries to developing countries and a system of measurement, monitoring, verification and reporting of the compliance of that provision. i) The actions of countries to achieve emissions reduction targets and the peak of the global emissions curve must ensure harmony between humanity and nature in defense of Mother Earth i. The actions of countries to achieve emissions reduction targets and the peak of the global emissions curve
43715	SPM	27				Finally, with respect to developed countries it is important to highlight the following: a. Developed countries should commit to emissions reductions of 40% and 50% by 2020, based on 1990 levels. b. A common accounting framework should be established for developed countries emissions, define a base ex-ante to measure progress of the quantified emission limitation and reduction obligations. c. Rules, methodologies and common tools of accounting and comparison should be established to measure emissions reductions in a reliable, technical and scientific manner. These rules must be built upon the base of the system established by the Kyoto Protocol.
46981	SPM	27	33	27	34	DFIs and MDBs are not sources of finance, neither according to CPI terminology (which is recently quoted in text) nor according to the terminology presented in chapter 16. Therefore we suggest the following rewording: "In many countries public sources of finance, e.g. channelled through public intermediaries such as national and international development banks, complement climate investments." Alternatively one might use the sentence from the chapter 16, Executive Summary, page 4, line 25: "In a range of countries a large share of private sector climate investment relies on low-interest and long-term loans as well as risk guarantees provided by public sector institutions to cover the incremental costs and risks of many mitigation investments."
46974	SPM	27	6	27	10	In the respective part of the Technical Summary, page 81, lines 44-45, it reads "very high confidence". Please correct this discrepancy.

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45906	SPM	27	22	27	29	<p>Suggest to add a sentence from the body tech ch 15.6.5 at the last of the paragraph as below for the clear understanding of the policy makers on the point of the paragraph.</p> <p>There is a distinct role for technology policy as a complement to other mitigation policies (high confidence). Technology policy includes technology-push (e.g. publicly funded R&amp;D) and demand-pull (e.g. governmental procurement programs). Such policies address market failures particularly related to innovation. Technology support policies have promoted substantial diffusion and innovation of new energy technologies such as wind turbines and photovoltaic panels, but have raised questions about their economic efficiency, and introduced challenges for grid and market integration that may require innovations concerning transmission, back-up power and time of day pricing. Evaluation of government programs to foster new energy technologies has been hampered by a lack of complete and consistent evaluation data at the program level.[2.6.5, 7.12, 15.6.5]</p>
44008	SPM	27	30	27	40	The paragraph is prescriptive and has limited evidence and medium agreement. Therefore, we suggest to delete this paragraph.
45907	SPM	27	31	27	31	<p>It is very important information that here exist no internationally agreed definition (Buchner 5 et al., 2011)(Ch.13, p.54) on climate finance. We will highly appreciate if this description is added to SPM.</p> <p>Also would like to ask for clarification on the confidence readings of this paragraph. Provided as "medium confident" however only Buchner et al. (2012; 2013) is referred at the corresponding part in the body text.</p> <p>[The corresponding part in the body text referred in our comment.] In the follow-up to the Copenhagen conference, the term "climate finance" has been coined for 4 financial flows to developing countries, but there exists no internationally agreed definition (Buchner 5 et al., 2011)(Ch.13, p.54)</p> <p>The estimate by Buchner et al. (2012; 2013) of current climate finance of USD 28 343 to 385 billion (2010/11 USD) per year using a mix of 2010, 2011 and 2012 data, corresponds 29 roughly to this concept.(Ch.16, p.7)</p>
45908	SPM	27	41	27	42	<p>It is not clear why EU is described as an exceptional case. It should be duly considered that other regional blocks (e.g., East Asia, Asia-Pacific etc) are quite different from EU in light of the degree of integration in other aspects (e.g., currency, trade). The additional information is required for the correct understanding of SPM for policy makers such as text taken from the body text Ch.14 to the paragraph.</p> <p>(Ch.14,p.54,L17-19) For regions where deep regional integration is not present yet, the experience from the EU suggests that only after a substantial transfer of sovereignty to regional bodies can an ambitious mitigation be pursued.</p>
45909	SPM	27	44	28	5	<p>It is not clear why EU is described as an exceptional case. Tax policies vary among countries based on various social, economical, cultural background differs from country to country and a European example does not always fit to the other part of the world. Therefore suggest to replace this description with a more general description in corresponding part in TS p.82 as below.</p> <p>Differentiation by sector, which is quite common, reduces cost-effectiveness that arises from the changes in 3 production methods, consumption patterns, lifestyle shifts, and technology development, but it may 4 increase political feasibility, or be preferred for reasons of competitiveness or distributional equity. 5 In some countries, high carbon and fuel taxes have been made politically feasible by refunding 6 revenues or by lowering other taxes in an environmental fiscal reform. Mitigation policies that raise 7 government revenue (e.g., auctioned emission allowances under a cap and trade system or emission 8 taxes) generally have lower social costs than approaches which do not, but this depends on how the 9 revenue is used [3.6.3]. [15.2, 15.5.2, 15.5.3](TS, p.82, line2-line10)</p>
44404	SPM	27	27	27	29	This text shows a surprisingly negative view on technology support policies, with a clear and exclusive reference to the development of renewable electricity generation. Furthermore, the challenges mentioned in lines 27-29 have been properly overcome, as the Spanish experience shows, especially regarding integrating renewable energy into the national grid.
47133	SPM	28				This figure does convey useful information, but we think it will be easier interpreted when there division lines would be included, so on the x-axis identify subnational, national, regional and global "zones".

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
45420	SPM	28				The expressions "over ends" and "over means" are only used in this figure but not in the full text of the report. It would be important to provide some footnotes in order to explain both concepts. It is unclear which parameters have been used to compare means and goals and what the underlying assessment is that informs that figure. The alternative would be to delete this figure if such background information cannot be made available.
44372	SPM	28				Need a degree symbol after 2 in "2C long term goal".
44373	SPM	28				What is "IO" in "Other IO GHG regulation"?
44712	SPM	28	1	29	21	It would be useful to explicitly specify the potential gains from international cooperation in general and on different issues (such as GHG emissions reductions and R&D as mentioned on page 6)
44327	SPM	28	10	28	14	This conclusion is a prejudgment of the upcoming agreement under UNFCCC and should be deleted.
44419	SPM	28	10		14	The paragraph is not reflective of Fig SPM.13. It makes no mention of means and ends axis. The first sentence needs to add "and whether agreements focus on means or ends"
44927	SPM	28	10	28	10	Replace "agreements" for "instruments". Not all examples listed below or in figure SPM13 are "agreements"
43779	SPM	28	10	28	20	The text from L10-L14 is self-explaining and there is no need to include Figure SPM.13. In addition, the rational flow between elements in this figure is very ambiguous and lacks clear definition, thus cannot provide accurate and reliable information to policymakers. It is suggested to delete Figure SPM.13.
45789	SPM	28	11	28	11	(robust evidence, high agreement)' may be added after the word 'centralized'.
45038	SPM	28	11	28	12	The analysis by several academics and the practical evidence suggests that the Kyoto Protocol cannot be labeled as "strong multilateral agreement". Doing so may lead to the conclusion that one should give up on multilateral agreeing. Please reconsider this wording.
46986	SPM	28	11	28	12	Please complement the words in brackets "(such as the Kyoto Protocol targets)" by adding "and accounting rules". The accounting rules of the Kyoto Protocol are one of the main reasons why the Kyoto Protocol can be considered as a centralized system.
45980	SPM	28	12	28	13	harmonized national policies (such as the Copenhagen/Cancún pledges) ~ harmonized national policies (such as the PARTIALLY harmonized Copenhagen/Cancún pledges) OR harmonized national policies (such as the Copenhagen/Cancún pledges by the EU Member States and some other states) ((the so-called Copenhagen/Cancún pledges have not been harmonized! so either the above mentioned alternative example or any other example could be used)); since Copenhagen/Cancún there are already the targets of the 2012 Doha Amendment and it will not be clear for the readers why this agreement is not mentioned (here or anywhere in the SPM)
45039	SPM	28	12	28	13	What is the "harmonized" aspect in the Copenhagen/Cancun pledges? It seems to us that harmonisation requires the implementation of more structured approaches than free pledges. Please reconsider this.
45790	SPM	28	14	28	14	the figure no '13.13.2' may be replaced by '13.4.3'.
43693	SPM	28	15	28	20	Some acronyms in this figure are not explained, and should be included in the caption (i.e. FCCC, IO GHG, and MRV).
44666	SPM	28	15	28	15	Figure SPM.13: The "border tax adjustments" and "national/regional ETS linkages" boxes should be colored blue instead of pink to represent that they are reflected in "existing agreements" (e.g., feed-in-tariffs and other border taxes on RE products) for the "border tax adjustment box" and the regional California-Quebec ETS justifies coloring the "national/regional ETS linkages" blue.
44667	SPM	28	15	28	20	Figure SPM13: The final sentence of the caption says that the "degree of centralization indicates the authority an agreement confers on an international institution, not the process of negotiating the agreement." The bubbles in the chart for "2C, long term goal" and "UNFCCC objective" - are not officially agreements but goals and here they are ranked very high on the centralized authority scale, even though there is no centralized authority or mechanism for implementing these goals within the institution itself. The UNFCCC has minimal (if any) authority at this point to enforce or implement those goals. These should fall to the far left of the scale on the chart (and/or included in a different format than the other agreement types).



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46987	SPM	28	15	28	15	Figure SPM.13 confuses the reader and does not give additional value to the SPM. It is not clear whether the figure is based on any quantitative/criteria-based analysis or whether the examples have rather been placed in the diagram according to "gut feeling". Examples: - To which extent does the "FCCC objective" have a more centralized authority than the "2°C long term goal"? - Why is "global carbon tax" placed on the far right side of the diagram? Does a global carbon tax necessarily require a high degree of authority to be conferred to an international institution? - Why are "harmonized carbon taxes" placed in the middle of "cooperation over ends" and "cooperation over means" whereas the "global carbon tax" is placed much closer to "cooperation over means"? - The terms in the figure refer to very different terms and concepts. Some of them are specific elements of regimes (e.g. "Kyoto targets", "FCCC/Kyoto/Copenhagen MRV rules"), some of them are institutions ("Green Climate Fund"), some describe broader approaches ("pledge and review"; "loose coordination of policies"). Furthermore, the distinction between "existing agreements" (blue) and "proposed structures" (pale pink) is not coherent. E.g., if the Cancun pledges are considered "pledge and review", then why is "pledge and review" displayed as a "proposed" instead of an "existing" structure? In conclusion, the figure does not add any substantial information to the SPM, but rather confuses the reader: please delete.
43469	SPM	28	17	28	18	"Examples in pale pink are proposed structures for agreements".  Proposed by whom?, in the way it appears now could produce the impression that IPCC is "proposing", and some of the proposal are very contentious, e.g. border adjustment. Obviously, these are not IPCC proposals, but to clarify it would be useful.
44244	SPM	28	2	28	3	Does this headline really require a confidence assessment? Seems to be a fact based on the discussion that follows.
44418	SPM	28	2		9	Several issues with this para: 1. The first sentence ignores the nature of climate change and how that informs international cooperation. Delete, and replace with ' Preventing climate change requires international cooperation, as is it a problem of the global commons in an unequal world'. 2. The diversity arises due to treatment in other "policy arenas AND BY OTHER INSTITUTIONS". 3. The sentence on Montreal Protocol needs to make clear that it has dealt only with GHGs that are also ozone-depleting substances, and that there is a policy debate (reflected in literature) on where other gases might best be treated. 4. The last sentence, on trade, does not have any clear message; delete
45978	SPM	28	2	28	9	at UN level, e.g. the UNFF and the UN Energy are at least of the same importance in this regard as (or even much more important than) the MP or international trade coop. mentioned here
45346	SPM	28	2			It is unclear what is meant by the term "institutionally diverse". It might be more clear to refer to the broad range of international initiatives which aim at GHG mitigation or which encourage climate-proofing of their activities.
45345	SPM	28	2	28	9	It should be pointed out that water quality legislation has also contributed to GHG reduction. Indeed, UNECE recommends that reactive N should be legislated for holistically.
43778	SPM	28	2	28	9	This section neither pays concrete attention to the concerns of developing countries nor fully reflects existing international cooperation, especially those under the UNFCCC. It is suggested that: Firstly, when highlighting the importance of mitigation, it should also be fully reflected that adaptation, finance, technology transfer, and capacity building play an equally important role in international cooperation. Moreover, further elaborations are needed on the obligations of developed countries in providing financial support and technology transfer. Secondly, as the primary channel of international cooperation, the UNFCCC and its distinct and significant role should be fully reflected. The Convention has already set the objective and principles for international cooperation on climate change, international cooperation should be guided by the Convention, particularly when regarding the obligations of developed countries to take the lead in emissions reduction and the legitimate priority of developing countries for sustainable development. It is suggested to replace the original paragraph with "The UNFCCC remains as the primary international forum for climate negotiations, which sets up the basic principles to guide International cooperation, in particular the principles of equity and common but differentiated responsibilities. The UNFCCC is currently the only international climate policy venue with broad legitimacy, due in part to its virtually universal membership (robust evidence, medium agreement). The UNFCCC continues to develop institutions and systems for governance of climate change. [13.2.2.4, 13.3.1, 13.4.1.4, 13.] Other institutions have emerged at multiple scales. [13.3.1, 13.12] This institutional diversity arises in part from the growing inclusion of climate change issues in other policy arenas. These and other linkages create opportunities, potential co-benefits, or harms that have not yet been thoroughly examined. Issue linkage also creates the possibility of forum shopping and increased negotiation costs, which could distract from or dilute the performance of international cooperation toward climate goals. [13.3, 13.4, 13.5]"

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43712	SPM	28	21	29	1	The evaluation of the Kyoto Protocol is not objective as determining that the Kyoto Protocol has been unsuccessful, which is not real. The KP is one important instrument of the KP and the fact that some parties have abandon it is not one reason to affirm that this is not working out.
45469	SPM	28	21	29	2	Maybe re-group the assessment of credits all in one place (i.e. the part about the credits for reductions that would have happened otherwise, repeated later in a statement that questions additionality).
44855	SPM	28	21	29	2	It is perhaps not altogether evident from the text what warrants the "medium evidence, low agreement". What does the latter refer to? Low agreement across the available data and research or different levels of success for different elements of the Kyoto Protocol?
44928	SPM	28	21	29	2	This paragraph has an explicit value judgement about the KP that is not appropriate, for it mistakes environmental effectiveness for the "intent" of the Protocol. The KP has in fact been very successful, surpassing its collective target and changing behaviour of actors, both developed and developing countries. It was as successful as the result of the collective will of Parties. That is not to say its environmental effectiveness has not been below expectations. The Protocol was never intended to regulate emissions of non-Annex I countries, but their emissions would certainly have been higher over the past decade without the Protocol and its Clean Development Mechanism. The phrase "and crediting for emissions reductions that would have occurred even in the absence of the Protocol" is a counterfactual and goes against the very concept of additionality that rules the CDM. Due to the timeframe of the literature assessed, the AR5 does not take appropriate account of recent developments (after 2006) of CDM projects and activities, which have greatly improved the assessment of additionality and issuance of CERs. Moreover, the idea of "concerns" cannot be held responsible for "mixed effects". The concerns raised over integrity of offset credits apply to offset schemes in general, not to the CDM in particular. Therefore it is suggested to rephrase the paragraph as following: "The Kyoto Protocol was the first binding step towards operationalizing and implementing the objectives, principles and provisions of the UNFCCC. While the parties of the KP surpassed their collective emission reduction target, the Protocol's environmental effectiveness has been questioned due to the incomplete participation and compliance of Annex I countries and because the KP was not intended to regulate emissions of non-Annex I countries. The KP's Clean Development mechanism, which created a market for emissions offsets from developing countries, has generated certified emission reductions equivalent to over 1.3 billion tCO <sub>2</sub> e as of July 2013. [this figure could be updated based on later reports from the CDM Executive Board]."
44390	SPM	28	21	28	28	Deletion of "but it has not been as successful as intended" and "and because the Kyoto Protocol does not directly regulate the emissions of non-Annex I countries, which have grown rapidly over the past decade": The leading bold-face sentence of the paragraph says "Kyoto Protocol has not been as successful as intended". Since its intention was to curb only Annex I Parties' GHG emissions, it is not plausible to regard Kyoto Protocol as not successful based on the rapid increase in GHG emissions from non-Annex I Parties.
43973	SPM	28	21	28	25	Non-regulation of non-Annex I countries is mentioned as a reason for KP being "not been as successful as intended" and "less than it could have been". The starting design feature of the KP, however, was to focus only on Annex-I countries' commitments. Therefore, it is misleading to say that the designed KP has "not been as successful as intended" or that this could have been improved in the context of the KP.
45040	SPM	28	21	29	2	What could be the main lessons to learn from the KP to design a more effective global climate policy architecture?
45348	SPM	28	21	28	29	Harsh assessment of the Kyoto Protocol. In general it has fulfilled its function of institutionalizing global GHG agreements.
45349	SPM	28	21	28	29	Suggest replacing this paragraph with a more factual and less normative statement. After the comma in line 22, replace "but it has not been as successful as intended" with "but it has not been enough to put the world on a low carbon development pathway required for limiting climate change" and delete rest of paragraph.

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43780	SPM	28	22	28	27	The Kyoto Protocol is mandated by the Convention, thus implements the principles and objectives of the Convention. It contains comprehensive and reasonable rules for setting emission reduction and limitation targets and means of implementation. The reasons why the Kyoto Protocol fails to meet expected outcome lies in the insufficient participation, lack of ambition and failure in fulfilling its commitments by Annex I countries, instead of blaming the Kyoto Protocol for design defects. In addition, Article 10 of the Kyoto Protocol clearly describes the obligations for non-Annex I countries; therefore, whether non-Annex I countries commit to obligation under the Kyoto Protocol should not be a factor to assess the environmental effectiveness of the Kyoto Protocol. It is suggested to: (1) Revise "but it has not been as successful as intended" into "but it has not been implemented as successfully as intended"; (2) Revise "because the Kyoto Protocol does not directly regulate the emissions of non-Annex I countries, which have grown rapidly over the past decade [5.2, 13.13.1.1]" into "because of lack of ambitious commitments of Annex I countries under the Kyoto Protocol.". Whether Annex I parties surpassed their collective emission reduction target needs verification procedures under the Kyoto Protocol. It is suggested to revise "while the parties of the Kyoto protocol surpassed their collective emission reduction target" into "while the parties of the Kyoto protocol might surpass their collective emission reduction target according to current estimation."
44389	SPM	28	23	28	24	"While the parties of the Kyoto Protocol surpassed their collective emission reduction target" -> "While the parties with mitigation commitments under the first commitment period of the Kyoto Protocol are likely to surpass their collective emission reduction target": This clause needs to be more specific as long as it intends to refer to the 1st commitment period of KP. In addition, the final result of the 1st commitment period is yet to be announced.
44773	SPM	28	23	28	24	Clarify the sentence: "... Kyoto Protocol surpassed their collective emission reduction target ..."
44370	SPM	28	23	28	27	The way these issues are ordered implicitly overstates the limitations caused by incomplete Annex I non-compliance (and final true up is still about a year away) and understates the impacts of not covering non-Annex I countries in the first place. But, in a sense, since non-Annex I countries weren't covered, growth in non-Annex I emissions isn't indicative of the limited success of the Protocol as those emissions were never intended to be within its scope. Suggest:"The Kyoto Protocol was the first binding step toward implementing the principles and goals provided by the UNFCCC, but it has not achieved intended results (medium evidence, low agreement). Parties of the Kyoto Protocol surpassed their collective emission reduction target, however not all Annex I countries participated and some credits were issued for emissions reductions that would have occurred even in the absence of the Protocol. Moreover, the Kyoto Protocol does not directly regulate the emissions of non-Annex I countries, which have grown rapidly over the past decade [5.2, 13.13.1.1]."
43470	SPM	28	24	28	27	"the Protocol's environmental effectiveness has been less than it could have been because...the Kyoto Protocol does not directly regulate the emissions of non-Annex I countries, which have grown rapidly over the past decade"  It is not fair to judge the effectiveness of KP for something which is not in its objectives. That is not to deny the rapid growth of non-Annex 1 emissions, but legally speaking that is completely independent of the results of KP.  By mixing both elements (Annex 1 non participation or noncompliance, and non-Annex 1 growth), the responsibilities of industrialized countries are, in some way, diluted.
44856	SPM	28	24			replace "less than it could have been" with "less than it might have been if all Annex B Parties would have ratified and complied with the Protocol" [note: one can only speculate what "could have been", it is not a scientifically robust approach]
43971	SPM	28	24	28	28	The sentence gives an impression that all the reasons mentioned are equally important for environmental effectiveness of the KP. However, aren't e.g. limited participation and the compliance maybe more important than some part of the CERs being non-additional?
44371	SPM	28	24			Insert "for the first commitment period" after "target"
44857	SPM	28	25			Replace "crediting" with "allocation of emission allowances"
45981	SPM	28	25			"the incomplete participation and compliance of Annex I countries" ~ "the incomplete participation of Annex I countries" ((actually, the "remaining" Annex countries generally complied with their emission reduction commitments by taking into account that USA and Canada are not Parties to the KP))
46988	SPM	28	25	28	25	(This is a high priority comment of Germany) Referring to "incomplete participation and compliance of Annex I countries" as reasons for a reduced effectiveness of the Kyoto Protocol conveys a misleading picture. Most Annex I countries have participated (at least in the first commitment period, which you are referring to) and almost all of them have complied with their obligations under the Kyoto Protocol. Please make clear that you are not referring to the bulk of Annex I countries.

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46989	SPM	28	25	28	26	In chapter 13, page 6, line 48 - page 9, line 1, you refer to "crediting for emissions reductions that would have occurred without the Protocol in economies in transition." In the SPM, this wording should be quoted fully, not selectively.
44328	SPM	28	26	28	28	This statement directly refers to non-Annex I countries. A comparison of emission rise with Annex I countries shall be presented in SPM.
45791	SPM	28	26	28	28	the line started from word 'because' and ended with word 'decade' may be deleted.
45982	SPM	28	27			Protocol does not directly regulate the emissions of non-Annex I countries, which have grown rapidly ~ Protocol does not directly regulate the emissions of THE GROUP OF the non-Annex I countries, which have grown rapidly ((the very rapid growth is valid for a part of the non-Annex I countries, therefore the rapid growth is valid only for the group, but not for all non-Annex I countries.))
47070	SPM	28	28	29	1	It is important to note that the CDM has not only generated certified emissions reductions, but also paved the way for the deployment of certain clean technologies and practices in places where they were not used much before. The sentence could be amended as follows: "The Kyoto Protocol's Clean Development Mechanism, which created a market for emissions offsets from developing countries, has enabled the diffusion of low-carbon technologies and practices and has ..."
43972	SPM	28	28	28	29	The sentence may be understood in a way that all the emission reductions of the CDM would have occurred even in the absence of the Protocol. This is clearly misleading and the sentence should be clarified.
43781	SPM	28	28	28	29	According to Article 12 of the Kyoto Protocol, the purpose of CDM has two aspects, which is "to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3." Thus, the assessment of CDM here should be described from both aspects. It is suggested to make revisions accordingly.
44925	SPM	28	3	28	4	The phrase "the UNFCCC remains a primary..." implies there may be other primary forums. Being a global issue, as stated in this very same SPM, the UNFCC is the primary international forum.
45979	SPM	28	3	28	4	The United Nations Framework Convention on Climate Change (UNFCCC) remains a primary international forum ~ The CONFERENCE OF THE PARTIES of the United Nations Framework Convention .. a primary international forum
45786	SPM	28	3	28	3	the word 'very high confidence' may be replaced by word 'robust evidence, high agreement'.
46982	SPM	28	3	28	3	In the respective part of the Executive Summary of chapter 13, page 5, line 15, it reads "(robust evidence, high agreement)". Please correct.
44711	SPM	28	4	28	4	We suggest changing "a" to "the"
45414	SPM	28	4	28	4	It is suggested to substitute "a" by "the".
47069	SPM	28	4	28	8	"Institutional diversity at multiple scales...the Montreal Protocol...". The Montreal Protocol example is somehow misleading here. The GHG emissions reductions were an indirect consequence of the MP's regulation of ozone-depleting substances and not because it included climate-change related issues.
45037	SPM	28	4			We suggest replacing "remains a" by "is the" - isn't it factual?
44916	SPM	28	6	28	9	It would be useful to add the reasoning behind the assertion on the emissions reductions achieved by the Montreal Protocol. The report provides clarifying text in that regard. It is suggested to add, on line 8, the following sentences: "Consistent with the principle of CBDR, the Montreal Protocol established mechanisms for financing (most notably the Multilateral Fund, which has transferred more than \$3 billion to developing countries) and provided technical support to assist developing countries in reducing their ODS emissions."
45787	SPM	28	6	28	6	e.g. sustainable development, international trade and human right' may be added before the word 'for e.g.'
45788	SPM	28	6	28	6	the word 'for e.g.' may be deleted.
46983	SPM	28	6	28	6	You refer to the Montreal Protocol as an example of how climate change issues have growingly been included into other policy arenas. Please also refer to examples where climate change has been included into broader fields of policy, as in chapter 13, page 5, line 19, where you refer to sustainable development. It seems a bit odd to only single out the Montreal Protocol as an example since (a) overall, the Montreal Protocol is rather a niche topic and (b) it has been concluded in the early 1990s and thus is not an example of recent trends.
45347	SPM	28	6	28	8	Check text in WG1 SPM on substitute gases under the Montreal Protocol which may be potent GHGs.
44245	SPM	28	8		9	Suggest including further detail about this final sentence regarding the influence of international trade on international climate change cooperation.
44854	SPM	28	8	28	9	This sentence on international trade is not very informative.
44926	SPM	28	8	28	9	If something can either promote or discourage cooperation, why is this relevant to policy makers?
45230	SPM	28	8	28	9	the reference to 'international trade' is vague, and could be made clearer

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46984	SPM	28	8	28	9	Why did you change the wording contained in the Executive Summary of chapter 13, page 6, lines 21-22? There it says "International trade can offer a range of positive and negative incentives to promote international cooperation on climate change." Please use this wording or delete sentence.
44924	SPM	28	1			Due to the timeframe of the literature assessed, the AR5 does not consider the most recent developments in UNFCCC negotiations since the Cancun agreements. It would be appropriate to point to this fact in a specific paragraph.
45229	SPM	28	1			Worth including figure 13.5 here?
46985	SPM	28	11	28	14	It remains unclear in what sense national policies are "harmonized", as to date the submitted pledges have been determined nationally. Thus, for better understanding, it would be recommendable to refer to "compiled nationally determined policies" (pledges) rather than "harmonized" national policies. The reference to "decentralized but coordinated national policies" also remains unclear, as the example only partly concerns national policy.
45910	SPM	28				Figure SPM13 should be deleted, since it might give an impression that AR5 recommends the indicated policy measures among various ones. Otherwise, following revision should be made, i) unify color of all policy measures since the classification of agreed ones and not-agreed ones are vague and ii) add the following note; "This figure is not exhaustive, as it is a compilation of policy measures/frameworks which are subjects of study in many articles. Also, this figure doesn't indicate priority of each of the measures/frameworks."
43692	SPM	28	0	29		This section on international cooperation warrants mention of Parties agreeing to negotiate a 'protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties' to be adopted in 2015 and come into effect and be implemented from 2020 (reference: UNFCCC 'Decision 1/CP.17').
44665	SPM	28	1	29	21	Section 4.2: Chapter 14 (e.g., paragraph 2 on p. 4, line 39) and the TS (p. 83, lines 28-40) contain an important point about opportunities to undertake mitigation that should be included in the SPM discussion of international cooperation (SPM.4.2). For example, the TS (at p. 83, lines 29-34) notes that "The regions with the greatest potential to leapfrog to low-carbon development trajectories are the poorest developing regions where there are few lock-in effects in terms of modern energy systems and urbanization patterns. However, these regions also have the lowest financial, technological, and institutional capacities to embark on such low-carbon development paths [Figure TS.36] and their cost of waiting is high due to unmet energy and development needs." This point could be included on p. 29 of the SPM, following or just preceding the final paragraph. Similarly, the point contained in the paragraph beginning on p. 85, line 4 of the TS ("non-climate-related modes of regional cooperation could have significant implications for mitigation, even if mitigation objectives are not a component") could also be included. Specifically, this paragraph makes the case for inclusion of environmental components in international trade agreements, noting: "Modest impacts have been found on the level of emissions of members of regional preferential trade areas if these agreements are accompanied with environmental agreements. Creating synergies between adaptation and mitigation can increase the cost-effectiveness of climate change actions. " Linking electricity and gas grids at the regional level has also had a modest impact on mitigation as it facilitated greater use of low carbon and renewable technologies; there is substantial further mitigation potential in such arrangements. [14.4.2]
44010	SPM	28	26	28	28	We request to delete this phrase: "and because the Kyoto Protocol does not directly regulate the emissions of non-Annex I countries, which have grown rapidly over the past decade".
44009	SPM	28	3	28	4	Replace by the following sentence: "The United Nations Framework Convention on Climate Change (UNFCCC) is the main international forum for climate Negotiations"
44011	SPM	28	6	28	8	It is requested to remove this sentence since the comparison with the Montreal Protocol is unfounded because the solution space of the Montreal Protocol is significantly different to that of GHG mitigation and also because the CFCs and HCFCs regulated by the Montreal Protocol have been largely replaced by other GHG.
45911	SPM	28	8	28	9	What exactly mean by the sentence "International trade can promote or discourage international cooperation on climate change [13.8]."? Suggest to add examples of the case where international trade promote or discourse cooperation on climate change.
44405	SPM	28	21	29	2	On text backed by "low agreement", it is proposed to be deleted.
45631	SPM	29	1	29	1	Please consider to substitute "billion" with "Gt" in order to be consistent throughout the SPM.
44246	SPM	29	1	29	1	Suggest using the same emissions units as elsewhere in the SPM (GtCO <sub>2</sub> eq rather than billion tCO <sub>2</sub> eq).
44858	SPM	29	1	29	2	Delete everything after 2013, or, alternatively replace with the more neutral "but assessments of the effectiveness have been mixed".

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43974	SPM	29	1	29	1	"has had mixed effects" is an unclear expression and questions the whole 1.3 billion tCO <sub>2</sub> eq. It would be more appropriate to say e.g. that "...but there have been concerns about the additionality of part of the projects..."
45231	SPM	29	1	29	2	criticism of the CDM seems excessive. Concerns about additionality should be quantified if possible, and 'other issues' should be explicitly identified or not referred to at all
45797	SPM	29	10	29	10	the figure mentioned '16.2.1.1' may not be required.
43975	SPM	29	10	29	10	"...in developing countries, in the context of meaningful mitigation actions and transparency on implementation". (Para 98 of Decision 1/CP.16 of the UNFCCC) Please use the correct language.
44250	SPM	29	11	29	15	This paragraph could also mention other examples for different levels, such as the Climate and Clean Air Coalition as an example of complementary international climate policies.
47072	SPM	29	11	29	15	Is there evidence for the effectiveness of regional ETS in the global economical context?
44929	SPM	29	11	29	15	Policy linkages among existing arrangements can offer benefits, but they could never replace a universal, binding agreement under the UNFCCC when it comes to the global response to climate change. Suggest to delete "in the absence of". The "prominent" examples listed of linkages between the EU-ETS and "planned" international offsets have not effectively materialized, at least not in the scale literature would have expected. It is questionable, therefore, whether these merit mention in the SPM, consider deletion for brevity. It is striking that, when describing the CDM, the authors have repeatedly pointed out concerns and issues associated with the integrity of offset credits, but when mentioning the EU-ETS, the reference is a "prominent linkage" and "offering climate benefits". Why portray such policies under a positive light if such schemes by developed countries are also based on offset credits and also raise the same issues on additionality?
45985	SPM	29	11			In the absence of – or as a complement to – a binding, international agreement on climate .. In the absence of – or as a complement TO THE EXISTING MULTILATERAL AGREEMENTS – a NEW binding, GLOBAL agreement on climate .. ((again at least some implicit reference is due to the 2012 Doha Amendment and to the new global agreement planned for 2015 ..))
45798	SPM	29	11		13	Wording may be changed since the meaning is unclear; please substantiate/link with text that follows.
44669	SPM	29	11	29	15	The only reference here is to the European Union. Other examples should be provided, such as the G8, the G20, the Major Economies Forum and its Clean Energy Ministerial, the IMO, and many others listed in 13.13.1.4.
44670	SPM	29	11	29	15	Would it be desirable to include a reference to chapter 14.5 here? Chapter 14.5 (p. 53, lines 5-8) contains the point that "...the ability to use existing regional cooperation for furthering a mitigation agenda, by pursuing a common and coordinated energy policy, embodying mitigation objectives in trade agreements in urbanization and infrastructure strategies, and developing and sharing technologies at the regional level, is substantial." Some abbreviated version of this, e.g., "The ability to use existing regional cooperation for furthering a mitigation agenda, for example by embodying mitigation objectives in trade agreements, is substantial," could be included in the penultimate paragraph of the SPM.
43784	SPM	29	11	29	15	(1) The assumption of "In the absence of – or as a complement to-" is not true, for both the Convention and the Kyoto Protocol are binding, international agreements on climate change. Furthermore, whether the assumption is true or not has no impact on the topic sentence. It is suggested to delete "in the absence of – or as a complement to-". (2) The linkage between EU ETS and international offsets is to be proved, and the example could not sufficiently support the topic sentence in bold. It is suggested to replace the example with the text of "Direct and indirect linkages.....policy experiments.[13.5.3]" (Ch13, ES, P6, Para.1)
45632	SPM	29	12	29	12	Please consider to substitute the word "nascent" with a different wording easier to understand.
45799	SPM	29	13	29	13	(medium confidence)' may be replaced by '(medium evidence, medium agreement)'. Could you clarify the wording "potential" climate benefits?
45041	SPM	29	13	29	15	Simply noting that the EU-ETS exists is not giving much information to policymakers. It would be much more useful to have a summary (e.g. based on section 14.4.2.1) about the performance of this "linkage" and the lessons learned.
46993	SPM	29	13	29	13	The respective part of the Executive Summary of chapter 13, page 6, line 3, states "(medium evidence, medium agreement)".
44917	SPM	29	14	29	14	There is no other specific reference to actors other than Europe or European Union, which does contribute to the comprehensive aspect of the SPM and such restrict references should be removed.
45800	SPM	29	14	29	14	prominent' may be replaced by 'direct'.
45801	SPM	29	14	29	15	the statement 'among national policies include the European Union Emission Trading Scheme and' may not required in place of it 'between and among sun-national, national and regional carbon markets' may be included.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44392	SPM	29	15	29	15	add a new paragraph as follows: "Also, most of the national climate policy initiatives in low-income countries, especially in the Least Developed Countries, have focused on adaptation, but more recently there has been a shift with a number of national policy initiatives that aim to develop climate resilient low-emission development strategies (LEDS) [15.11]. These strategies can be a larger part of development plans and contribute to achieving a national commitment under UNFCCC negotiations."
45633	SPM	29	16	29	21	The validity of this statement "(medium evidence, low agreement)" is inconsistent with the validity of a similar statement in the TS (p. 41 l. 1-2) which says "medium evidence, high agreement". Please make sure that the TS and SPM are consistent on the benefits of coupling adaptation and mitigation in a common policy framework, and that the conclusions in TS and SPM also are consistent with the AR5 chapters.
44251	SPM	29	16	29	21	This statement switches from describing countries' approaches to mitigation and adaptation policy in the first sentence, to the benefits of considering the two together at the international level. This is confusing since it is not clear that the same benefits exist at the national level. The level (i.e., national or international) the remainder of the paragraph applies to is also not clear. Consider revising.
44421	SPM	29	16		21	This paragraph lacks any clear message. Perhaps the literature does not yet enable a clear finding. Suggest deletion
44671	SPM	29	16	29	21	As worded, the last sentence contradicts the former. The authors should revise the text to remove this contradiction.
44672	SPM	29	16	29	21	This paragraph should reflect the conclusion from Chapter 14 and the TS (p. 85, lines 10-11) that "...creating synergies between adaptation and mitigation can increase the cost-effectiveness of climate change actions." The quoted text supports the existing headline in bold text and should be added to the paragraph, along with a reference to chapter 14.4.2.4.
46994	SPM	29	16	29	21	The statement on the potential benefits of integrating mitigation and adaptation is not consistent with the findings of the WG2, see for example SPM, page 14 ("Climate-resilient pathways are sustainable-development trajectories that combine adaptation and mitigation to reduce climate change and its impacts. They include iterative processes to ensure that effective risk management can be implemented and sustained (high confidence)."; "Opportunities to take advantage of positive synergies between adaptation and mitigation may decrease with time, particularly if limits to adaptation are exceeded." "Significant co-benefits, synergies, and tradeoffs exist between mitigation and adaptation and between alternative adaptation responses; interactions occur both within and across regions (very high confidence).") WG2 is very clear about the benefits of integrating mitigation and adaptation, and its statements are associated with high confidence. Please revise your statement in line with the findings of WG2.
45351	SPM	29	16	29	21	Could the benefits of adaptation in AFOLU be indicated to protect food production in existing areas while reducing agricultural pressure as a driver of land use change.
43785	SPM	29	16	29	21	Adaptation is as equally important as mitigation, which is already internationally recognized. The description of the relationship between adaptation and mitigation is not appropriate. It is suggested to use the following text to replace the original paragraph: "While a number of new institutions are focused on adaptation funding and coordination, adaptation has historically received less attention than mitigation in international climate policy, but inclusion of adaptation is increasingly important to reduce damages and may engage a greater number of countries (robust evidence, medium agreement). Other possible complementarities and trade-offs between mitigation and adaptation, particularly the temporal distribution of actions, are not well understood. [13.2, 13.3.3, 13.5.1.1, 13.1]" (Ch13, ES, P6, L10)
43976	SPM	29	19	29	19	It is unclear what "adding adaptation to mitigation measures in the policy portfolio" means.
44329	SPM	29	2	29	2	Define other issues in SPM when referring integrity of offset credits.
44247	SPM	29	2	29	2	Suggest avoiding the use of technical terms such as "additionality".
45983	SPM	29	2			additionality of projects ~ additionality of a part of such projects ((no need to criticize all these projects))
45634	SPM	29	20	29	21	The necessity to not only look at mitigation or adaptation in isolation, but also their interdependencies, is an important point that is very relevant for policy makers, and we support having this sentence in the SPM.
45802	SPM	29	21	29	21	in financing (medium confidence)' may be added after the word 'trade-offs'.
44693	SPM	29	24	30	2	CHAPTER 14, P. 29, LINE 24 - P. 30, LINE 2: The point that the AFOLU sector dominates emissions from several regions may be relevant for inclusion in the SPM. Figure 14.12 on p. 31 also makes clear that for AFOLU, the difference between a high-emissions (RCP 8.5) and low-emissions (RCP 2.6) trajectory is concentrated in three regions: Sub-Saharan Africa (SSA), Latin America (LAM), and Southeast Asia and the Pacific (PAS).
45470	SPM	29	3	29	10	In light of the various estimates of the funding that has to be mobilised globally, be it in energy only, to put the world on track with 2 degrees (trillions are often mentioned), it is surprising to read that USD 100 bn will have an important impact on the distribution of effort. In that sense, it may be useful to refer back to Figure SPM 12, where the orders of magnitude of additional investments in non-OECD are certainly higher than USD 100 bn, but at least in the same order of magnitude...

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44248	SPM	29	3	29	5	At the end of this bolded headline (on line 5), suggest replacing "...and substantial new funding mechanisms" with "...and new institutions and mechanisms to facilitate the implementation of commitments through financing, technology transfer, and capacity building".
47071	SPM	29	3	29	10	This paragraph does accurately represent the current state of play of the UNFCCC but singles out particular aspects, namely financial, which is not informative. For example, the reference to the funding for climate action in 2020 is incomplete and fails to mention that the distributional impact is also dependent on ambitious pledges. The final sentence ("The distributional impact...") should be deleted.
44859	SPM	29	3	29	10	This paragraph differs from most of the others in the sense that it does not carry a "calibrated uncertainty language" statement. The first part would seem to be a statement of fact. The second part of the paragraph is more an assessment, which, reasonably, would be affixed with a confidence level.
45792	SPM	29	3	29	3	In place of the word 'recent' 'exact CoP decision need to be given' may be mentioned.
44668	SPM	29	3	29	10	The bolded text is a statement of fact as opposed to an assessment of literature. Furthermore, the conclusion in this section, on lines 7-10, is not justified in the underlying material. For example, the language suggests that the distributional impacts will depend upon sources of financing, when countries made their commitment independent of financing. If anything is to be retained here, it should be references to the role for domestic and international market-based mechanisms, the de-emphasis of the distinction between developed and developing countries, and the role of plurilateral coalitions rather than global arrangements in implementing emissions reduction policies. Otherwise, this section should be deleted.
44686	SPM	29	3	29	4	CHAPTER 3, P. 29, LINES 3-4: The statement that, "distributional weights should be applied to monetary values before they are aggregated" is too prescriptive, particularly given that there is no consensus in the economics literature about what weights should be used. Acknowledging the alternative of conducting an unweighted CBA in tandem with a separate distributional analysis would make for a more balanced discussion.
46990	SPM	29	3	29	10	When referring to "recent UNFCCC negotiations", it seems a bit odd to stop with the Cancun Agreements and not mention the ongoing negotiations under the Durban Platform on Enhanced Action. In chapter 13, the Durban Platform is mentioned several times (e.g. chapter 13, page 22, line7; page 29, lines 1-2; page 33, lines 16-22; page 67, line 1; page 67, lines 16-19). Please include a reference in the SPM.
45350	SPM	29	3	29	10	Suggest making reference to UNFCCC Ad Hoc Working Group on the Durban Platform for Enhanced Action, which aims to reach agreement in 2015 on a protocol, another legal instrument or an agreed outcome with legal force for the post 2020 period.
43782	SPM	29	3	29	5	The description here fails to comprehensively reflect the real situation of the UNFCCC negotiations. It is suggested to revise "Recent UNFCCC negotiations have sought to include more ambitious commitments from the countries with commitments under the Kyoto Protocol, mitigation commitments from a broader set of countries, and substantial new funding mechanisms." into "Recent UNFCCC negotiations have sought to include more ambitious mitigation commitments from the developed countries as well as provision of finance and technology transfer, and mitigation actions from developing countries."
44420	SPM	29	4		5	"mitigation commitments from a broader set of countries" is undifferentiated. Replace with 'mitigation commitments or targets by developed countries not under the Kyoto Protocol, and actions by developing countries'. Delete "substantial" - it is unclear whether funding is substantial, the GCF is currently not yet capitalised
45793	SPM	29	4	29	4	listed in Annex B' may be added after word 'countries'.
43977	SPM	29	4	29	5	Please change "a broader set of countries" to "all countries".
43471	SPM	29	5	29	6	"Under the 2010 Cancún Agreement, developed countries formalized voluntary pledges of quantified, economy-wide emission reduction targets and developing countries formalized voluntary pledges to mitigation actions".  Most of developed countries pledges were highly conditioned to different factors (a new legal agreement, meaningful mitigation actions for all), and so on. Which such a weak and conditioned level of compromises it is maybe too much to consider it as "formalized voluntary pledges".
45984	SPM	29	5	29	7	Under the 2010 Cancún Agreement, developed countries formalized voluntary pledges of quantified, economy-wide emission reduction targets and .. ~ Recently, many developed countries formalized new quantified, economy-wide emission reduction targets and other developed countries and .. ((again the existence of the 2012 Doha amendment should be taken into account))
45794	SPM	29	5	29	5	than those under Annex B' may be added after word 'countries'.
45795	SPM	29	5	29	5	(medium evidence,low agreement)' may be added after the word 'mechanisms'.



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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
46991	SPM	29	5	29	5	Delete "substantial new funding mechanism" and replace it by "and a new operating entity of the financial mechanism" or alternatively "and substantial financial support", see underlying report.
44249	SPM	29	7	29	10	Regarding the phrase on line 7 stating "The distributional impact of the agreement will depend in part on sources of financing, including...", it is unclear what is meant by the 'distributional impact of the agreement'. Suggest clarifying and also suggest repeating 'Cancun agreement' if this is the agreement referred to here. Suggest also considering deleting the remainder of the sentence after "sources of financing" as the link it establishes between developing country mitigation actions and developed country pledges may be considered as overly explicit.
44391	SPM	29	7	29	7	add the following phrase "and the GCF was established as an operating entity of the financial mechanism of the UNFCCC" to page 29 line 7 sentence.
45232	SPM	29	7	29	10	The statement "including the successful fulfillment by developed countries of their expressed joint commitment to mobilized USD 100 billion per year by 2020 for climate change action in developing countries" is not substantiated by the underlying report. This sentence should stop after the word "financing".
46992	SPM	29	7	29	10	The current sentence links the "distributional impact of the agreement" to the "successful fulfillment by developed countries ... to mobilize USD 100 ...". We cannot track down this statement in the underlying report. Chapter 13 states on pages 14/15: "Distributional impacts from agreements will depend on the approach taken, criteria applied to operationalize equity, and the manner in which developing countries' emissions plans are financed..." but there is no reference to a concrete commitment. Please use the sentence from chapter 13. If you insist on keeping the reference, the language agreed in Copenhagen and Cancun should be quoted fully. After "expressed joint commitment to mobilize USD 100 billion per year by 2020 for climate action in developing countries", please add: "in the context of meaningful mitigation actions and transparency on implementation."
43783	SPM	29	7	29	8	Both technology transfer and financial supports are major factors that affect the distributional impact of the agreement. The description here is not comprehensive. It is suggested to revise "The distributional impact of the agreement will depend in part on sources of financing, including ....." into "The distributional impact of the agreement will depend in part on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology, including ....."
45796	SPM	29	8	29	8	the word 'for developing countries' may be added after the word 'financing'.
43786	SPM	29				Finance is a key element to the international cooperation and also a crucial issue under the current UNFCCC negotiation. It is suggested to add the following text before line 16 in this section: "Financial support from developed countries to developing countries is the corner stone of international cooperation in addressing climate change. [13.2.2.4] International cooperation for climate mitigation and adaptation can stimulate public and private investment, which can impact the domestic climate discourse and create incentives for sustainable development at national and local levels in developing countries. (TS, P86, L26) [15.12.1]. Increased financial support by developed countries for mitigation (and adaptation) measures in developing countries will be needed to stimulate the increased investment. Numerous options exist for developed countries to raise public funding for climate finance in developing countries. [16.2.3]"
43787	SPM	29				Technology is a key element to the international cooperation and also a crucial issue under the current UNFCCC negotiation. It is suggested to add the following text before line 16 in this section: "Facilitating technology transfer is one of key objectives of international cooperation in addressing climate change. Technology has been a central element of human, social, and economic development, and can be a means to achieving equitable SD. (Ch4, P25, L13-15) The role of international cooperation in facilitating technological change, including access to, facilitation of, and transfer of technology, is explicitly recognized in Article 4(1)(c) and (h), 4(5), 4(7), 4(8), and 4(9) of the UNFCCC. Although international technology transfer issues for climate change mitigation or adaptation have become concerns in numerous countries, these concerns have been especially acute in developing countries. (Ch13, P48, L35-44) There are some crosscutting issues, such as regimes for technology transfer and intellectual property that are particularly relevant to international cooperation in meeting the global challenge of pursuing equitable SD and mitigation. (Ch4, P26, L31-34)"
45912	SPM	29	10	29	10	Based on Copenhagen Accord, "for climate action in developing countries" should be replaced with "to address the needs of developing countries"
44012	SPM	29	11	29	15	It is requested to delete this paragraph because it prejudices the negotiation outcomes and underlines specific policy instruments that may not fit for all countries.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44677	SPM	30	18	30	19	CHAPTER 2, P. 30, LINES 18-19: The authors need to delete "by applying a specific guideline such as the precautionary principle (see section 2.5.5)" (or replace that phrase with "for example", so that it reads: "The target can be defined through CBA, [for example], or by specifying a threshold level of concern or environmental standard...". As discussed in many of these Chapter 2 comments on the FGD, we do not agree with how precaution is described in this draft. The authors' default cannot be to describe precaution always as a "principle". Any references to a so-called "precautionary principle" or "PP" should be eliminated, unless the literature cited specifically references precaution as a "principle", in which case the dispute between the two approaches must also be cited.
44678	SPM	31	26	31	26	CHAPTER 2, P. 31, LINE 26: The authors need to replace "The precautionary principle and" with "Precaution and". Any references to a so-called "precautionary principle" or "PP" should be eliminated, unless the literature cited specifically references precaution as a "principle", in which case the dispute between the two approaches must also be cited.
44679	SPM	31	26	31	38	CHAPTER 2, P. 31, LINES 26-38: The authors need to replace "The precautionary principle and" with "Precaution and". Any references to a so-called "precautionary principle" or "PP" should be eliminated, unless the literature cited specifically references precaution as a "principle", in which case the dispute between the two approaches must also be cited.
44680	SPM	31	28	31	39	CHAPTER 2, P. 31, LINES 28-39: The authors need to delete these lines (i.e. the following text: "In the 1970s and 1980s, the precautionary principle (PP) was proposed for dealing with serious uncertain risks to the natural environment and to public health (Vlek, 2010)"). In its strongest form the PP implies that if an action or policy is suspected of having a risk that causes harm to the public or to the environment, precautionary measures should be taken even if some cause and effect relationships are not established. The burden of proof that the activity is not harmful falls on the proponent of the activity rather than on the public. A consensus statement to this effect was issued at the Wingspread Conference on the Precautionary Principle on January 26 1998. The PP allows policy makers to ban products or substances in situations where there is the possibility of their causing harm and/or where extensive scientific knowledge on their risks is lacking. These actions can be relaxed only if further scientific findings emerge that provide sound evidence that no harm will result. An influential statement of the PP with respect to climate change is principle 15 of the 1992 Rio Declaration". The authors could, therefore, say instead simply "One influential statement of a precautionary approach is contained in principle 15 of the 1992 Rio Declaration...". We strongly disagree with the understanding of precaution in this passage. In our view there is no such thing as a single agreed precautionary "principle," as there are various formulations of precaution. Instead, precaution is a tool or an approach. Moreover, the precautionary approach reflected in the Rio Declaration does not require action in the face of uncertainty, or shift the burden of proof to the proponent of an activity to prove it is safe. On the contrary, the Rio formulation of precaution is a carefully stated concept that in certain circumstances -- where there are threats of serious or irreversible damage -- lack of full scientific certainty is not an excuse for not taking cost-effective measures to prevent environmental degradation.
44681	SPM	31	43	31	43	CHAPTER 2, P. 31, LINE 43: The authors need to replace "the PP" with "precaution". Any references to a so-called "precautionary principle" or "PP" should be eliminated, unless the literature cited specifically references precaution as a "principle", in which case the dispute between the two approaches must also be cited.
44682	SPM	31	48	31	48	CHAPTER 2, P. 31, LINE 48: Replace "RDM thus captures the spirit of the precautionary principle in a way that illuminates" with "RDM thus illuminates"
44674	SPM	4	1	4	1	CHAPTER 2, P. 4, LINE1: The authors need to replace "The precautionary principle and" with "Precaution and". Any references to a so-called "precautionary principle" or "PP" should be eliminated, unless the literature cited specifically references precaution as a "principle", in which case the dispute between the two approaches must also be cited.
44687	SPM	44	13	44	14	CHAPTER 12, P. 44, LINES 13-14: This wording says that "excessive" regulation is the problem, which is inaccurate. It is not a question of the amount of regulation, but the content of the regulation. The authors should replace "excessive" with "outdated or poorly designed" or a similar phrasing. This would also fix the problem in the rest of the bullet, where, with no descriptor before "zoning, building codes, [etc.]," it gives the impression that the existence of those regulations alone distorts the market, which is not true. It is when the regulations are out of date or not appropriate that they cause problems.
44688	SPM	47	45	47	48	CHAPTER 12, P. 47, LINES 45-48: Saying that brownfield redevelopment is "invariably" more expensive than greenfield development is too absolute and sweeping a statement to make. In addition, brownfield redevelopment can be more profitable than greenfield development, even if the initial expensive might be higher (source: Wernstedt, Kris, Peter B. Meyer, and Kristen R. Yount. "Insuring Redevelopment at Contaminated Urban Properties." Public Works Management & Policy 8(2): 85-98. 2003.). The authors should replace "is invariably" with "can often be."

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44690	SPM	5	17	5	23	CHAPTER 14, P. 5, LINES 17-23: This discussion is factual, but the reference to trade in particular appears intended to bolster arguments for special treatment under the 2015 agreement for fossil fuel producing economies, a highly contentious and political issue. The IPCC should avoid this issue. If it *is* to be addressed, the discussion should present a more balanced picture of the situation, including that other economic and environmental factors are driving fossil-fuel dependent economies to seek to diversify their economies and that mitigation policies could be considered just one of those factors.
45108	SPM	5	1	29	21	<p>We do not see a clear set of messages from policymakers in the SPM as it currently drafted. We would like to see significantly stronger, and clearer drafting, particularly around headline messages.</p> <p>From what is written in the underlying report, we see the key messages that need to be more clearly articulated as</p> <p>+ 2C is clearly achievable – there is more than enough mitigation potential across a range of sectors so the challenges in delivering this are of designing effective policies and political will.</p> <p>+ That, while most models do anticipate that ambitious mitigation action consistent with 2C is likely to require some economic costs (ignoring many of the benefits associated with reducing risks on the business as usual path) the cost is very moderate when compared to forecast economic growth – in other words climate action is consistent with maintaining strong global economic growth and development.</p>
45109	SPM	5	1	29	21	A general observation would be that previous SPM's, including the recently published WG1 SPM, use 'call out' boxes to highlight key messages for the reader. These draw the attention of policymakers to the absolutely vital messages. SPM WG1 starts with a 'call out' stating "Warming of the climate system is unequivocal..." The lack of such clear messaging in the WG3 SPM should be addressed, and these key messages should be highlighted to draw the reader's attention to them
45110	SPM	5	1	29	21	A general observation is that figures, particularly SPM.4, SPM.8, SPM.9, SPM.10, SPM.11 are seeking to convey far too much information and should be significantly simplified for the policymaker.
44689	SPM	51	20	51	22	CHAPTER 12, P. 51, LINES 20-22: The statement that these cities instituted parking regulations to "constrain car use or increase the cost of driving" is inaccurate. None of these cities appear to cite these as goals. The authors should consider replacing "to constrain car use or increase the cost of driving as well as to reduce the amount of urban land devoted to vehicle infrastructure." with "to reduce the costs of development, use urban land efficiently, and encourage alternate transportation modes." (These are goals that communities explicitly state when implementing parking maximums.)
44694	SPM	53	12	53	25	CHAPTER 14, P. 53, LINES 12-25: Even in areas of deep integration where multiple instruments for mitigation have been put into place, progress on mitigation has been slower than anticipated. This is largely related to a political reluctance to pursue the multiple policy instruments with sufficient rigor. The challenge will be to drastically increase the ambition of existing instruments while carefully considering the positive and negative interactions between these different policies. For regions where deep regional integration is not present yet, the experience from the EU suggests that only after a substantial transfer of sovereignty to regional bodies can an ambitious mitigation be pursued. Such a transfer of sovereignty is unlikely in most regions where the regional cooperation processes are still in early stages of development. Alternatively, regional cooperation on mitigation can build on the substantial good-will within regions to develop voluntary cooperation schemes in the fields outlined in the chapter that also further other development goals, such as energy security, trade, infrastructure, or sustainable development. Whether such voluntary cooperation will be sufficient to implement ambitious mitigation measures to avoid the most serious impacts of climate change remains an open question.
44695	SPM	54	43	55	15	CHAPTER 14, P. 54, LINE 43 - P. 55, LINE 15: This FAQ 14.3 "How do opportunities and barriers for mitigation differ by region?" could be amplified by folding in lessons from the chapter and from other chapters, for example from sectoral discussions that identify regional differences in the ability or opportunity to pursue various mitigation strategies.
43694	SPM	6		7		General comments introduction: It is important to emphasize the issue that climate change is contingent upon the fulfillment of commitments of developed country Parties based on the historical responsibility and the principle of Common but Differentiated Responsibilities, and ensuring financial, technological and capacity building for the necessary climate adaptation
44033	SPM	6		6		Footnote 1: We recommend that this footnote present the calibrated uncertainty terminology more thoroughly so that the qualifiers for confidence and agreement/evidence are fully identified (e.g., very low, low, medium, high and very high). The footnote on this in the WGI SPM (Footnote 1) would be a good model to follow, since this text is already approved.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44034	SPM	6		6		Footnote 1, lines 4-5: The sentence "Levels of evidence ..." is awkwardly phrased, and could be read to imply that the IPCC chooses not to disclose evidence/agreement evaluations in some instances (which of course, is false - this information is presumably always present, either explicitly or implicitly, in the underlying account of the evidence in the chapters). Suggest replacing the sentence with something along the lines of "Levels of evidence and agreement are generally not reported when it is possible to assess a confidence level, whereas evidence is often summarized with assessed evidence and agreement levels when a confidence level has not been assessed." This would be fully consistent with the advice to authors that is given in step 8 of the assessment process described in the Uncertainties Guidance paper. It is important to avoid words like "can" or "may" because they can be interpreted ambiguously (indicating a possibility, but also implying that permission is given to authors). Thus it is best simply to describe what has been done - which is that evidence/agreement assessments have been given frequently, but not in every instance.
45472	SPM	6	1	7	43	Please consider to split SPM 1 in two parts with a short introduction (line 1-23) followed by a new section (line 24- page 7 line 43). We notice that there are no confidence levels given. We assume that the statements in bold are stated as facts, hence no confidence levels are needed.
45362	SPM	6	1	6	1	It is strongly suggested to change the title of the first section of the SPM again to "introduction" and delete the second element "framing". The new and additional text in this first section of the SPM has very much the character of a text book but not the character of an assessment. Different people might frame the context differently. This framing exercise could be perceived rather policy prescriptive, weakening the core of the whole WGIII contribution to the AR5. As a consequence it is suggested to delete all text that is more related to framing than introducing the assessment. It is suggested to reformulate section 4 of the SPM and make it more coherent with the SPM of Working Group II (section Climate-resilient Pathways and transformation). In analogy to WG II the title of this last section might be Low carbon emission Pathways and transformation. This last section might reflect some of the findings of WG III main report, addressing also topics such as equity, economic evaluation, trade-offs, synergies, mitigation in the context of risk management.
46997	SPM	6	1	7	43	Section SPM.1 "Introduction and framing". This section is a rather weak introduction to the SPM and offers a poor description of the whole issue of mitigation. Furthermore, the text frequently focuses on philosophy and ethics of international action and introduces value judgments. Specific examples are provided in our comments below. This section should be rewritten to clearly outline the challenge, building solely on the findings of the underlying report.
45914	SPM	6	1	6	2	The term "mitigation" is a crucial one. I agree that reducing sources and enhancing sinks are important elements, however, I suggest to also include avoiding emissions by preserving carbon stocks. This would then include actions where emissions are side-products, and/or where there may be no emissions to reduce and sinks to enhance, rather, emissions to avoid.
44424	SPM	6	1	29	21	It would be helpful to define which countries fall in the income-level categories used in the SPM (e.g high income, upper middle income, lower middle income, and low income). It would be useful to have this within the SPM itself or through a link to the definition in the appendix/glossary. The definition should include the ability to view the specific countries listed in each category in addition to the income brackets.
44425	SPM	6	1	29	21	The SPM uses the terms FOLU, AFOLU, and "emissions in the land-use sector" interchangeably. The text would be clearer if a single term were used consistently, unless the authors are trying to make a distinction between land use including agriculture vs. land use excluding agriculture (in which case they should be more explicit about this distinction).
44426	SPM	6	1	29	21	The messaging is unbalanced in places, where it includes only a little on the expected damage and risks of business as usual. Whenever mitigation costs are discussed in SPM, the authors should include comparison to the range of costs of BAU (i.e., inaction), cobenefits, etc. Or at a minimum remind the reader that these balancing costs exist.
44427	SPM	6	1	29	21	The SPM under-represents co-benefits, in general, and completely neglects beneficial socio-economic spill-overs, specifically - e.g., employment, to which Chapter 7 draws attention (e.g., see p. 45, l. 12-13 on net job gains in China, attributable to expanding renewables, in 2010).
44428	SPM	6	1	29	21	There are several places where the AR5 mentions key differences compared to AR4 (e.g. pg 21 line 16, pg 20, line 15). This is very helpful to the reader as it reflects the shifting system in the past several years, and likely could be included for additional items. The authors should consider a specific ask of each chapter author group for a check if the most important changes since AR4 are all reflected in the SPM.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44429	SPM	6	1	29	21	The SPM, especially its "Introduction and framing", presents content that is atypical for an IPCC report. What is presented is a collection of statements that attempt to summarize normative concepts as opposed to an assessment of the scientific and technical literature that is empirical and evolving. This is underscored by the fact that there are no confidence / likelihood / agreement statements paired with these findings. Given the normative nature of the content in this section, the authors need to strongly re-consider how to present this material in a manner that is balanced and representative of the diversity of perspectives on these issues - or delete the section altogether.
44430	SPM	6	1	29	21	There is an unbalanced presentation of various framings for emissions metrics (e.g., a presentation of historic emissions, per capita emissions and "imported" emissions, but no similar presentation on emissions intensity, committed/locked-in emissions, projected emissions, etc.). In chapter 1, six framings are presented, but only a select few are brought forward into the SPM - with no clear reason why these ones were chosen. Moreover, this text does not reflect the fact that historic and per capita emissions reflect historic choices, when countries developed and how much area is under their sovereignty. It is also more normative than it should be - and does not speak to the certainty framework of its conclusions. The authors should strongly consider making the text (specifically, Section 2) more balanced in this respect.
44431	SPM	6	1	29	21	The SPM largely neglects changes in the balance of developed/developing world emissions shares - for instance, entirely omitting the (recurrent) Chapter 7 headline that Asian coal consumption has substantially driven escalating global emissions, since at least 2001 (see, e.g., p. 11, l. 7-16 and p. 14, l. 21-28).
44432	SPM	6	1	29	21	While there is mention of almost every type of upstream energy supply source (i.e., coal, natural gas, oil, bioenergy, wind, solar, etc.) there is not a single mention of hydropower throughout the entire SPM. This is an important omission for a baseload, low-carbon energy source that is significant - and growing - in many regions of the world.
44433	SPM	6	1	29	21	As we mentioned in the SOD review, there is very little focus on non-CO2 gases and mitigation opportunities in the SPM. Since they represent 25% of current GHG emissions, this seems like a significant omission for a Summary for Policymakers.
44434	SPM	6	1	29	21	It is unclear why there are no certainty or likelihood characterizations associated with any of the statements in Section 1 of the SPM, especially since statements in the Executive Summaries in the underlying text contain such characterizations.
44435	SPM	6	1	29	21	In general, regional differences (the focus of chapter 14) are not very much discussed in the SPM. There are a few areas where a regional perspective could be more integrated.
44673	SPM	6	1	29	21	WHOLE DOCUMENT (ENTIRE WG3 REPORT): Any references to a so-called "precautionary principle" or "PP" should be eliminated consistent with many of the comments below, unless the literature cited specifically references precaution as a "principle", in which case the dispute between the two approaches must also be cited.
43695	SPM	6	10			Also it implies the consideration that: "(...) Parties' efforts should be undertaken on the basis of equity and common but differentiated responsibilities and respective capabilities, and the provision of finance, technology transfer and capacity-building to developing countries in order to support their mitigation and adaptation actions under the Convention, and take into account the imperatives of equitable access to sustainable development, the survival of countries and protecting the integrity of Mother Earth;" (second paragraph of Doha Decision 1/CP.18)
44254	SPM	6	11	6	13	On the statement "This report does not recommend particular goals for mitigation but assesses the options available at different levels of governance and in different economic sectors, and the societal implications of different mitigation policies." The SPM does not discuss/refer to societal implications (for example issues relates to sustainable development, energy access, poverty etc.) of different mitigation policies. These elements must be provided
47086	SPM	6	11	6	13	If the section is not deleted entirely, we suggest to delete the sentence: "This report ... policies.", as the SPM should not include information that is not in the report. In fact we think it raises a suspicion that may be counterproductive.
45358	SPM	6	11	6	11	"Options" is a very open term. It would be clearer to link this language to the language used as headlines for sections, e.g. mitigation pathways and measures.
45359	SPM	6	11	6	13	These two sentences do not convey the most relevant information in a clear manner. The following wording is suggested: The assessment of mitigation of climate change in the Working Group III contribution to the IPCC's Fifth Assessment Report (WGIII AR5) evaluates mitigation pathways and measures in different contexts and how risks of climate change can be reduced through mitigation. Throughout this Summary, the validity of findings is expressed in a standardized language. (Add footnote).
44737	SPM	6	11	6	11	Write: "This report assesses mitigation options available ..."
45642	SPM	6	11	6	13	This para is obvious and covered in every IPCC report.

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45113	SPM	6	11	6	23	This paragraph is unnecessary, and should be replaced by a short list of the Section titles
46789	SPM	6	11	6		Please add at the beginning of this sentence the expression "According to the mandate of the IPCC" and continue with "this report does not recommend...."
45242	SPM	6	11			This report should reflect the internationally agreed goal of "below 2 °C above pre-industrial levels" which was agreed in 1/CP16 of the UNFCCC.
45917	SPM	6	12			the societal implications of ~ not only societal, but also certain environmental implications, e.g. in case of reducing deforestation
44438	SPM	6	12	6	12	"Societal" may be too narrow a descriptor for policy "implications". The authors should remove this without replacement, or replace with term(s) of expanded scope, e.g., "energy-environmental and socio-economic implications" - consistent with Chapter 6-7 content drawing on integrated assessment modeling of those dynamically interacting dimensions.
45474	SPM	6	13	6	13	This footnote should also list the qualifiers used. After the third sentence, please consider to add the lists of qualifiers for confidence, agreement and evidence, ref AR5, WGI SPM page 4, footnote 1.
47087	SPM	6	13	6	13	When the section in lines 2-13 is deleted, the introductory sentence may read: "The remainder of this Summary highlights the reports's main findings."
47088	SPM	6	13	6	15	We suggest to delete the sentence: "This Section ... subsequent sections.", as we think it is redundant, and it reduces the text.
45117	SPM	6	13	6	13	Footnote 1 is much less informative than the footnotes (1 and 2) in WG1's SPM. We recommend it should be replaced with the language used in WG1's SPM
46790	SPM	6	13	6		Footnote 1: The usual wording of the AR5 is "uncertainty", not "validity" of findings. Please be consistent and use the same language as WG1 and WG2. Second-last sentence: What does "Where appropriate, ..." mean? Does this imply that statements without uncertainty qualifier are high-confidence statements? There is no explanation on the meaning of likelihood statements in the text given in italics, it comes only as a footnote of Table SPM.1. We propose to follow the footnote approach of SPM WG I (footnote #1 and #2) and to adapt the references respectively, see also comment on page 6, line 13.
44023	SPM	6	14	6	14	Suggest changing to "This Section (Section 1) provides...".
44024	SPM	6	15	6	16	Suggest changing to state "...evidence on trends in GHG emissions..." rather than referring to "stocks and flows". In particular, the reference to "stocks" seems awkward since most carbon resides in reservoirs where it is held in forms other than gaseous CO2. Section 2 of the SPM is about trends in GHG emissions and we have made a similar comment with respect to the title of Section 2.
47089	SPM	6	15	6	17	We think it would be more precise to change the end of this sentence to: "... including economic growth, technologic, demographic and policy or population changes."
43632	SPM	6	16			Define GHG in the first instance.
44786	SPM	6	16	6	17	Suggest deleting "...economic growth, technology or population changes" as it implies a direct relationship between emissions and economic growth (which there is not). Economic growth can be combined with emission reductions as the Swedish example shows.
45919	SPM	6	17			including economic growth, .. ~ including economic PROCESSES, .. e.g. a structural change of economy w/o direct growth effect can also be an important driver of the ghg emissions
46791	SPM	6	18			Please exchange the word "requirements" with "options".
44021	SPM	6	2	6	2	Suggest in this first use of the word mitigation, it would be helpful to specify that the context is climate change (e.g., edit the sentence so it reads "Mitigation in the context of climate change is a human intervention....").
43978	SPM	6	2			This definition of mitigation only highlights that human intervention is meant to reduce the sources or enhance the sinks of greenhouse gases but does not say anything about reducing existing emissions from current sources.
47082	SPM	6	2	6	13	This section may be deleted as it does not contain new insights, neither is it relevant to inform policy decisions.
47083	SPM	6	2	6	3	If the section is not deleted entirely, we suggest to change this sentence in order to be factually correct to read: "Mitigation is a human action intervention to reduce emissions, the sources or enhance the uptake and storage or sinks of greenhouse gases."
44784	SPM	6	2	6	2	"Mitigation" should read "Climate change mitigation" or it becomes a strange/new definition of the word.
45915	SPM	6	2	6	2	"Mitigation" is a human intervention to reduce the sources or .. ~ "Mitigation" is a human intervention to reduce the EMISSIONS FROM sources or ..
44735	SPM	6	2	6	2	Write: "... sinks of anthropogenic greenhouse gases"
44787	SPM	6	20	6	22	This is not really a fair representation of what section 4 summarises.
44439	SPM	6	21	6	22	"Instrument types" requires clarification.

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44332	SPM	6	22	6	23	Square brackets already have an accepted meaning in UNFCCC negotiation texts. Suggest use of curly brackets for section references, as in the WGI report.
43696	SPM	6	24		34	This paragraph must include the concept of the historical responsibilities of developed countries to climate change
44025	SPM	6	24	6	24	Suggest deleting the word "commons" and simply state "a global problem". Also, why is "Climate Change" capitalized here?
47091	SPM	6	24	6	34	We think this section as it is formulated in abstract scientific jargon, if it is not deleted as we prefer, we suggest to reword it as follows: "Climate Change is a global commons problem thatSince most GHGs have such long lifetimes, they become equally distributed in the atmosphere, and hence the distribution of sources is inconsequential. This implies the need for international cooperation in tandem with local, national, and regional policies on many distinct matters. Because the emissions of any agent (individual, company, country) affect every other agent, an effective outcom will not be achieved if individual agents advance their interests indepently of others. International cooperation can contribute by limiting GHG emissions or increasing the uptake and storage of carbonedefining and allocating rights and responsibilities with respect to the atmosphere [...]. Moreover, research and development (R&D) in support of mitigation is a public good, which means that ilnternational cooperation can play a constructive role in the coordinated development and diffusion of technologies [...]. This gives rise to separate needs for cooperation on RDD&D, opening up of markets, and the creation of incentives to encourage private firms to develop and deploy new technologies and householdssocieties to adopt them and sharing experiences can increase the effectiveness and efficiency of mitigation ."
47090	SPM	6	24	7	13	This section may be deleted as it does not contain new insights, neither is it relevant to inform policy decisions.
45360	SPM	6	24	6	34	This paragraph is on so far strange as it includes broad conclusions beyond the focus of Working Group III, mitigation. In addition it uses policy prescriptive language (International cooperation can contribute by defining .....). When it comes to the rate of deployment of technologies any statement should build on actual figures, an assessment in the underlying report, etc. It is therefore strongly suggested to delete it.
43633	SPM	6	24	6	24	Change 'implies the need for' to 'requires'.
44862	SPM	6	24	6	27	Delete "commons". The description that follows in lines 25-27 is of a collective action problem, not a global commons issue. Defining something as a "commons" refers to rights of access, property and use, which has major juridical implications that do not seem to be the intent here.
44738	SPM	6	24	6	25	Write: "Climate change is a global commons' problem that would benefit of international cooperation, as well as on synergies with local, national, and regional policies on many distinct matters"
45644	SPM	6	24	6	24	Mitigation is a public goods' may be added before word 'Climate Change'.
45645	SPM	6	24	6	24	Case of tradegy' of the may be inserted before word 'commons'.
45646	SPM	6	24	6	24	word 'global' and word 'problem' may be deleted.
45643	SPM	6	24	6	34	Climate change is a global common problem..... Is it anything new compared to AR4 or TAR.
45114	SPM	6	24	6	28	This does not tell policymakers anything they don't already know. Given that it is not possible to define what an "effective outcome" would be without subscribing to value judgements, this text should be deleted
45240	SPM	6	24	6	34	This is a selective representation of what international cooperation can do and therefore seems policy prescriptive. A shorter factual statement regarding what has happened might be more useful and less prescriptive e.g. international cooperation under the UNFCCC has defined responsibilities for all Parties with respect to protection of the atmosphere and prevention of dangerous climate change.
43723	SPM	6	24	6	34	Current descriptions on climate change international cooperation are not presented in a comprehensive manner. Comparing with previous assessment reports, international cooperation accounts for a more important proportion in the underlying report. Therefore, the SPM should reflect comprehensive understandings of the importance of international cooperation on climate change and achievements made so far. The topic sentence in bold is suggested to be replaced with the following text: "The global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response, in tandem with local, national, and regional policies on many distinct matters." It is also suggested to replace "with respect to the atmosphere" in L28-29 with "based on the principle of equity and in accordance with countries' common but differentiated responsibilities and respective capabilities."
44026	SPM	6	25	6	25	The term "tandem" suggests stronger coupling between international and other policy levels than might be achievable or desirable. Suggest replacing "in tandem with" with "together with". Consider also removing "on many distinct matters" from the end of the sentence, as this is quite vague.
44788	SPM	6	25	6	25	What is meant by "many distinct matters"? Delete?

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45920	SPM	6	25	6	27	Here again, the text only talks about "emissions", but it should also speak about the (current) lack of emissions that could turn to emissions in case adverse actions are taken or no proper actions are taken. The text should be re-formulated to include this idea.
45647	SPM	6	25	6	25	Within brackets the text 'Uncertainty treatment' may be added after the word 'matters'.
44440	SPM	6	25	6	27	The text as written is unclear. The authors should delete this entire sentence and refer to chapter 13.2.1.1 (p. 8, lines 29-32). The text should be re-phrased to read something like "Emissions by any jurisdiction are spread around the world and as a result there are shared economic costs and benefits for emissions reductions by any actor."
46792	SPM	6	25	6	27	The sentence sounds rather technical ("Because the emissions of any agent (individual, company, country) affect every other agent, an effective outcome will not be achieved if individual agents advance their interests independently of others.") The language used in chapter 13, page 5, lines 8-9 makes it easier to understand why climate change is a global commons problem: "This is principally due to the fact that greenhouse gases mix globally in the atmosphere, making anthropogenic climate change a global commons problem." Please use this wording.
43634	SPM	6	26	6	26	Recommend inserting 'GHG' before the word 'emissions' for clarity, and changing 'of any agent' to 'by any agent'.
44948	SPM	6	26	6	26	"an effective outcome", what is an effective outcome? Please provide a clearer wording, such as "significant mitigation and/or adaptation policy" or "effective reduction of emissions"
44739	SPM	6	27	6	27	Write: "... if individual agents do not cooperate with others."
45648	SPM	6	27	6	27	suggesting the need for collective action' may be added after the word 'others'.
44027	SPM	6	28	6	29	With respect to the sentence "International cooperation can contribute by defining and allocating rights and responsibilities with respect to the atmosphere", we are concerned that the phrasing of defining and allocating 'rights' suggests a top-down approach. Suggest saying more generally "...can contribute by considering responsibilities with respect to the atmosphere".
43979	SPM	6	28			International cooperation could be better directed if clearer definitions were given as to what rights and responsibilities exist with respect to the atmosphere instead of simply mentioning them.
44863	SPM	6	28	6	29	Insert "in the context of equitable effort-sharing" at the end of the sentence after "respect to the atmosphere", for consistency with lines 35-41 on the same page.
44374	SPM	6	28	6	29	Deletion of "and allocating": The precise definition of allocation has not been settled yet.
44740	SPM	6	28	6	28	Write: "... can contribute, inter alia, by defining ..."
43919	SPM	6	28	6	28	in addition to allocating rights and responsibilities, international cooperation can enhance mutual learning etc.
45809	SPM	6	28			Suggest replacement of "defining and allocating rights and responsibilities" with "sharing burdens" or "sharing responsibilities" in line with discussions in Chapter 3 of the importance of sharing burdens and responsibilities among countries, as we can't seem to find an explicit discussion of "defining and allocating rights and responsibilities" in the reference provided.
45115	SPM	6	28	6	29	The analysis of the potential contribution of international cooperation in the underlying report is far more complex and nuanced than presented here. In particular the reference to "defining and allocating rights and responsibilities with respect to the atmosphere" is not supported by the underlying report. The word "responsibilities" has a value judgement that appears to be highly problematic to the UK and should be deleted
44028	SPM	6	29	6	32	It should be clarified that it's public research and development on mitigation that is a public good (i.e., research funded by governments), as explained in section 3.8.4. Not all types of research and development are public goods (e.g. research and development conducted by the private sector). The current sentence is misleading and raises concerns with respect to intellectual property rights.
43635	SPM	6	29	6	31	The logic of this sentence is not clear and it is difficult to decipher the key message of this point. Suggest re-phrasing to make this clearer.
46998	SPM	6	29	6	31	"Moreover, research and development (R&D) in support of mitigation is a public good": Correct point, but the phrase "is a public good" can generate ambiguities and controversies. Using instead "is in the public interest" would be more accurate.
45921	SPM	6	29	6	34	It is misleading: R+D also contribute to elaboration of mitigation policies and measures (PaMs, i.e., it should not be meant only in technological context), for which international coordination is also essential and the Report also deals with the PaMs in broader sense.
44375	SPM	6	29	6	30	"is a public good" -> "has significant global positive externalities": R&D itself is not a good and due to relevant intellectual property rights, outcomes of R&D activities from private sectors, which account for a sizeable part, are largely not public goods with non-excludability. Still, technology development supporting mitigation has positive effect on those who are not directly involved with it and have positive externalities globally.
44741	SPM	6	29	6	31	Write: "Moreover, international cooperation on research and development (R&D) in support of mitigation can play a constructive role in the coordinated development and diffusion of technologies [1.4.4, 3.11, 13.9, 31 14.4.3]."



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44441	SPM	6	29	6	30	This statement is not an accurate reflection of the underlying text (3.11.1, p. 70, 11-12). R&D often provides corporate strategic advantage and, as the text states, is profit-motivated and, therefore, is not necessarily a public good. We suggest that the authors delete the first clause of the sentence and begin with "International cooperation can play..."
45808	SPM	6	29	6	34	This part should be maintained, because it is quite important in pointing out the role of technologies appropriately.
44949	SPM	6	29	6	29	We suggest deleting 'Moreover'
44950	SPM	6	29	6	29	Please replace 'respect to the atmosphere' by 'respect to emissions and emission reductions'
44951	SPM	6	29	6	30	"R&D in support of mitigation is public good". This is true from a welfare economics point of view, but the majority of the readers may check R&D spending, and observe that a significant share of (technology-related) R&D is not public, but private money. Therefore we recommend to specify the perspective of the statement, or even better to reveal the multiple perspectives in defining R&D.
45916	SPM	6	3			contributes to the goal .. ~ contributes to the (ultimate) OBJECTIVE .. ((this is the term used in the UNFCCC))
46786	SPM	6	3			The UNFCCC uses the word "objective", not "goal". Please modify.
44789	SPM	6	30	6	30	Replace "which means that" with "and"
44952	SPM	6	30	6	30	We suggest replacing 'which means that international cooperation can play' by 'and international cooperation plays'
44029	SPM	6	32	6	32	It is not clear what is being implied by "separate needs". Would the sentence be just as clear if it were rephrased as "This requires cooperation on R&D, the opening up markets, and the creation of incentives ..."?
44864	SPM	6	32	6	34	Consider deletion of "opening up of markets", for it may be considered prescriptive, as it involves a broader discussion on the roles of states and free markets on R&D, as well as on international trade.
45649	SPM	6	32	6	32	The word ' opening up of ' may be replaced by 'facilitating'.
44442	SPM	6	32	6	34	The phrase "needs for cooperation" is overly prescriptive. Recommend replacing "this suggests potential value in cooperation..."
44953	SPM	6	32	6	34	Could you please provide references to the main report for this sentence ? In addition, we suggest that it would be useful to clarify that "opening up of markets" is not systematically beneficial, as indicated in TS.4.4 (International cooperation), page 87 : International trade can promote or discourage international cooperation on climate change (high confidence).
45116	SPM	6	32	6	34	From "This gives rise" to the end of this para. is policy prescriptive and should be deleted
43724	SPM	6	32	6	34	Current descriptions lack support from the underlying report. The elements listed are not accurate, comprehensive and objective. It is suggested to replace "opening up markets" (L32) with "fostering markets"; and "private firms" (L33) with "stakeholders" and to insert "provision of financial support, transfer of technology" after "R&D" (L32).
45650	SPM	6	33	6	33	The word 'encourage private firms' may be deleted.
43920	SPM	6	33	6	33	Please change "private firms" to "private sector"
44443	SPM	6	33	6	34	This is too narrow a characterization of the actors involved in the development and deployment of new technologies. The text should be revised to read "... and the creation of incentives to encourage the development and deployment of new technologies."
44422	SPM	6	34	6	34	Technologies not only adopted by households, also include businesses
44790	SPM	6	34	6	34	Why specifically "households"? Replace with "private and public actors"?
45651	SPM	6	34	6	34	The text 'various industries and' may be added before the word households'.
43725	SPM	6	34	6	35	Sustainable development and equity is closely connected to climate change and is a central framing issue of this Assessment Report. (Ch3, P4, L11) The SPM should reflect the key conclusions of Chapter 4 regarding sustainable development and equity. It is suggested to add the following paragraph before line 35: "Sustainable development, as a central framing issue, is intimately connected to climate change. In relation with the objective of international cooperation on climate change, there has been a substantial increase in awareness of how climate change interacts with the goal of sustainable development, such as eradication of poverty, environmental protection, job creation, security, and justice, based on the original understanding that the response to climate change should be coordinated with social and economic development in an integrated manner with a view to avoiding adverse impacts on the latter, taking into full account the legitimate priority needs of developing countries for the achievement of sustained economic growth and the eradication of poverty. [1.2.1, 4.4, 4.5]"
44257	SPM	6	35	6	35	Delete 'Equitable effort sharing' as there is no agreed definition for 'equitable effort sharing'.
44256	SPM	6	35	6	36	These statements on "International cooperation and mitigation" are biased towards international cooperation. Instead this shall be termed for example as global agreement. Other types of cooperation (regional, groups of likely minded countries) also play significant role.
43697	SPM	6	35		41	This paragraph must include the principle of the Common but Differentiated Responsibilities of developed and developing county parties

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44701	SPM	6	35	7	32	While ethical considerations, sustainable development and risk perceptions may be relevant to mention in the SPM, they should not take up half of the introduction. This detracts attention from the central messages around the potentials for mitigation (section SPM 4)
47092	SPM	6	35	6	41	We prefer this section to be deleted as it errs on the edge of policy prescription even without being policy relevant as it does not provide information that supports decision making. If it is not deleted, we suggest to delete the bolded sentence, and to make bold what is now the second sentence and change it to: "... mitigation and, adaptation and ability to pay." We suggest to replace the following two sentences: "Engaging ... well" with "Assigning different weights to these factors, results in large differences in the optimal division of mitigation efforts. Mechanisms for sharing costs and benefits will increase the willingness to enter into an effective international agreement to combat CC."
45361	SPM	6	35	6	41	There is no need to justify the topics addressed in the report. The outline of the report has been agreed by the IPCC plenary and the Working Group III has assessed the literature related to the agreed topics. The introduction only should inform about the structure of the SPM related to WGIII AR5 and put it into context within the AR5. Again, these lines should be deleted. The introduction should be in the range of 20 lines, not more.
44865	SPM	6	35	6	41	In light of the many aspects related to climate change negotiations, this paragraph is of great value to the SPM.
44444	SPM	6	35	6	36	The underlying chapter section 3.2, page 10, line 45 to page 11, line 18 notes that there are many ethical questions raised by climate change. This summary does not adequately reflect the diversity of such considerations in the chapter. Thus, for example, with respect to the bold text on line 35, the only link is made to effort-sharing. That implies a normative connection between a particular ethical point of view and a particular effort-sharing solution. This text should be revised to read "There are multiple ethical questions raised by climate change including those related to burden-sharing, justice, fairness, rights, and overall mitigation."
45118	SPM	6	35	6	41	<p>The UK does not think that the headline statement is true, or supported by the underlying report, and the whole paragraph implies some sort of global equity formula/burden sharing approach is required/essential to share the burden.</p> <p>We broadly agree with the overarching that point that international cooperation on a basis that is agreed by all parties to be equitable is more likely to be ambitious but here it is presented as a causal relationship and implies a more rigid equity formula/framework/approach.</p> <p>The the reference to "equitable effort-sharing" is prescriptive and not supported by the underlying report, as there has been international cooperation on climate change that did not have an agreed equity framework/formula on this, nor is it clear that such agreement would be needed/possible going forward. I don't think you could argue that there was equitable effort sharing in Cancun pledges process yet that is clearly where we are currently in international cooperation.</p> <p>"Engaging countries in effective international cooperation requires strategies for sharing costs and benefits" is an assertion that is again not supported by the underlying report. Currently international action only implies/reveals such strategies rather than being based on them. Going forward it is unlikely that any single/articulateable cost sharing approach would ever be adopted and it is not entirely clear that such a rigid approach is required even if it would be desirable.</p>
45243	SPM	6	35	6	41	"Ethical considerations including equitable effort-sharing" are not relevant to "understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation"- the role of the IPCC as described in the principles governing IPCC work. To assist in streamlining and focussing section 1, this paragraph should be deleted.
43726	SPM	6	35	7	13	Climate change ethics should focus on the issue of "equity", which is broader than "equitable effort sharing", including historical responsibility, national circumstances, development stage, respective capacity, as well as the opportunity for sustainable development. More importantly, the understanding of equity should be based on the existing principles and practice, not be based on "perceived fairness". In addition, the second paragraph on Page 7 (L7 to L13) only lists questions without any substantial conclusions, and is closely related to the last paragraph on Page 6 (L35 to L41). Therefore, it is suggested to combine those three paragraphs and modify as following: "International cooperation on climate change involves ethical considerations, in particular equity. Countries have contributed differently to the build-up of GHG in the earth system, have varying capacities to contribute to mitigation and adaptation, and are in different development stages with different needs for future development due to national circumstance. Engaging countries in effective international cooperation requires well elaborated approach to address all those factors in ways that are considered to be equitable in accordance with principles and criteria established in previous practice. [3.10, 4.2, 4.6, 13.2.2.4] Analysis contained in the literature of moral and political philosophy can also contribute to resolving ethical questions that are raised by climate change in this regard. [3.2, 3.3, 3.4] "

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44030	SPM	6	36	6	39	Suggest revising the second line to read "Countries have contributed, and will continue to contribute, differently to the build-up of GHGs in the atmosphere, ...". It should also be noted that capacities to contribute to mitigation and adaptation will also evolve over time.
43980	SPM	6	36			While this recognition is true and helpful, there is still no link between different contributions and current responsibilities and capacities, which there should be.
46999	SPM	6	36	6	37	The build-up of GHG in the atmosphere is an on-going process therefore this sentence should read: "Countries contribute differently to the build-up of GHG..."
45922	SPM	6	36	6	37	The text suggests that it is "countries" that are "sins", instead of different communities or groups of people, that "countries" are constant over time, that generations do not exist, and that sons have to pay for the "sins" of their fore-fathers. In other words, this text includes judgments that may open (or keep open) wide divides between various groups of current population. This is true even if recent commitments and pledges are based on dividing people by countries. Divisions could be made e.g. by multinational companies and other lines. Thus, this text should be revised.
45652	SPM	6	36	6	36	The word ' efforts' ,may be replaced by 'burden'.
43918	SPM	6	36	6	36	Please change "build-up of GHG" to "build-up of GHG concentrations"
44445	SPM	6	36	6	36	The current text reads: "Countries have contributed differently to the build-up of GHG in the atmosphere." The authors should revise it to read: "Countries contribute differently..." to make the sentence in the present tense. Otherwise, pegging to the past makes the statement incomplete and biased, given that historically high/low emitters are often times current and future low/high emitters.
44258	SPM	6	37	6	39	The statement "Engaging countries in effective international cooperation requires strategies for sharing the costs and benefits of mitigation, in ways that are perceived to be equitable." Should be Deleted as it Prejudging an undefined "equitable" term.
45475	SPM	6	37	6	39	Please consider to move this sentence up in front of the paragraph and in bold, and to adjust the sentence by replacing "perceived" with "considered".
47000	SPM	6	37	6	39	This paragraph contains a number of value judgments and singles out one aspect of international cooperation. The text should be written in a factual and neutral manner with no judgment of possible perceptions. We also suggest that the third sentence ("Engaging countries..." ) be replaced by "approaches for sharing the costs and benefits of mitigation, that are broadly accepted as equitable."
43921	SPM	6	37	6	39	According to the sentence, engaging countries in effective international cooperation requires equitable ways to share costs and benefits. Effective international cooperation also requires that these ways are politically acceptable in the jurisdictions considering cooperation. These are not necessarily equal depending on how the equity framework is defined => therefore please change the sentence to "...ways that are perceived to be equitable and politically acceptable".
44333	SPM	6	37	6	38	We do not agree that specific strategies are required to ensure an equitable outcome, and we are wary that the current formulation could imply endorsement of some of the formulaic burden sharing proposals currently circulating. We suggest a simpler statement: "Engaging countries in effective international cooperation requires the sharing of costs and benefits of mitigation to be perceived to be equitable."
44031	SPM	6	38	6	39	Remove the comma after mitigation. More substantively, it would be worth pointing out that a nontrivial implication is that there is a requirement for agreed methods for determining costs and benefits (which is something that goes beyond the perception of equitability).
44032	SPM	6	39	6	40	Suggest avoiding use of expressions like "Evidence suggests" and "that finding may suggest" and instead describe the available literature and/or use calibrated uncertainty terminology.
44791	SPM	6	39	6	41	The statement is probably based on behavioural experimental economics but that "these findings may suggest" for international cooperation is rather weak, or naive even on international relations, negotiations and "realpolitik". Delete sentence?
45653	SPM	6	39	6	41	use of language maybe clarified with regard to the two terms finding and evidence; although the meaning seems to be the same.
44446	SPM	6	39	6	41	What is the qualitative level of evidence supporting this statement? If low, it should be removed as low evidence/confidence statements should not be elevated to the SPM.
45806	SPM	6	4	6	7	Suggest to add the following as a footnote to the sentence mentioning the UNFCCC Article 6: In connection with the UNFCCC, implication of its ultimate objective "stabilization of the greenhouse gas concentrations" is now taken to be more flexible than in previous reports until AR4. Until AR4 stabilization scenarios have definite target concentration levels and concentrations are supposed to increase monotonically to approach the target level without overshooting. In AR5, however, in addition to those stabilization scenarios, some scenarios have peak-and-decline pathways in concentration and their final destination are not defined, lacking clear stabilization target. Thus quite a few scenarios treated in this report cover only transient state until 2100, though they may reach stabilization in a long-term after 2100.
44954	SPM	6	40	6	40	replace 'and that finding may suggest' by 'suggesting' (the word suggest already includes 'may'; using both is a pleonasm)

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45473	SPM	6	5	6	7	Part of the text in article 2 in the climate convention is replaced by dots. This could be interpreted as a selection of a specific part of Article 2. Please consider to include the entire Article 2. We believe that Article 2 is a fundamental basis for the policy relevance of the Assessment Report.
46787	SPM	6	5	6	5	The quote from UNFCCC is incorrect. It must read "within a time frame sufficient to allow..."
45421	SPM	6	7	6	9	The terminology "prudent climate policy" sounds like a moral judgement and could be avoided. It would be better to tell what science can bring to climate policy.
44022	SPM	6	7	6	10	These lines about "prudent climate policy" could be interpreted as unduly prescriptive. Suggest rephrasing to express what methods or approaches can be used to evaluate the effects of different policies. For example, a possible rephrasing could be: "Scientific methods can be used to predict the effects of mitigation and adaptation policies. Valuation of these effects, using methods from various disciplines, ultimately rests on ethical principles".
47084	SPM	6	7	6	8	If the section is not deleted entirely, we suggest to change this sentence to: "Prudent climate policy employs the best available knowledge methods of science to assess the effects of each policy measure.
45357	SPM	6	7	6	10	Those three sentences try to describe the role of science and the limitations of the scientific approach - obviously in the context of Article 2 of the Convention. This is a rather sensitive territory and it is recommended to use clearer language that is more aligned with the language of Working Group II. The following text is suggested: This report assesses the relationship of various emission pathways with risks of climate change across contexts and providing a basis for value judgments about the level of climate change at which risks become dangerous. It might be useful to add one sentence (e.g. as footnote) explaining what "across contexts" covers (e.g. trade-offs, synergies with other societal goals; use of geo-engineering approaches, changes in behaviour).
44785	SPM	6	7	6	10	It is not clear what you are trying to say in this passage on prudent policy, or if you need to say it at all. The last sentence is especially questionable and unclear. It implies that there are universal ethical principles that are somehow value-neutral and can be used to make judgements on the value (do you mean of policy effects?). The passage is unclear, problematic and may thus cause unnecessary debate.
44736	SPM	6	7	6	7	The word "prudent" has not been defined. Would it be possible either to define "prudent" or redraft the sentence and the two following using a clearer qualification of climate policy.
44436	SPM	6	7	6	9	Climate policy does not use science to "predict the effects of each policy". The authors should revise the text to read: "Strategic climate policy planning employs the methods of science, economics, and other disciplines to simulate, assess, and value the effects of policy options."
44947	SPM	6	7	6	10	This text is rather general and abstract, in particular, what is covered by "systematic methods from various disciplines"? More importantly, the last sentence seems confusing: "judgement of values derived by these (scientific) methods rest on ethical principles". This may be misunderstood as suggesting that value judgements should be based on scientific methods. We suggest a revision of the 3 last sentences of this paragraph, starting with "prudent", to clarify that policy making involves value judgements and can be informed by scientific information from various disciplines (not derived from it) in a way that may help selecting policies that are effective, efficient, and fair.
44946	SPM	6	7	6	7	"Prudent climate policy": what is the real meaning of 'prudent'? This is not an established criterion to assess climate policy. We suggest substituting "Effective, efficient, and fair" for "prudent" (as commonly used, in particular in IPCC AR4, 2007, WGIII, Ch.12 - criteria for policy evaluation).
46788	SPM	6	7	6	10	The sentences are not an assessment of the science assessed in the underlying report. They rather seem to represent a claim, a definition or a wish. In addition, they would require science to be able to really "predict" the future. IPCC usually does not claim such capacity and talks about "projections" instead of "predictions". Therefore, please replace the word "predict" with "assess".
45241	SPM	6	7			Include "employs method of science to predict, monitor and review the effects of policy."
45112	SPM	6	8	6	10	The text from "Prudent climate policy" to the end of the paragraph is a value judgement that is not scientifically supported by the underlying report. This should be deleted
47085	SPM	6	9	6	10	If the section is not deleted entirely, we suggest to delete the sentence: "Judgements ... principles.", as it does not provide useful information.
43631	SPM	6	9	6	10	Suggest deleting the sentence 'Judgements of value derived by these methods rest ultimately on ethical principles'. It is confusing in this context and does not add value to the paragraph.

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44437	SPM	6	9	6	10	The authors should strongly consider removing the very doctrinaire claim that "judgements of value...rest ultimately on ethical principles". This is not only prescriptive but inaccurate, as well as inconsistent with text (e.g., Chapter 7) emphasizing the importance of more holistic evaluations (e.g., accounting for co-benefits, adverse side-effects, and trade-offs across climate and other policy objectives) for real decision-making.
45807	SPM	6	9	6	10	Suggest that an explanation of term "judgment of value" be added as it may be a new term for many readers. Also suggest this sentence be re-written because the message in underlying report does not really imply that judgment of values rest ultimately on ethical principles but rather that ethical judgment is an important principle among many other socio-economic principles in making policy decisions about climate change. (For example, BOX TS.1 on TS P4 and Chapter 3 P11 line 14-17.)
45238	SPM	6				The introduction and framing section should recall key messages of the AR4, key messages of the AR5 WG I SPM including the carbon budget, and the internationally agreed goal of "below 2C above pre-industrial levels" which was agreed in 1/CP16 of the UNFCCC.
45239	SPM	6				Section 1 introduction and framing should be shortened and simplified. It should focus on the factual context i.e. international agreement on the goal "below 2C above pre-industrial levels" of 1/CP16, the key messages of the AR5 WG 1 SPM and key messages of the AR4.
44020	SPM	6	1	7	43	Section SPM.1 is overly long given that it is focused only on framing issues. Suggest that this section be reduced substantially into a few key points (no more than 1 page).
44945	SPM	6	1	6	1	Section SPM.1 is far too general and also too long as a 'framing chapter'. Many paragraphs could be deleted or rewritten in a concise way while providing more concrete and focused messages for policy-makers.
45111	SPM	6	1			The "Introduction and Framing" section is far too long, and risks losing the interest of readers before they have even passed the first page of the document. The "Introduction" sections in previous SPMs, as well the SPM of the AR5 WG1 are far shorter. We strongly recommend an Introduction section along the lines of that presented in the SPM of AR4 WG3, which says, in a single line, what the report focuses on, and then provides, as a bullet list, the specific sections of the SPM. Those paragraphs on pages 6 and 7 that need to be reflected in the SPM should then be moved under the appropriate sections, rather than occurring in the Introduction
43722	SPM	6	1			In order to build a clear structure of the SPM and to keep consistency with practices of WGI and WGII, it is suggested to consider the first two paragraphs as "SPM.1 Introduction" by separating them with subsequent paragraphs. Meanwhile, in the introduction section there should be a paragraph highlighting the scientific progress since the AR4 as well as the new perspectives and key findings in the WGIII contribution to the AR5 (Ch1, ES, P3, L21), including sustainable development and equity (Ch4), ethical considerations (Ch3), and integrated risk and uncertainty assessment of climate change response policies (Ch2), etc., which could provide a holistic overview of relevant conclusions for policy makers. The subsequent paragraphs (SPM, P6, L24, to P7, L43) should be entitled "SPM. 2 Framing".
46793	SPM	6	36	6	37	We suggest the following rewording of the sentence: "Countries have contributed and will contribute differently to the build-up of GHG in the atmosphere, and have and will have varying capacities to contribute to mitigation and adaptation." Explanation: Country specific emissions are dynamic and are changing with time, e.g. due to economic growth.
43629	SPM	6	0			It would be useful to define the adjectives used to describe confidence. E.g. In this Summary for Policymakers, a level of confidence is expressed using five qualifiers: very low, low, medium, high, and very high, and typeset in italics, e.g., medium confidence.
43630	SPM	6	0			It would be useful to define the adjectives used to describe evidence (limited, medium, robust) and agreement (low, medium, and high).
45918	SPM	6	13	6	13	A reference to the Guidance Note should be added.
44783	SPM	6	1			The "Introduction and framing" section would seem, beyond its first two paragraphs (lines 2-23), to try to provide some integrating considerations. However, it neither adds up to a summary nor does it provide concrete findings. (It neither covers the whole SPM/underlying report.) It is not clear what the utility of the Section is, beyond the first two paragraphs.
43991	SPM	6	1	7	43	There are no levels of evidence, agreement or confidence associated with these findings.
43992	SPM	6	28	6	29	The phrase is unclear, clarification is requested. It is considered that international cooperation can not and should not define and assign rights and responsibilities. It should rather be the opposite.
45815	SPM	6		7		Would appreciate confidence readings for each bullet, especially because this is an introduction of the report.
43628	SPM	6	0	7		The relative emphasis on mitigation issues as relating to 'ethical principles' and 'values' in the Introduction and Framing section does not seem a balanced reflection of the content covered in the body of the report.
44004	SPM	6	9	6	10	We request to delete the last sentence in the paragraph starting with "Judgements...".

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44394	SPM	6	1	7	43	The information under this section is not clear. On the contrary is confusing and the result of this compilation of messages do not clarify the purpose and the report. Spain suggests deleting the whole Section. For example in the first paragraph the definition of Article 2 of the UNFCCC should be completely clear: "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". For example using the language "Prudent climate policy" in the second sentence is ambiguous term that is not policy relevant.
43698	SPM	7	1		6	In this paragraph referring to economic valuation is also important to notice the relationship between unsustainable patterns of consumption and its effects on climate change
44035	SPM	7	1	7	2	The bolded statement in this paragraph stating "and be given a foundation in ethics" does not correspond to other parts of the paragraph, as ethics is not referenced here. As per other comments, we suggest considering using other terms besides "ethics" as its interpretation is not clear/consistent. The term "appropriate distributional weights" is also an opaque term. Suggest explaining in plainer language.
47093	SPM	7	1	7	2	We regard the bolded section as policy prescriptive and it uses abstract scientific jargon and we prefer it to be deleted. If it is retained we suggest to reword it as follows: "PolicyEconomic evaluation is can be useful for policy design and implementation be given a foundation in ethics, provided appropriate distributional weights are applied".
45363	SPM	7	1	7	43	Delete all that text as it goes far beyond an introduction. Framing is seen as policy prescriptive; results of the assessment should be integrated in a new section at the end of the SPM addressing Low-carbon pathways and transformation (see also comment above).
43636	SPM	7	1	7	2	Suggest shortening this sentence to simply 'Economic evaluation can be useful for policy design.' The second half of the sentence seems superfluous and is covered in the text below.
44792	SPM	7	1	7	6	Does your statement imply that the choice of discount rate can be founded in ethics and that you thereby settle a long debate on discount rates? Also, the list of practical tools is very limited in scope to economic assessments.
44742	SPM	7	1	7	1	Write: "Economic evaluation can be useful for policy design and can refer to ethical values, provided ...".
45654	SPM	7	1	7	1	The text 'of the mitigation' may be inserted between the word 'evaluation' and 'can'.
45655	SPM	7	1	7	3	relationship between ethics and economic evaluation is not clear; recommend "has" instead of "can be"; distributional weights is the tool available for economists but does not seem appropriate to equate one to the other.
43923	SPM	7	1	7	1	Please change "can be useful" to "is useful"
43922	SPM	7	1	7	6	The paragraph is quite difficult to understand and the text should therefore be clarified.
44447	SPM	7	1	7	2	This sentence is prescriptive and does not reflect the state of the literature and discussion in Chapter 3.
44448	SPM	7	1	7	2	The text here refers to a "foundation in ethics". However, language in lines 2-6 does not reference ethical discussions at all. Therefore, this phrase should be deleted.
44449	SPM	7	1	7	6	The bold statement is about distribution while the rest of the key finding is about discount rates. The authors should revise the text and align te statements in this paragraph.
44450	SPM	7	1	7	6	The recommendation to apply "appropriate distributional weight" could be construed as too prescriptive and is also out-of-step with the mainstream economics literature and practical cost-benefit analysis as used by most governments. There is no consensus in the economics literature on how such weights should be selected. The authors should consider deleting this statement but could instead add "distributional analysis" as an addition to the list of practical tools for policy assessment given on lines 5-6.
44451	SPM	7	1	7	6	This might be an appropriate place to reference the fact that expected impacts from climate change are uneven geographically and socioeconomically.
44955	SPM	7	1	7	6	This § contains some rather general terms, e.g.: the title 'Economic evaluation can be useful...' (so what?). "The literature provides significant guidance on intertemporal weighting": what is 'significant guidance'? As far as our knowledge of the literature reaches, there is no generally accepted theory, neither methodology, nor practice to found the 'guidance' for the choice of a social discount rate, in particular when the time horizon of the problem issue exceeds a few centuries (being the case for climate change, and options like nuclear power). Therefore, 'significant guidance' requires clear specification.
45119	SPM	7	1	7	6	It is not clear that this paragraph says anything which is useful, or can be clearly understood by, policymakers. We recommend it should be deleted. We have further concerns about the framing around 'per capita' income and 'inequality' as there might be highly unfair and undesirable ways of achieving these, particularly through rapid decline in global population

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46794	SPM	7	1	7	6	<p>What is the main statement or conclusion of this paragraph? The first sentence is on "economic evaluation", but the last sentence talks about "policy assessment". It is not clear what the topic of the paragraph is, or to what kind of "policy assessment" it refers to.</p> <p>Distributional weights and discount rates are noted here as important factors and the paragraph strongly suggests that the economic evaluation mainly depends on these. However, this paragraph is unsuitable for top-level messaging in SPM, because values for these parameters are not provided and there is no implication for or link with the rest of WG3 AR5 at all, notably the work on long-term mitigation pathways, SPM 3.1 and chapter 6, page 43, line 35-39 "... in the absence of specific information from individual models about the discount rate used in studies, the estimates of net present value costs in this chapter are aggregated ex-post using a discount rate of 5%. This is roughly representative of the average interest rate that underlies the discounting approach in most models (Kriegler et al., 2014c)."</p> <p>Recommendation: (1) make paragraph more substantive by including assessment of values and detailing very clearly the implications and connections with SPM 3.1 and chapter 6, or (2) delete paragraph.</p>
45244	SPM	7	1	7	6	<p>This paragraph is too detailed for the 'introduction and framing' section. Suggest reducing to one sentence regarding the usefulness of economic analysis for comparing cost-effectiveness of different instruments and for conducting cost-benefit analysis where assumptions are agreed and appropriate in particular regarding discounting.</p>
44039	SPM	7	10	7	12	<p>Regarding the statement "...how to account for such factors as historical responsibilities for emissions...", suggest also adding "and anticipated future contributions to emissions" in order to account for both forward and backward-looking perspectives in this list of examples of factors associated with ethical questions.</p>
47001	SPM	7	10	7	11	<p>"such factors as historical responsibility for emissions" does not accurately reflect the analytical work in the underlying chapters, including the notion of causal vs. moral responsibility (chapter 3.2). The text could be improved as follows: "...such factors as causal and/or moral responsibility for past, current and future emissions."</p>
45121	SPM	7	10	7	10	<p>"shared among" is policy prescriptive, in the it pre-supposes that this sharing should happen. "delivered by" would be a better phrasing</p>
46797	SPM	7	10	7	11	<p>Please rephrase the sub clause ", how to account for such factors as historical responsibility for emissions," into "how to account for factors used to determine common but differentiated responsibilities and respective capabilities, such as historical emissions among other factors, ..."</p>
44866	SPM	7	11	7	11	<p>Insert "and temperature increase" after "historical responsibility for emissions" or substitute "emissions" for " temperature increase". The discussions on historical responsibility refer to temperature increase as well as cumulative emissions.</p>
45659	SPM	7	11	7	11	<p>The word ' provision of finance and technology ' may be added after word 'emissions,'.</p>
44452	SPM	7	11	7	11	<p>It is unacceptable and inappropriate to equate/assign historical emissions with responsibility; doing so is a normative construct that is not in keeping with the IPCC's mandate for objectivity. Moreover, the authors should not overlook recent decisions that have locked-in emissions for years to come. The text as written presents only one perspective of the issue. The text could be made unbiased and more balanced if it read: "... how to account for such factors as historical AND COMMITTED CONTRIBUTIONS TO emissions..." As presented, this is an unbalanced discussion. Section 3.3.1, for example, presents "causal and moral responsibility" through a very unbalanced lens. Indeed, emissions from developed and developing nations - from 1750 to 2010 are nearly 50-50. The underlying text does not reflect this fact - a fact we first alerted the authors to during the SOD review. Why was this fundamental concern not more fully addressed in the FGD? Moreover, Chapter 3, p. 14, line 20 illustrates the prominence that (at least) current (i.e., not just historic) emissions play in this framing. And the entire paragraph on p. 14, lines 23-31 lays out at least 3 reasons why this particular framing is unbalanced. The authors need to accurately reflect this balance in the SPM - or remove such discussions altogether.</p>
44259	SPM	7	12	7	12	<p>This statement needs to encompass the relevant topic that is refer in chapter 3 on the adverse side effects of climate change policies . In order to reflect the sentence we should bring in the negative impact on oil producers which is also highlighted by TS 3.1.4. add the following statement after "mitigation and adaptation": ", as well as the consequences of different mitigation and adaptation strategies.] from Chp 3.2 and INSERT [Several studies suggest that mitigation policies reduce export revenues from oil.]</p>
45478	SPM	7	14	7	15	<p>Please consider to insert "societal" before the word "goals". Ref next bld statement line 20.</p>
45479	SPM	7	14	7	15	<p>Please consider to remove the quotation marks from "co-benefits" and "adverse effects", since these are well established terms for policy makers.</p>
45481	SPM	7	14	7	19	<p>We suggest mentioning effects of co-benefits and/or adverse side effects on biological diversity/ecosystem services as an exampel, given the close link between the two. C.f. TS p 35 line 2 and p 36 line 19-23.</p>

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45480	SPM	7	14	7	25	We believe it is important to describe co-benefit in the introduction and these statements have confidence interval assigned. Please substitute this text with the text from WGIII, SOD: "Climate policy decisions often lead to co-benefits and/or adverse side-effects for other societal objectives (high confidence). Limiting climate change is one of many economic, social, and environment+F4al policy objectives. Mitigation objectives and options should therefore be assessed within a multi-objective framework in order to maximize synergistic effects and to avoid trade-offs with other societal objectives. This implies that policy design and implementation practices may need to consider local priorities in order to create appropriate incentives. Since the relative importance of different goals differs among various stakeholders and may change over time, transparency on the multiple effects that accrue to different actors at different points of time is important. The possibility of harnessing near-term co-benefits of mitigation policies may increase the incentives for a global climate agreement. [3.5, 4.8, 6.6]"
44040	SPM	7	14	7	19	Only environmental protection and energy security are mentioned as co-benefits of climate policies. Suggest that health co-benefits, which are also identified in underlying chapters could also be added to this list. We also note that this SPM makes no reference to economic co-benefits. Suggest explaining how economic benefits are interpreted here.
43982	SPM	7	14		16	while it is undeniable that climate policies intersect with other goals, specific mention of two examples may create tunnel vision, like the mentioning of changing production and consumption patterns as a co-benefit of mitigation.
47096	SPM	7	14	7	19	We suggest to clarify this para a little as follows: "Most climate policies interactintersect with other goals, resulting in increasing the possibility of 'co-benefits' and/or 'adverse side-effects'. Mitigation can influencealso address other goals, such as air qualitylocal environmental protection ..."
44793	SPM	7	14	7	25	This is a good and important passage.
44745	SPM	7	14	7	15	Delete the words: 'adverse 14 side-effects' since the paragraph does not deal with this.
45660	SPM	7	14	7	14	Word 'mitigation' may be used instead of word 'climate'.
43924	SPM	7	14	7	19	This is a good example of an easy to read -paragraph
44453	SPM	7	14	7	19	The supporting text to the bolded statement is not supportive as there is no mention of 'adverse side-effects'. The authors should refer to Chapter 1, p. 42 line 41 through p. 43 line 2 for text that can be brought forward.
45811	SPM	7	14	7	15	No examples are given in bullet about adverse effects and therefore leaves the policymaker wondering what adverse effects could occur. Perhaps, "adverse side-effects" could be deleted if no corresponding examples can be given.
44958	SPM	7	14	7	19	The title includes both 'co-benefits' & 'adverse side-effects'. The text refers only to 'co-benefits' without making this clear, because the vague terms "multi-objective perspective" / "multiple objectives" are used. It should be specified that it is referred to "multiple concurrent objectives" (excluding conflicting ones).
45122	SPM	7	14	7	19	We feel this para would be strengthened by recognising that climate change mitigation is often the co-benefit of other local policies (e.g. policies to address poor energy efficiency). To frame all benefits as co-benefits of climate policy ignores the point that good policy could deliver the desired non-climate benefits but that designing 'non climate' policy in particular ways could boost potential climate benefits at the same time as delivering the primary benefits. Research highlights the extensive impacts of climate change on non typical issues such as wellbeing and mental health, this should be included to demonstrate the breadth of impacts and co-benefits.
46798	SPM	7	14	7	15	Why are the expressions 'co-benefits' and 'adverse side-effects' put in primes? These are of common use. Apart from that, this paragraph should be kept, it is highly relevant.
43727	SPM	7	14	7	19	"Adverse side-effects" is mentioned in the topic sentence of this paragraph, but there is no further elaboration in the following discussion. In fact, avoiding adverse side-effects in international cooperation is crucial. Thus, it is suggested to add "and avoiding adverse side-effect" after "... will be robust" in L17. Moreover, the paragraph should be modified in accordance with Section 5.7.2 and 5.7.3 in the underlying report.
44726	SPM	7	15	7	19	Despite their importance for mitigation strategies, co-benefits are often not monetized or even quantified in analyses of climate change. [6.6] This should be mentioned.
44684	SPM	7	15	7	19	CHAPTER 3, P. 7, LINES 15-19: The summary statement about Integrated Assessment Model damage function in the ES comes across as too dismissive and one-sided. A more balanced treatment would acknowledge promising areas for improvements, as well as the usefulness of these models in providing order-of-magnitude estimates of climate damages. The discussion provided in section 3.9.2 does provide a reasonable summary.
44260	SPM	7	16	7	16	SPM does not have definition of energy security. SPM lacks example of adverse side-effects.



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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
43925	SPM	7	16	7	17	Mitigation can often also support local economic development, which may be one of the most important co-benefits => "..., such as local economic development, local environmental protection,..."
44454	SPM	7	17	7	19	The last sentence in this section seems to repeat the idea expressed in the previous sentence.
45661	SPM	7	19	7	19	Word 'for' may be used instead of word 'to'
45662	SPM	7	19	7	19	Word 'emissions' may be deleted.
45246	SPM	7	19			Insert "greenhouse gas" between 'mitigate' and 'emissions' and suggest using this consistently throughout the report.
44036	SPM	7	2	7	6	This text is heavily laden with academic language ("inter-temporal weighting", "social discount rate", "inequality aversion", etc., that most readers of the SPM will not be able interpret. Suggest translating into plain language.
47094	SPM	7	2	7	3	This sentence uses abstract scientific jargon, and we prefer to delete it. If it is retained we suggest to reword to: "The literature provides methods for significant guidance on comparing current with future costs and benefits of climate change measures intertemporal weighting - (social discounting rate) for consumption.
44743	SPM	7	2	7	6	Reference to risk and ambiguity aversion would be useful in this context. Inequality aversion is one among other factors: another important factor is differing views on the rate of pure time preference (cf. Stern-Nordhaus disagreement).
45656	SPM	7	2	7	2	Within brackets the text 'Uncertainty treatment' may be added after the word 'applied'.
44956	SPM	7	2	7	3	"intertemporal weighting" and "social discount rate for consumption" may be unclear for policymakers. Please explain the meaning of these terms or rephrase.
46795	SPM	7	2	7	5	This paragraph does not clearly explain the link between the social discount rate and an economic evaluation. The following sentences could help to explain the link (it could be added after the bold sentence): "[...] most benefits of mitigation will materialize only in the distant future. On the other hand, the costs of mitigation are borne today." [chap. 3.6.2]. Moreover it is chap. 3.6.2 (not 3.5.2) which discusses the discount rate.
44334	SPM	7	2	7	3	The sentence: "The literature provides significant guidance on inter-temporal weighting - the social discount rate for consumption" is too technical for the second page of an SPM. Please rewrite it in language understandable to a non-expert reader.
45482	SPM	7	20	7	20	Please consider to replace "can" with "should".
44041	SPM	7	20	7	20	Should "can" be replaced with "could" here? Is this sentence implying that this evaluation has not be done, but could be done in the future?
47097	SPM	7	20	7	25	We think the bolded section is not useful, and we suggest to replace it by a slightly altered version of the final sentence of the para: "Sustainable development policy entails incorporating ..."
45924	SPM	7	20	7	25	The term "sustainable development" is correctly put in quotation marks in line 21. This is because this is a term that is defined in a very wide variety of ways, very often in a rather unreasonable and inconsistent way. Therefore, these quotation marks should be kept in all appearance of the term.
45663	SPM	7	20	7	20	Mitigation efforts generates' may be added before word 'Trade-offs'.
44455	SPM	7	20	7	25	The bolded statement is incomplete. Does this mean to say "Mitigating climate change has trade offs or synergies that ..."?
46799	SPM	7	20			What is the difference between 'adverse side-effects' and 'trade-offs'? Please ensure consistency.
45247	SPM	7	20	7	25	Suggest this paragraph should be shortened and more focussed. Take sentence beginning "instead it entails..." in line 23, change to "sustainable development entails..." and move it to beginning of paragraph.
44261	SPM	7	21	7	21	A robust definition of sustainable development should be included.
45483	SPM	7	21	7	21	Please replace this sentence with either the text from Technical Summary (p. 7, l. 14-16): "Maintaining and advancing human wellbeing, ..., while avoiding unsustainable patterns of consumption and production, are fundamental aspects of equitable and sustainable development." Or use the definition from the Glossary: "Sustainable development is development that meets the need of the present, without compromising the ability of future generations to meet their own needs."
44042	SPM	7	21	7	21	This description of sustainable development is inaccurate and vague. Suggest either defining the term (there are widely accepted definitions of sustainable development) or replacing it with something like "Many of the diverse goals that societies value are related to sustainable development goals." or "Many of the diverse goals that societies value can be considered as sustainable development goals.
44794	SPM	7	21	7	21	Goals themselves are not called "sustainable development" but you don't mean that? Rephrase.
45925	SPM	7	21			"The many diverse goals that societies value are often called "sustainable development". ~ this is a very strange sentence on sustainable development: it'd better to delete!
44746	SPM	7	21	7	21	The sentence: "The many diverse goals that societies value are often called "sustainable development"." is not a definition of sustainable development. It should be amended or deleted.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44774	SPM	7	21	7	21	The phrase "the many diverse goals that society value are often called "sustainable development"" is not accurate. A more accurate statemente would be "societies are placing increasingly value on sustainable development frameworks".
45664	SPM	7	21	7	21	goals are not called sustainable development.
43926	SPM	7	21	7	21	The sentence - as it stands - suggests that sustainable development is anything that societies define as their goals. Not all goals however can be defined as "sustainable development" => "Sustainable development consists of multiple goals, which vary in different societies".
44959	SPM	7	21	7	21	"The many diverse goals that societies value are often called "sustainable development". How must one read this? It may be clearer to say: " 'Sustainable development' is often used as a flag to cover not so sustainable goals that societies value". An alternative suggestion would be to remove the statement because there are other goals that societies value and that are not covered by SD. The word "often" is vague. We do not think that this sentence adds value.
44262	SPM	7	23	7	23	Chapter 4 clearly states in a balanced way that mitigation actions can produce benefits as well as adverse side effects and risks which are elaborated upon in 4.2.1.2. This sentence needs to be inserted to avoid selective citation of the underlying chapters and reflect its content in accurate manner. after "...Specific co-benefits." INSERT [there are synergies and trade-offs between climate responses and broader SD goals, because some climate responses generate co-benefits for human and economic development, while others can have adverse side-effects and generate risks (robust evidence, high agreement).] and change the following sentence into "climate issues need to be incorporated into the design..."
44696	SPM	7	23	7	25	CHAPTER 16, P. 7, LINES 23-25: The text here states, "Under the UNFCCC, climate finance is funding provided to developing countries by Annex II Parties for climate related activities." This as an inaccurate statement. First of all, "climate finance" has not really been defined under the UNFCCC. Second of all, if this is referring to specific Annex II commitments under the UNFCCC, we include finance provided and mobilized, so the reference should at least state "climate finance is funding provided to and mobilized by Annex II Parties". The authors needs to revise the text to accurately reflect this.
44795	SPM	7	24	7	24	"Equitable" is included in sustainable development and thus superfluous?
44456	SPM	7	24	7	25	"Development" seems adequately described by "sustainable"; the authors should remove "equitable", as the term risks over-emphasizing geopolitically variable (and invariably subjective) determinations of fairness, in an otherwise technical paragraph.
46801	SPM	7	25			Please add "international", see chapter 4.
43700	SPM	7	26		32	In this paragraph it is important to incorporate the idea the the ultimate goal of achieving sustainable development by using diverse means does not imply climatizing the agenda of the sustainable development.
45484	SPM	7	26	7	27	Please consider to replace this sentence with the preceeding sentence (line 27 - 28).
43466	SPM	7	26	7	27	The human's different perceptions of risks and opportunities have also to do with wealthy. More affluent people and societies have more opportunities, ways and alternatives of recovering, relocating, compensating damages, and so. The poorest have other priorities to face, including water, sanitation and food. In one way or the other, the economic status has to be considered as a factor influencing risk perception.
47098	SPM	7	26	7	27	We think the bolded section does not fully capture the paragraph, and suggest to amend it to: "Different groups have divergent knowledge and perceptions of risks and opportunities and this is reflected in differences in goals."
44796	SPM	7	26	7	26	Replace "perceive" with "value"?
44797	SPM	7	26	7	32	Is the hidden message that "formal methods" show that we value future long term climate change risks too low and thus formulate unambitious GHG emission goals? Is that what are you trying to say? Tell it like it is.
44691	SPM	7	26	7	26	CHAPTER 14, P. 7, LINE 26: This line could be interpreted as recommending an Africa window at the Green Climate Fund. It is highly inappropriate for the IPCC to put forward such a policy proposal for an issue that is subject to ongoing negotiations under the UNFCCC.
44457	SPM	7	26	7	32	Whose goals? What goals? The text seems inappropriate.
45123	SPM	7	26	7	26	Uncertainty' should also be included in this paragraph as how humans perceive risk, uncertainty and opportunities frames and defines action/inaction
45248	SPM	7	26	7	32	Suggest this paragraph should be shortened and focus on how difference in risk perception may lead to different preferences for action to meet a particular goal, in particular with reference to scenarios of different probabilities to meet 2C degrees goal.
44043	SPM	7	27	7	31	Should agreement/evidence/confidence terminology be included in this paragraph? The sentences imply with certainty that "Policies can be improved" and "Formal methods can systematically address issues", but is not clear to the reader whether this is a statement of fact or a judgement on the part of the authors based on the literature.
44458	SPM	7	27	7	28	The authors need to check the section/chapter reference here. It does not appear to be in 2.4.6 or 2.5.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
43639	SPM	7	28	7	30	The sentence 'Individuals misperceive risks and utilise simplified decision rules such as the tendency to maintain the status quo.' is not supported by the underlying chapters, and lacks quantifiers or qualifiers. Suggest that this be re-worded to 'Individuals vary in both their ability to identify risk and their capacity to respond appropriately.' Or alternatively, 'A tendency to maintain the status quo is characteristic of lower risk recognition or response capability; as is the degree of risk aversion that depends on the relative importance placed on near term versus long term ramifications [2.4.6]'. The following references should also be included [2.4.3, 2.4.2].
44960	SPM	7	28	7	29	"Individuals misperceive risks...". This is likely true, but so do also groups and communities of experts and established institutions. In addition who is the judge that can decide whether A or B is 'misperceiving' particular risks? The case is prominent in perceiving risks of nuclear power stations: in many countries the majority of individuals (citizens) reject nuclear risks as too high and want to phase out or prohibit nuclear power; they are on the same level of rationality as the most risk informed agents in the world, being the global reinsurance corporations that consider nuclear power as non-insurable for full indemnity. On the other hand IEA accepts nuclear power risks and consider the non-acceptance of it as a barrier. It is important to assess all literature on risk and risk perception, individually and socially. This sentence seems to be an inappropriate generalisation. Is it supported by section 2.4.6 ? Please check and clarify.
45476	SPM	7	3	7	4	It is not clear what is meant by the term "inequality aversion". We suggest an alternative sentence: "The discount rate depends primarily on the anticipated growth in income per capita, the rate of time preferences and preferences concerning distribution of income between generations".
44961	SPM	7	31	7	32	"issues of risk and uncertainty..." There is also a further dimension "ignorance" (unknowns). This point is taken up somewhat in the last paragraph on p.7 (38-43). The issue could receive more attention, but at least lines 38-43 should move before line 33 to ensure coherence of the SPM text. The § 33-37 comes best at the end of this section because it is important for policymakers. The present paragraphs 26-32 and 38 -43 could be merged and re-edited to get a clear and shorter message.
44263	SPM	7	32	7	32	This statement is subjective in nature and lacks the comprehensive analysis offered by Chp 2 which includes more on the realistic challenges that decision makers face in developing Countries in particular. Beside value and perception national circumstances and constrains especially when it comes to allocation of resources to development activities is decisive factor for decision making which is captured in eth underlying chapter. INSERT [Managing uncertainty and risk in the context of climate policy is of particular importance to developing countries that are resource constrained and face other pressing development goals. In addition, institutional capacity in these countries may be less developed compared to advanced economies.]
45485	SPM	7	33	7	33	Please consider to replace "involves" with "requires".
44044	SPM	7	33	7	33	The bolded statement appears to imply that institutions and capacity are lacking everywhere, which we don't think is completely the case. Consider revising.
43983	SPM	7	33		37	Climate policy is also dependent on political will and international relations
43640	SPM	7	33	7	37	After the words 'winners and losers' an additional reference to [4.1.2] should be inserted.
47002	SPM	7	33	7	33	This sentence could be misunderstood as a general preference for creating new institutions over using existing ones, whereas there is no evidence in the main body of the report to support the assertion. It would be preferable to rewrite as follows: "Climate policy involves making good use of existing institutions, reforming them or building new ones as appropriate, and strengthening capacities for governance."
45665	SPM	7	33	7	33	Effective' may be added before word 'Climate Policy'.
45666	SPM	7	33	7	35	Climate policy involves building institutions and capacity..... nothing new, reported in every previous IPCC report.
44459	SPM	7	33	7	37	As written, the text is prescriptive. Policy does not necessarily involve this, but the implementation of policies might require it. The authors should revise the text to read "climate policy MAY involve building..."
44045	SPM	7	35	7	37	With respect to the phrase "It also involves issues related to procedural equity...and decision-making authority among the potential winners and losers"., it is unclear what is meant by 'procedural equity'. Also, what is the rationale behind the characterization of 'winners and losers' when talking about building capacity for governance? Suggest deleting.
45250	SPM	7	35	7	37	The last sentence of this paragraph should be clarified or deleted.
44798	SPM	7	36	7	36	Is it clear to most readers what "procedural equity" means?
44460	SPM	7	37	7	37	The authors should replace " the potential winners and losers" with "all involved stakeholders."
45812	SPM	7	37			Perhaps this question comes from the fact that we are not native speakers/readers of English but wonder if WINNERS AND LOSERS is the most appropriate term? Might there be another way of expressing this?
45486	SPM	7	38	7	43	We suggest that the precautionary principle and safe minimum standards are reflected here.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44047	SPM	7	38		43	It would be helpful if this paragraph could explain how risk varies with different outcomes (e.g., by noting that some risks are probably and some are unlikely) as well as discussing risk in the context of the full range of outcomes.
44046	SPM	7	38	7	38	What "outcomes" are referred to here? Suggest being more explicit as presumably this makes reference to possible future development and emissions pathways.
45124	SPM	7	38	7	39	This sentence would read better if rearranged: "The assessment of mitigation options needs to consider risks associated with the full range of possible outcomes, including extreme climate change."
45125	SPM	7	38	7	43	This is an extremely general paragraph and doesn't contain any clear messages for policymakers. The SPM should be more impactful, succinct and clear
46802	SPM	7	38			The word "outcomes" is not clear enough. It should include both the consequences of climate change itself (WG2 uses the expression "impact", not "outcome") and those of mitigation options (e.g. on the economics). Please clarify the sentence. The paragraph itself is highly relevant and should be kept.
45249	SPM	7	38	7	43	This paragraph does not reflect that there is an internationally agreed goal for limiting climate change to "below 2C degrees above pre-industrial levels" which was agreed in 1/CP16 of the UNFCCC.
43637	SPM	7	4	7	4	Reference to the underlying chapter should be changed to [3.5.1].
44744	SPM	7	4	7	4	It should probably be [3.6.2] rather than [3.5.2], since there is no chapter 3.5.2
45657	SPM	7	4	7	4	[3.5.2] is not mentioned in the text.
46796	SPM	7	4	7	4	Reference to wrong section [3.5.2]. Correct reference is [3.6.2]
47099	SPM	7	40	7	41	It would be more appropriate to emphasize that risks from extreme events attributed to climate change are very difficult and in many cases impossible to determine. Extreme events occur on too large spatial and temporal variability and large uncertainties arise when attributing climate change or even the human contribution. WGI and WGII contain sufficient references to support this addition.
43728	SPM	7	40	7	41	The "tipping point" is undefined, and is highly controversial. Furthermore, the logical relationship between "tipping point" and "triggering new climate regime" is not clear. It is not appropriate to present this controversial information to policy makers. Therefore, it is suggested to replace "new climate regime" with "more ambitious actions", alternatively, to delete the sentence of "Some of the risks..... new climate regimes."
44048	SPM	7	41	7	41	This statement is not in line with the WGI assessment on the topic of abrupt and irreversible changes. Table 12.4 in WGI includes an assessment of the likelihood of abrupt or irreversible change in various aspects of the climate system (WGI does not generally use the term 'tipping point'). Suggest replacing "Some of these risks are essentially unknown" with "Some of these risks are poorly quantified". The probability of high equilibrium climate sensitivity is hard to quantify, for example, but could be associated with extreme climate change - such a phrasing would encompass such risks, and would be more general than the current reference to tipping points.
44867	SPM	7	41	7	41	The term "new climate regimes" may be confused with international regimes in an institutional sense; for instance, the UNFCCC is a climate regime. Consider substitution for "new climate systems".
44868	SPM	7	41	7	41	Consider replacing "tipping points" for "non-linear adverse impacts", which is technically more precise, while "tipping points" has been widely misused in some contexts.
43927	SPM	7	41	7	41	Does "climate regimes" here mean climate policy regimes?
44799	SPM	7	42	7	42	It is very unclear what you mean by "management system".
43699	SPM	7	7		13	In this paragraph is important to refer that the ultimate objective of the Convention is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system (Objective 2 UNFCCC)
45422	SPM	7	7	7	8	It is suggested to write "moral, political and economical philosophy can contribute to resolving ethical, methodological and epistemological questions"
44038	SPM	7	7	7	13	This paragraph points to a particular body of literature, but does not provide readers with a good sense of how large or robust the literature base is. Suggest this be clarified in order to avoid misinterpretations of this paragraph. T.
44037	SPM	7	7	7	7	The phrase "Analysis contained in the literature" seems vague, and it is not clear if this is referring to only one article in the literature or many. Is it possible to be more precise, perhaps using evidence/agreement terms? Otherwise this sentence reads as subjective and hypothetical.
43981	SPM	7	7		13	Moral and political philosophy can also contribute to the question of how countries can define climate policies that help fulfill the ultimate objective of the Convention, with special emphasis on their role with regards to sustainable development in developing countries

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
47095	SPM	7	7	7	13	We regard this section as policy prescriptive and it also uses abstract scientific jargon. We prefer to delete it, but if it is retained we suggest to reword it as follows: "Philosophical literature can assist decision making on the sharing of efforts and cost for climate change mitigation". It can also provide a method to support decisions on adoption of mitigation pathways and to indentify possible alternatives for mitigation and adaptation.[3.2, 3.3, 3.4]"
45810	SPM	7	7	7	8	Suggest a revision be made to "Analysis contained in the literature of moral and political philosophy is important to address ethical questions that are raised by climate change." as Sections 3.2-3.4 in the underlying chapters say that ethics embrace debate and disagreement, and stating that ethical questions can be resolved may wrongly encourage unrealistic optimism among policymakers.
44957	SPM	7	7	7	13	Like the previous paragraphs this again remains rather general: "Analysis in the literature ... can contribute to resolving ... questions...." (so what?). The paragraph only mentions questions; where are the answers? The SPM is not covering the dimensions of political philosophy & ethical questions. It is not consistent to highlight this text here, unless more substance is provided.
45120	SPM	7	7	7	8	The headline "Analysis contained in the literature of moral and political philosophy can contribute to resolving ethical questions that are raised by climate change" is not supported by the underlying sections of the report [3.2, 3.3, 3.4] which come to no firm conclusion on the value of the literature. This paragraph should therefore be deleted
45245	SPM	7	7	7	13	Suggest this paragraph should be clarified so that it is clear what the IPCC WG III SPM can and can't do. Suggest referring to the role of the IPCC as per the "principles governing IPCC work" . It is not relevant to "understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation"- the role of the IPCC as described in the principles governing IPCC work. Suggest deletion or shortening.
45477	SPM	7	8	7	9	"...how much overall climate mitigation is needed to avoid dangerous interference" this does not really fall under the literature of moral and political philosophy referred to in the previous sentence, but rather natural sciences. Would suggest to remove this or alternatively include a reference to natural sciences in the previous sentence.
43638	SPM	7	8	7	9	The underlying chapters treat the question of 'how much overall climate mitigation is needed to avoid 'dangerous interference' as a science question rather than an ethical question. As such, the inclusion of it in this paragraph of the SPM seems at odds with the chapters. Suggest that this sentence is removed from this paragraph.
45658	SPM	7	8	7	8	Within brackets the text 'Medium Confidence' may be added after the word 'Climate Change'.
44683	SPM	7	8	7	9	CHAPTER 3, P. 7, LINES 8-9: The text discussion on discounting provides a useful and robust discussion of recent work on declining discount rates. However, the ES conclusion that there is high confidence about a consensus on this issue is likely an overstatement, even though the recent literature leans in that direction.
45923	SPM	7	9			climate mitigation ~ climate CHANGE mitigation or simply mitigation ((it is not the climate that should be mitigated ..))
46800	SPM	7	21	7	21	The sentence "The many diverse goals that societies value are often called 'sustainable development' " is semantically incorrect. The "goals" cannot be called "sustainable development". Furthermore, societies might value unsustainable issues. We could not trace this phrase in the underlying report and suggest changing the sentence in order to avoid confusion over its meaning. Furthermore, the "definition" of sustainable development can be misleading and is moreover not used in the chapter itself. Therefore, please use the definition of the "Brundtland-Report" because it is the most frequently quoted [chap 4.2.1.1]. This definition reads: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (World Commission on Environment and Development's (the Brundtland Commission) report "Our Common Future" (Oxford: Oxford University Press, 1987).
46803	SPM	7	41	7	41	The tipping-point risk is not unknown. The risk is real and exists, but maybe not easy to quantify. Furthermore, it remains unclear what "new climate regimes" (plural form) means. It is usually referred to the climate regime (singular).
43994	SPM	7	26	7	32	It is proposed to remove this paragraph because it is not appropriate to make this distinction regarding the perception of risks and opportunities by humans.
43995	SPM	7	33	7	33	Replace "building" for "strengthening".
43993	SPM	7	7	7	13	It is requested to remove this paragraph since the historical responsibilities of countries should not rely on subjective considerations such as moral or ethical considerations.
45813	SPM	7	39	7	39	What kind of state does the phrase "extreme climate change" refer to specifically? This term is undefined, and request that it should be replaced by, if possible, an explicitly defined term. If not possible, the definition of this term needs to be provided.
45814	SPM	7	41	7	41	Climate risks associated with global change going beyond tipping points are by no means "essentially unknown", though they may be difficult to assess quantitatively. A more appropriate wording would be "difficult to project in quantitative terms based on the scientific understanding at this time."

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45930	SPM	8				Policymakers might be very much interested within the SPM how the FOLU activities (described in details in ch. 11) are related to the LULUCF term extensively applied in the context of the international negotiations.
45262	SPM	8				Consider using term "biogenic CO2" rather than FOLU in this figure. Otherwise the use of FOLU, which is a subsector of AFOLU is confusing as gases and sectors are mixed.
44049	SPM	8	1	8	1	The title, referring to "stocks of greenhouse gases", seems a bit awkward since most carbon resides in reservoirs where it is held in forms other than gaseous CO2. Since this section is about emissions, suggest having shorter title, such as "Trends in greenhouse gas emissions and their drivers".
45667	SPM	8	1	8	1	In header 'flows and stocks' may be replace with 'stocks and flows'.
45127	SPM	8	1	12	31	A general observation is that this section presents an awfully large volume of numbers with little or no statements of the implications for policymaking. We think this section needs considerable work to identify a small number of key messages, highlight these (see Comment 1 above) and provide more detail under each highlighted message. For us the key messages in this Section are that GHG emissions are continuing to rise and that without action emissions are projected to rise in future
45126	SPM	8	1	8	1	In the AR4 WG3 SPM this section was simply called "Greenhouse gas emissions trends". We strongly prefer this title as it is clear, short and impactful
46804	SPM	8	1	8	24	Somewhere in the context of the GWP discussion it should be mentioned that it is only CO2 affecting ocean acidification, and that non-CO2 greenhouse gases do not contribute.
45251	SPM	8	1			Heading could be clearer and shorter.
45263	SPM	8	1	8	5	This information should be referenced back and compared to the carbon budget for 2C degrees goal as outlined in AR5 WGI SPM.
45489	SPM	8	11	8	11	Please consider to add "than in the previous three decades." to this sentence, ref. TS p. 9, line 44-45.
44052	SPM	8	11	8	11	It is recommend that the authors consider deleting the word "more" from the statement that GHGs have risen "more rapidly" between 2000 and 2010. The current wording implies an acceleration, but we note that findings such as this can be affected by the choice of decadal boundaries for the finding. In general, assessments of acceleration based on short periods should be expressed with caution. Suggest also that a reference period is needed to explain what this finding of "rapidly" is being compared against (e.g., "than all previous decades" could be added at the end of the sentence).
43467	SPM	8	11	8	19	<p>When considering the steady increase on global GHG emissions, despite current policies, or the global 2007/2008 economic crisis, the Report affirm that economy and population are the two main drivers (pag. 9, line 12).</p> <p>If we take in a simple way it means that by reducing this two factor, GHG will diminish.</p> <p>Is that enough to explain why are being so ineffective the current international, regional and national policies?.</p> <p>It is not the same to talk of economic growth for a developed than for a least developing country. For many countries economic growth is an imperative. The impact of economic growth on GHG depends of the quality of such growth, and of the levels and patterns of consumption.</p> <p>The same with population, the impact is not in the form of 1 new person = to 1 new person, because the impact depend of the consumption per capita.</p> <p>The analysis of the impact of economy requires considerations regarding the different models development can take.</p>
45366	SPM	8	11	8	11	The first sentence is incomplete because a reference period would be required (e.g. compared to the period 1990 to 2000). An alternative would be to delete "more".
43642	SPM	8	11	8	11	An indication of when the current rapid rise is referred to would enhance clarity - i.e. than in previous decades? Or than over the entire accounting period?
47004	SPM	8	11	8	11	It would be helpful to list the components included in the basket of GHGs, before giving the total emissions. Also, it would useful to clarify whether CO2e concentrations include the contribution of aerosols.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
47005	SPM	8	11	8	19	It would be helpful to put this first sentence in context. Suggest something along the lines of (drawing from Chapter 5): "Global anthropogenic GHG emissions increased from 28 Gt CO <sub>2</sub> e per year in 1970 to its highest value in human history at 49 GtCO <sub>2</sub> e per year in 2010, with its highest rate of increase occurring between 2000 and 2010 (high confidence)". Also, could the rates be double-checked as there seems to be some inconsistencies with the numbers given in the executive summary of Chapter 5.
44871	SPM	8	11	8	13	The sentence "Current GHG emissions...in 2010" is confusing: emissions have reached 49GtCO <sub>2</sub> e, not the trends. Consider rephrasing "GHG emissions have reached 49 GtCO <sub>2</sub> e in 2010 and current trends are at the high end of projected levels for the last decade".
45926	SPM	8	11	8	11	The sentence reads "... more rapidly" but does not say "than ...". Please reword it to say that emissions increased between 2000 and 2010 at a higher rate than before.
44406	SPM	8	11	8	11	As this sentence points to the Figure SPM.1, it will be helpful for the interpretation to specify like in the TS that: "Global GHG emissions have risen more rapidly between 2000 and 2010 than in the previous three decades."
45668	SPM	8	11	8	11	To be consistent with ' may be added before word 'Global'.
43929	SPM	8	11	8	11	"Global GHG emissions have risen more rapidly between 2000 and 2010". Please add "...compared to x"?
44466	SPM	8	11	8	11	This statement needs additional context - compared to when? Any of the preceding three decades? The author should consult Chapter 1, p. 4 lines 8-10 for the appropriate context.
44963	SPM	8	11	8	11	"... more rapidly between 2000 and 2010". Compared to what ? A reference period should be added ("... than between x and y").
45128	SPM	8	11	8	11	"have risen more rapidly between" begs the question "More rapidly than what?"
46808	SPM	8	11			To which other period is the phrase "risen more rapidly" referring to? Please add this information.
46807	SPM	8	11	8	19	This is very important information.
45255	SPM	8	11			This sentence needs to be completed to include the comparator i.e. risen more rapidly than ... when?
43729	SPM	8	11	8	19	This paragraph emphasizes the recent short-term trends of last decade. However, trends based on short records are sensitive to economic cycle, as well as the starting and ending dates, and is problematic to reflect long-term emission trends. For example, the current starting year of 2000 followed the economic crisis in 1998/1999 with GHG emissions dipped to a low point. If 1996 or 1997 is chosen to be the starting year, the average GHG growth rate up to 2010 could be totally different. In addition, the average growth rates for 20-year periods are 1.6% for the period 1970-1990 and 1.3% for the period 1990-2010 respectively, that lead to a decreased trend which fails to agree with the current conclusion. Therefore, it is suggested to replace the sentence in L11 "Global GHG emissions have risen more rapidly between 2000 and 2010" with the following text: "Global GHG emissions have continued to increase since 1970. Although it has risen more rapidly between 2000 and 2010, short term trends which are determined by the selection of time span are very sensitive to the beginning and ending dates, reflecting economic cycle and do not in general reflect long term trends."
44336	SPM	8	11			"Global GHG emissions have risen more rapidly between 2000 and 2010 (high confidence)". The word "more" implies a comparison, so please indicate the comparison period, e.g. "Global GHG emissions have risen more rapidly between 2000 and 2010 than during the previous xxx years".
44053	SPM	8	12	8	12	The text here makes reference to "projected levels" of emissions. Which projections? Our understanding is that RCPs and SRES scenarios are just that - scenarios and not projections. We suggest replacing "trends are at the high end of projected levels" with "trends are at the high end of the range represented by the RCP and SRES emissions scenarios". If you adopted this text, it would also be necessary to define RCP and SRES. Also, the reference to "last decade" here is unclear. Suggest replacing with the dates of the decade being referred to (e.g. 2000-2010).
44467	SPM	8	12	8	12	What does "high end of projected levels" refer to here? RCP scenarios? The authors should specify.
44964	SPM	8	12	8	12	"at the high end of projected levels" . Please clarify : a reference for the projection, or at least to when the projection was done, is needed. How are "current trends" defined ? (Why is comparison to the last decade appropriate ?)
45256	SPM	8	12			It should be clarified which projections are referred to. IPCC?
45490	SPM	8	13	8	13	To be consistent with Fig SPM 1, please replace 49 by 49,5 (or 50).
45367	SPM	8	13	8	16	The comparison of the periods 1970 to 2000 and 2000 to 2010 is scientifically not very sound. The seventies of the last century saw the two oil price shocks that triggered a change in the energy policy of many countries. In contrast climate change policy only materialized in 1997 with the adoption of the Kyoto Protocol. It is obvious that the oil price shocks induced more changes in the energy system than the climate policy so far.
45927	SPM	8	13			multilateral institutions ~ multilateral instruments (?) ((i.e. policy and legal instruments))

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44468	SPM	8	13	8	13	Why has there been a reduction to 49.5 Gt from 50.1 Gt for 2010 emissions since the SOD?
45257	SPM	8	13	8	16	The sentence beginning "Despite the presence..." should be more factual. Begin sentence instead at "GHG emissions grew...".
45258	SPM	8	15			The word 'entire' is redundant.
45491	SPM	8	16	8	17	We propose that the sentence is changed to "The global economic crises 2007/2008 temporarily reduced emissions, but did not change the longer term trend".
44054	SPM	8	16	8	16	Suggest adding "from peak levels" after "temporarily reduced emissions". Some reference point is needed from which the reduction is apparent.
47006	SPM	8	16	8	16	Replace "but not" by "may not have". The time series of several years is rather short to draw such a strong conclusion.
44469	SPM	8	16	8	17	"...has temporarily reduced emissions but not changed the trend." Is the temporariness of this reduction a presumption or a fact? This needs to be made clear. Also what exactly does 'not changed the trend' mean? Certainly the trend since 2007 has been changed. Is the thought being expressed here that we presume that the reduction in emissions since 2007 is temporary, and that the previous long-term trend will eventually resume? The authors should insert the following text: "... but not changed the DECADEAL [OR MULTI-YEAR] trend."
45259	SPM	8	16	8	17	The sentence beginning "the global economic crisis..." should be given more prominence as it is a useful fact for policymakers.
44265	SPM	8	17	8	18	Information only on emissions from fossil fuel appears biased in SPM. Other sectoral emissions information such as AFOLU shall be given in SPM. Information on other gases trends in the same period, since the heading speaks about GHG not only CO2
44055	SPM	8	17	8	18	Suggest replacing "growth in global CO2 emissions from fossil fuel combustion has continued by about 3%" with "global CO2 emissions from fossil fuel combustion have increased by about 3%". We are also concerned that the opening of this sentence with "Initial evidence suggests" is rather vague, suggesting that it might even be premature to make an evidence/agreement assessment and that this may be a tenuous piece of information to include in an SPM. Suggest further clarifying the evidence in order to minimize risks to the IPCC.
45368	SPM	8	17	8	19	It is confusing to address in the same paragraph total GHG emissions, including probably all greenhouse gases and not only CO2 and CO2 emissions from fossil fuel combustion. It is suggested to delete the last sentence from this paragraph and move it page 9, second paragraph (lines 6 to 14).
44801	SPM	8	17	8	17	What does the "initial" refer to? Also to 2010 and 2011 values and not only 2012?
45129	SPM	8	17	8	17	the word "underlying" should be inserted before the word "trend"
44470	SPM	8	18	8	18	The authors should provide historic numbers to put these recent numbers in context.
44471	SPM	8	18	8	18	The difference between 3% growth (2011 vs 2010) and 1-2% growth (2012 vs 2011) seems large. It is puzzling to introduce this without commenting on it. What's going on that resulted in this change?
44264	SPM	8	2	8	10	This important piece of information on time-series data as considered in AR5 shall be given at the beginning of SPM. Clarification shall be given in SPM on whether AR5 has also adopted SAR values.
44463	SPM	8	2	8	10	The authors should specify whether these are top-down or bottom-up inventories and describe what each is.
44962	SPM	8	2	8	10	This could be shortened.
45253	SPM	8	2	8	4	This sentence is hard to understand and needs to be redrafted probably as two sentences.
44266	SPM	8	20	8	22	The ratio of other GHGs need to be explained in CO2 equivalent taking into account their GWP
45492	SPM	8	20	8	21	Please consider to rephrase the sentence to "CO2 is the fastest growing GHG in absolute terms and remains the major anth.....".
44056	SPM	8	20	8	20	Suggest replacing "with about 76%" with "accounting for 76%".
44057	SPM	8	20	8	21	It would be useful to give some indication of the uncertainty in the fractions that are given (76%, 16%, 10% and 2%), as these numbers are uncertain (as seems to be indicated by Fig SPM.1). The confidence assessment for the bolded statement about CO2 being the major GHG seems less relevant, as this could be taken as a statement of fact.
47007	SPM	8	20	8	20	For clarity regarding "major", it might be better to phrase the first sentence as: "CO2 remains the largest contribution to global anthropogenic GHG emissions, accounting for about 76% of total GHG emissions in 2010."



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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44872	SPM	8	20	8	24	If "the choice of type of emission metric and time horizon involves explicit or implicit value judgments", this bullet only has instrumental value to policy makers if they can evaluate other metrics, which are closer to their own value judgments. Therefore, it would be appropriate to include here one or more alternatives - in particular GTP, which is referenced in WGI Technical Summary as more suitable to target based policies. Suggest the following rephrasing: "CO2 remains the major anthropogenic GHG with about 76% of total GHG emissions in 2010 weighed by GWP100 and XX% by GTP100. 16% come from CH4, 10% from N2O and 2% from fluorinated gases as measured by GWP100; YY%, ZZ% WW%, respectively, as measured by GTP100 (Figure SPM.1). The choice of type of emission metric and time horizon involves explicit or implicit value judgements, no single metric can accurately compare all consequences of different emissions, and all have limitations and uncertainties." Figure SPM.1 should be edited accordingly.
45669	SPM	8	20	8	20	The value '76%' may be replaced by '75% or it may be verified'.
45130	SPM	8	20	10	5	The 'headline' messages here are not very exciting, and could be condensed as a series of bullet points under the main headline that "GHG emissions are continuing to rise"
46811	SPM	8	20	8	21	Please insert "and the share of CO2 increases". This can be seen from Figure SPM.1. The formulation "remains the major anthropogenic GHG" might otherwise imply a decreasing share.
45260	SPM	8	20	8	21	This sentence should be replaced with language consistent with the WG1 SPM report
45494	SPM	8	21	8	21	Contribution from N2O should read 6 % not 10 %, ref. Figure SPM.1. which states 6.2 % contribution from N2O, also compare with the text in TS which reads 6 % (in addition 76+16+10+2 = 104)
44058	SPM	8	21	8	22	Shouldn't the percentage for N2O be about 6% (as shown in Figure SPM.1) not 10%? Suggest reviewing.
43643	SPM	8	21	8	21	According to Figure SPM 1, the phrase '10% from N2O' should be corrected to '6% from N2O'.
45928	SPM	8	21	8	22	it would be better to keep the decimals in the text otherwise some readers will not understand why those numbers add up to >100%
44376	SPM	8	21	8	21	GWP100 → GTP100 from SAR.
44472	SPM	8	21	8	21	The reference to N2O as comprising 10% of GHG emissions is inconsistent with what is depicted in Figure SPM.1, which shows it to be 6%. The authors need to ensure consistent numbers between text and figures, as well as throughout the text.
44965	SPM	8	21	8	21	The 10% share of N2O in the text should be changed to 6%, as in the figure, so that total adds up to 100% and not 104%
45131	SPM	8	21	8	21	N2O 10% does not match the 6% in figure SPM.1. (and the total is more than 104%).
45261	SPM	8	21	8	22	GWPs used should build on WG I SPM.
43730	SPM	8	21	8	21	According to Figure SPM.1, it should be 6.2% instead of 10% from N2O, it is suggested to verify and revise accordingly.
45493	SPM	8	22	8	22	The Figure SPM.1 illustrates very well that CO2 emissions from fossil fuel and industrial processes have increased substantially from 1970 to 2010 while emissions of other GHGs, with the exception of HFC, PFC and SF6, have stabilised or decreased. Please consider to reflect this important finding in the text, preferably as a new sentence in line 22 before "Using GWPs with.....".
45495	SPM	8	22	8	23	We propose that the sentence is changed to "The use of GWPs with shorter time horizons will increase the relative importance of the non-CO2 GHGs compared to CO2 ." We believe that this will improve the readability of the sentence.
45369	SPM	8	22	8	24	It is suggested to delete any discussion on various metrics in SPM WGIII - this topic has been considered in the SPM of WG I. It might again be considered in the Synthesis report. The information is redundant with information provided in the SPM of WG I.
44747	SPM	8	22	8	22	Insert after (Figure SPM.1) the sentence: "On time scales of greater than 100 years the GWP of CH4 and N2O decrease relative to CO2."
44966	SPM	8	22	8	24	It may be added that, "by contrast, using GWP's with longer time horizons increases the share of CO2, as more than 20% of CO2 emissions remain in the atmosphere for more than 1000 years".(see AR5 WGI)
44267	SPM	8	23	8	24	The statement Lack of clarity and relevance to policy makers and is vague in explaining what the "value judgment" is and how it is decided.
43644	SPM	8	23	8	23	Suggest deleting 'type of' - It is the choice of metric that is relevant.
45929	SPM	8	23	8	24	"The choice of type of emission metric and time horizon involves explicit or implicit value judgements." ~ This sentence is not clear w/o some additions or rephrasing.
44718	SPM	8	24	8	24	It seems the reference to Box TS.2 should be to Box TS.5 instead.
44873	SPM	8	25			Edit Figure SPM.1 accordingly to reflect also the GHG emissions as weighed by GTP100, as per the comment above, with two graphics or, alternatively, insert figure SPM.1 bis with a equivalent graphic for GTP100. For clarity, insert average growth for the total period 1970-2010 (1,3%) above the 4 decades averages.
44473	SPM	8	25	8	25	It is very difficult to discern from this figure (with the stacked wdges) which sources of emissions "flattened out" after 2007 and which did not. I.e. the trends in the individual sources are pretty obscured. It would be nice to show these in a clear way in a separate plot.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44474	SPM	8	25	8	25	Figure SPM.1: Why has the % energy CO2 changed from 60.7% in the SOD to 65.2% in this FGD?
46812	SPM	8	25			The characters within the figure SPM.1 are too small, please increase font size.
45497	SPM	8	26	8	31	Figure SPM 1: Caption: I) The Figure should be given a short and descriptive title, e.g. "GHG emissions 1970-2010". II) Since the trend of 1.3 % increase over the entire period 1970-2000 is mentioned in text line 15, please consider to add a horizontal line covering this period as done for the decades. III) Please be consistent with the number of years in decadal means. As it is now it seems that you are counting start and end years twice as ex. 1990-00 and 2000-10. This is also 11 years, please check this.
44059	SPM	8	26			Figure SPM.1 caption: Suggest replacing "Total annual GHG emissions..." with "Total global annual GHG emissions"
46813	SPM	8	26	8	28	Specification of colour codes is already provided in the figure and is not needed again in the caption.
45496	SPM	8	27	8	31	Figure SPM.1: The explanation of emissions from FOLU is somewhat confusing - especially since reference to AFOLU is made later in the chapter. Does "emissions from forest and peat fires and decay" refer to (man made) deforestation in general? If this is the case we propose that the wording is changed, since "forest and peat fires and decay" might be interpreted as naturally occurring incidents. As for the "forest part", we suggest to replace "forest" with "deforestation, forest degradation" in order to more specific since the word forest could be comprehended very widely. It may as well be considered to include the definition of "Forestry" in the glossary/Annex I., e.g. "Forestry is the science, art, and craft of creating, managing, using, conserving, and repairing forests and associated resources to meet desired goals, needs, and values for human benefit. ".
44060	SPM	8	27	8	28	Figure SPM.1 caption: Suggest: (1) Clarifying that this is the net anthropogenic CO2 flux from forestry and other land use - not the net flux from the terrestrial biosphere. Insert 'Net anthropogenic' before 'CO2', and (2) Explaining, possibly through a footnote, why FOLU is used here as a category for emissions, whereas AFOLU is used in other places.
45931	SPM	8	27	8	27	In this line, but also in several other places, the non-standard term "Forestry and Other Land Use" is used instead of AFOLU. I suggest to use AFOLU even if "Agriculture" is not so important in several cases (if such detail is considered at one place, all other details should be considered which may change from country to country etc., an goes into unnecessary details in an SPM.
44061	SPM	8	29	8	29	Figure SPM.1 caption: Although the chapeau to this section specifies that GWPs used in this SPM are those from the IPCC SAR, Figures from IPCC SPMs are widely downloaded and used in presentations; therefore, the information about the GWPs being from the SAR needs to be provided in the figure caption as well. Recommend adding "IPCC SAR" before "GWP100".
45370	SPM	8	29	8	29	It is confusing to use in the SPM the abbreviation FOLU (for Forestry and Other Land Use) as well as AFOLU (figure SPM.3). It is strongly recommended to use only AFOLU and to change the text/the figures accordingly as AFOLU is clearly defined sector in the IPCC 2006 Inventory Guidelines. The alternative would be to use the abbreviation LULUCF (Land use and land use change and forestry) which is described in the 1996 IPCC Guidelines.
44869	SPM	8	3	8	4	There is an inconsistency between WG3 SPM and WG1 SPM. In WG1 SPM section B1, data sets extend until 2012, not 2010. Consider comparing with the data of WG1.
44464	SPM	8	3	8	3	The authors should explain why 1970 was chosen as the beginning year - and AR4 was "through" 2004 not "to" 2004, correct? Similarly, later in the line it should be "through 2010", not "to 2010".
45252	SPM	8	3			When are the present report trends from - 1970 or earlier?
44062	SPM	8	31	8	31	What confidence interval do the uncertainty ranges show? 5-95%? Please clarify.
43645	SPM	8	31	8	32	Suggest using the term 'error bars' rather than 'whiskers' and identify their resolution/scope; these error bars are meaningless in their current form. The term 'whiskers' may also be confusing for policymakers.
44475	SPM	8	31	8	32	Figure SPM.1: There is actually a fairly robust literature on GHG emissions uncertainties. In fact, Figure 1.3 on p. 21 lines 7-8 states that these are 90% confidence intervals, so this should be included here.
46814	SPM	8	31	8	32	We generally appreciate the information about uncertainties provided in the SPM. Whiskers like in Figure SPM.1 for the emission uncertainty should also be added in other figures.
45364	SPM	8	4	8	10	The choice of the GWP-values has triggered lengthy debate under the UNFCCC. The choice suggested by the WG III is a very pragmatic one. Austria strongly suggests that any such decision should be valid for the whole AR5 in order to provide consistency across the reports of the three Working Groups.
45254	SPM	8	4	8	10	Shorten sentence to state clearly that they are using the SAR GWPs unless otherwise stated. An explanation of the choice of GWPs and the implications of this should be provided at plenary.
44719	SPM	8	5	8	8	Different definitions of CO2-equivalent concentration exist, including different gasses. It would be helpful with a description or list, or at least a reference to a description or list of the substances included.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
44050	SPM	8	5	8	6	Suggest it would be useful to include a footnote describing how CO2-equivalent emissions can be converted to carbon-equivalent emissions, since the units used in WG1 are referenced to carbon rather than to CO2.
44051	SPM	8	6	8	10	Suggest it would be useful if explicit reference could be made to WG1, Section 8.7.1, which gives background on the development and interpretation of the GWP metric, the choice of time horizon, and also provides current GWP estimates at 20, 100 and 500-year horizons.
44800	SPM	8	6	8	10	It would be useful to also provide examples of how the later updates of the GWP100 values would affect the results. This would support policy-related considerations of metrics and updates to them.
47100	SPM	8	7	8	10	We think it is confusing that WGIII uses SAR GWPs while WGI has updated the values. It is also very policy relevant to show how GWP100 values have changed between SAR and AR5 and taking these into account would create a substantial shift in the optimum between the emission reductions of the different gases. The RF from CO2 is 56% of the total GHG contribution (ref. SPM WGI). Since the SAR the relative GWP of CO2 has significantly decreased(12%), lowering the contribution from CO2 compared to those given in this SPM.
43641	SPM	8	7	8	10	Suggest deleting the text 'the SAR values are widely used in policy settings, including the Kyoto Protocol' because Parties under the second commitment period of the Kyoto Protocol use GWP values from IPCC AR4. The AR4 values are also used for current UNFCCC reporting.
47003	SPM	8	7	8	10	This does not accurately reflect current usage of GWP values in policy making. This section and the relevant analysis needs to be updated to take account of the UNFCCC decision to use the GWP values from the AR4 in place of those from the SAR. It may also be useful to reflect on how much/little impact using AR4 values makes, perhaps based on the line from Chapter 5, p.9, 1.42-43 which says: "...use of updated AR4 or AR5 WGP, which change values by a smaller amount, would not change the overall conclusions in this section."
44870	SPM	8	7	8	10	WG1 offers a very important discussion on metrics and their limitations on chapter 8.7 (see bullet WGI SPM, page 17) that has important bearings in this section. Consider "There are other metrics, such as the GTP, and although GWP values have been...".
46806	SPM	8	7	8	10	The statement on the Kyoto Protocol (KP) is not correct as for the second commitment period of the KP, the GWP from the AR4 are used.
45365	SPM	8	8	8	8	The sentence is incomplete. It should read: ... updated several times since the SAR, ....
44465	SPM	8	8	8	10	Outdated values of GWPs are "widely used in policy settings." The authors should explain why this is done (i.e., UNFCCC practice). For example, one might argue that the use of older values allows easy cross comparison with previous assessments, but no such comparisons are made here.
44335	SPM	8	9			SAR GWP values are used in the first commitment period of the Kyoto Protocol (2008 to 2012). For the second commitment period (2013 to 2020) GWP values from AR4 are to be used. The text should be change to make this clear and after "Kyoto Protocol" insert "in its first commitment period"
43701	SPM	8				General comments: it is important to incorporate at the outset of section 2 the discussion of carbon budget and temperature increase. The following discussion is important to introduce: The maximum carbon budget in order not to exceed an increase of 2 ° C in global average temperature this century is 44 gigatonnes of Carbon Dioxide Equivalent (GtCO2e)by 2020 (followed by a steep decline) according to the "Emissions Gap Report 2011" by the UN Environment Programme (UNEP). It is important to establish clearly how this budget would be distributed between the developed and developing countries, although there are no criteria, much less political decisions in the context of the discussion or negotiations of the United Nations Conference on Climate Change (UNFCCC) regarding the concept or at least the idea of the distribution of a carbon budget. Considering the low-end of emissions reduction pledges made by developed countries, excluding LULUCF calculations show that 38% (equivalent to 16.7 GtCO2e) of the total carbon budget recommended by UNEP for 2020 would be used by developed countries, which, in the year 2020 are projected to have just 17% of the world's population, while 62% of the carbon budget would be available to developing countries who will represent 83% of the world's population. If we begin with the population data of developing countries and then add to this the challenges associated with overcoming poverty and hunger, the distribution is of course unfair. Furthermore, despite the apparent important reduction in emissionsby developed countries, in reality there is a great likelihood that they will use even more of the budget than what they have proposed and that developing countries are going to make a bigger effort than developed ones. On the other side, developing countries have the challenge to separate the process of developmentof carbon emissions, although this can only be done with greater financial and technological transfers from developed countries.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
43702	SPM	8				General comments: It is important to incorporate a consideration here regarding the fact that, given proposed targets, developed countries could take between 19.6 and 21.6 GtCO <sub>2e</sub> , of the carbon budget of 2020 which is a share of 44.5% and 49% respectively. If the total budget suggested by UNEP were to be strictly adhered to then the available balance for developing countries would be 24.4 GtCO <sub>2e</sub> (ie 55.4%) in the first case and 22.4 GtCO <sub>2e</sub> (ie 50.9%) in the second case. Therefore, in 2020, 83% of the population would have access to just 51% of the maximum allowable carbon budget in order to have a chance of avoiding the increase of 2°C of warming. In this scenario there is no possibility of having equity nor the right of equal access to development. Consequently, there is a risk of further increases in emissions augmented by carbon market mechanisms, leading to a serious risk that total world emissions could be 56 GtCO <sub>2e</sub> in 2020; resulting in an increase in temperature between 3°C and 4°C, which would be dramatic for the planet and humanity.
43703	SPM	8				It is important here to establish the correlation between GHG emissions and development (the right of development from developing country Parties). It is clear that developing countries are making significant efforts to reduce emissions, despite the limitations in access to technology and funding, but there are countries with capabilities to make advances and they have, in fact, made significant pledges of emissions reductions. Reduction pledges from developing countries exceed the volume of reductions pledged by developed countries. Taking the UNEP data we can see that applying strict rules and high reduction pledges, non-Annex 1 (NA1) would reduce 5.2 GtCO <sub>2e</sub> while developed countries, under the same conditions, would reduce by 3.8 GtCO <sub>2e</sub> in 2020. Efforts to reduce emissions by developing countries (NA1) are expressed not only in their emission reduction pledges, but in the fact that they additionally offer carbon credits to developed countries who buy or will buy them. Approximately 2 GtCO <sub>2e</sub> of so-called reductions could be in the form of offsets through reduction actions by developing countries in the context of carbon credits. Consequently, offsets will also be considered a part of developing countries (NA1) efforts, adding 2 GtCO <sub>2e</sub> to their domestic contributions.
43704	SPM	8				Globally in 2009 developed countries had reduced their emissions by 12% compared to 1990 levels excluding LULUCF and by 18% including LULUCF. However, individually several countries have increased their emissions, including the United States and Canada, while others have reduced, such as Japan. The United States has increased its emissions by 7.2% excluding LULUCF and 5.6% including LULUCF. Canada has increased its emissions by 17% excluding LULUCF and 29.8% including LULUCF. In contrast Japan has reduced its emissions by 5% including LULUCF and by 4.5% excluding LULUCF.
45488	SPM	8	1	12	31	SPM. 2. This section introduces the concept of "consumption based" emission, as a supplement to the territorial emissions more easily defined and used by the UNFCCC and the KYOTO-protocol. Challenges related to estimating consumption based emissions should be appropriately reflected in the text and illustrations, ref AR5 WGIII, Chapter 5.3.3.2. The UNFCCC establishes a clear allocation of responsibility for GHG emissions between Parties based on the territorial origin of emissions. This has led to a well established framework for accounting and responsibilities for emissions and are therefore the most relevant approach for policymakers. Consumption based emissions represent a supplement to this approach and it should be presented in this SPM in a way that reflects the established responsibilities and the additional uncertainties connected to this. The government in countries of final consumption normally would have very limited instruments to influence emissions outside its own territory (in contrast to territorial emissions, where legal and economic instruments may be applied). If the concept of consumption based emission is used in the SPM, these aspects should be reflected in the text.
45487	SPM	8	1	8	1	SPM.2 deals only with flows of greenhouse gases and their drivers. Futural aspects are limited to concentration levels in the atmosphere and don't entail emissions. We suggest to make the heading consistent, "Historic and current trends of flows of greenhouse gases and their drivers". This will make it clear that this section is about historical emissions, and neither emissions in the future nor stocks.
46805	SPM	8	1	12	39	Most recent emissions data used are from 2010. WG I report uses 2011 data. Please provide wherever possible the most recent data.
46809	SPM	8	16	8	16	The year "2007/2008" is not correct. The crisis started end of 2008 and spread in 2009 and 2010. This is included in the report, e.g. section 1.3 of SOD 2013: "Shortly after the publication of AR4 in 2007, the world encountered a severe and deep financial crisis (Sornette and Woodard, 2009). The crisis which spread rapidly in the fall of 2008 ..."
46810	SPM	8	20	8	22	According to Figure SPM.1, only 6% of total GHG emissions in 2010 come from N <sub>2</sub> O. With an N <sub>2</sub> O share of 10%, as indicated in the text, the shares of GHG emissions by groups of gases would not result in 100%.
45816	SPM	8		9		Rounding the numbers in text from the ones in Figure SPM 1 and 2 is making it difficult for readers to follow. Matching numbers would be much easier to read through the text while referring to figures. (Specific comments will follow below.)
44461	SPM	8	1	12	31	Little attention is paid to the various structural components, including capital stock, carbon intensive infrastructure, and regulatory decisions that could affect future emissions and the underlying socio-economic drivers that will exert pressure on the balance of emissions among gases and sources. The text should be revised to incorporate this.

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44462	SPM	8	1	12	31	Regarding Section SPM.2, little attention is paid to non-CO2 GHG emissions (less than 10 lines in the entire section). While emissions of non-CO2 GHGs are a third of CO2 emissions, they represent some of the lowest cost near-term mitigation opportunities.
45817	SPM	8	13	8	13	49 should be 49.5 to be consistent with Figure SPM. 1, which is on the same page.
43459	SPM	8	21	8	21	The contribution of NO2 as GHG is given as 10% while in the referenced figure SPM.1, it is 6.2%. The value of 6.2% as reflected in the said referenced figure seems to be the correct one since the total contribution for all the gases considered in the figure adds up to 100%
45818	SPM	8	21	8	21	Wonder if "10% from N2O" is 6% as indicated in TS"6% from N2O". Also for this part, Figure SPM.1 indicates 6.2% from N2O however TS description is probably correct, thus request to check these values. Also suggest to rewrite the sentence to ensure consistency between 15.8% in SPM text and 16% in the body text, and also between 6.2% in the figure SPM.1 and 10%(which we believe is 6%).
45819	SPM	8	25			CO2 emissions from fossil fuel combustion and cement production in 2010, $49.5 \text{ GtCO}_2 \times 65.2\% \times 12 \text{ gC} / 44 \text{ gCO}_2 = 8.8 \text{ GtC}$ , seem somewhat different from those described in WG1 (p.10, L2) as 9.5 [8.7 to 10.3] GtC in 2011. Note that the WG3 number increases to 9.1 GtC when taking account 3% growth from 2010 to 2011 (lines 17-18), which is still less than 9.5 GtC. Although they are within the error range, it is better to mention the difference between WG1 and WG3.
44075	SPM	9		9		It would be helpful if uncertainty ranges could also be shown in panel (b).
47102	SPM	9		9		We think panels (b), (d) and (f) are redundant. Instead we would like regional information on the temporal development of the distribution of non-CO2 GHGs. IPCC needs to give a balanced view. Calculations using the same EDGAR database, but including all GHG sources and upto 2010, show that the share of Annex I and non-Annex I countries in cumulative GHG emissions is currently almost identical. (den Elzen MGJ, Olivier JGJ, Höhne N, Janssens-Maenhout G, 2013b. Countries' contributions to climate change: effect of accounting for all greenhouse gases, recent trends, basic needs and technological progress. Climatic Change:1-16 (doi: 10.1007/s10584-10013-10865-10586).
44875	SPM	9		11		Pages 9 and 11 offer very different ways to aggregate different groups of countries. Page 9 uses mainly geographic regions to show cumulative emissions data, while page 11 separates them along economic/income groups, together with a loose reference to Annex I/non-Annex I countries, to offer a picture of recent years. The result is that one information cannot be related to the other, so it does not contribute to clarity and may be highly misleading to policy makers. Moreover, there is no outline of the economic/income groups, with no information of the range of the incomes (HIC, UMC, LMC and LIC) or the countries that are part of each group.
45932	SPM	9		9		Providing information on emissions is crucial for anyone to understand why climate changes, and what needs to be done to curb emissions. In order to understand this, what is needed in the first place is the total amount of emissions that could be emitted in future. Citing past emissions over time by groups of countries opens up a debate of historical responsibility, and may be counter-productive. (Only one figure with data for the one air of Earth may be enough.) Also, the information about how much emissions occurred until 1990, i.e. the cut-off year of the climate agreements, is a scientifically interesting but impractical detail that takes a lot of space and diverts attention. I consider Figure SPM.9 of WG1AR5-SPM_Draft the one that should be cited, or referred to, here. This figure correctly links the target of not exceeding 2 °C with the maximum cumulative emissions (by any point in time!!) that is allowed. In other words, this approach could be formulated, in a demonstrative manner, to say that about half of the air as a waste-bin of limited capacity is filled in, and we only have this and that much to emit. This also means that humanity together has a maximum allowable amount of emissions. What might be useful here is to report the cumulative emissions that have occurred since 1990 (e.g. by country or sectors), but main a graph with one or a few scenarios of cumulative emissions that can be treated as options for humanity as a whole. Please see a graph (in an Excel file) and suggested text (in a Word file) at <a href="http://www.scientia.hu/ftp/WGIII_SPM_for_review_suggestion.zip">http://www.scientia.hu/ftp/WGIII_SPM_for_review_suggestion.zip</a> , a version of which could be used in the SPM to convey the above idea. It also needs to be highlighted that there is just one common "dustbin" (i.e., Earth's air) to take up all emissions, irrespective of their origin.
43931	SPM	9				The color shading is not very clear in the figures, e.g in the panels a, b and e it is easy to mix the colors for Latin America, and Middle East and Africa.
45265	SPM	9				These graphs are missing agriculture which is an important sector internationally. Therefore FOLU should be calculated as AFOLU instead.
45266	SPM	9				Consider developing another figure on non-CO2 gases.
44340	SPM	9				Should the y-axis of the bottom two plots be labelled "AFOLU" rather than "FOLU" ? This would be no problem if the acronym FOLU is explained at first use.
43646	SPM	9	0			Suggest placing SPM.2 directly after page 9, line 5, as it appears to align better with this text than the current preceding text.

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45498	SPM	9	1	9	2	This statement is inaccurate, since the increase (according to the numbers referred to) has been by more than a factor of 2. We think that the main message, which we assume that this text is supposed to carry, is somewhat "hidden". Perhaps an easier way to convey the same message would be something in the line of: "More than half of cumulative CO2 emissions since 1750 have occurred in the last 40 years, increasing from about 900 Gt for the period 1750 - 1970 to 2000 GtCO2 for 1750 - 2010."
45499	SPM	9	1	9	2	Please check the amount of cumulative emissions of CO2 with the amount given in WGI's report for the same time periods.
44063	SPM	9	1	9	1	This is a statement about anthropogenic cumulative emissions, we think. If so, please add "anthropogenic" before "CO2 emissions".
47101	SPM	9	1	9	5	We think it would be very useful to insert a statement on how emissions from sectors in particular groups of countries have changed and the driving forces of these changes.
44874	SPM	9	1	9	5	WG1 offers similar data in GtC instead of GtCO <sup>2</sup> . Check for consistency.
43930	SPM	9	1	9	1	Please replace "increased by a factor of 2" with "nearly doubled"
44968	SPM	9	1	9	1	"... total cumulative CO2 ..." The structure of the paragraph would be better understood if the distinction between fossil CO2 and FOLU CO2 was made here. Suggestion "... total (fossil + FOLU) cumulative CO2 ..."
44967	SPM	9	1	9	5	This paragraph is not sufficiently easy to read, please consider wording improvements (consistency in the presentation of time periods, reference to "historical emissions", etc.). An interesting alternative would be to explain that the total CO2 emissions between 1970 and 2010 were larger than the total between 1750 and 1970.
45132	SPM	9	1	9	5	This paragraph represents a collection of facts without explanation of their significance, which is essential for the policy-maker.  We suggest replacement of this text with "Between 1750 and 2010, cumulative CO2 emissions were 1300+-110 GtCO2. Figure SPM.2 shows the different sectors and groups of countries from which these emissions arose, and how they have changed since 1750." There then needs to be a cross-reference to WG1 SPM, Figure SPM.10, which sets out the policy relevance of cumulative emissions. There is an important issue of consistency here as WG1 presents cumulative emissions from 1870 expressed as GtC, whereas WG3 Figure SPM.2 presents Gt carbon dioxide and uses a start date of 1750. The different WGs must be consistent with one another if a useful story for policymakers is to emerge.
43731	SPM	9	1	9	5	This paragraph only addresses the total cumulative CO2 emissions and its trends without consideration of the population factor and the resulting cumulative per capita emissions. Furthermore, the first sentence in this paragraph (L1-2) fails to provide information on uncertainty range. According to descriptions in the underlying report (Ch5, P11, L16-17), "Cumulative per capita emissions are another method of presenting emissions in the context of examining historical responsibility". It is thus suggested to add relevant conclusions regarding cumulative per capita emissions as well as the uncertainty range for cumulative CO2 emissions.
44480	SPM	9	10	9	10	Why is the uncertainty associated with CH4 inventories 20% in this draft when it was 25% in the SOD? Similarly, why is there an even more dramatic change in the uncertainty in N2O emissions from 30% in the SOD to 60% in the FGD
44481	SPM	9	10	9	10	The authors should revise the text to read: "20%, 60%, and 20%, respectively."
44069	SPM	9	11	9	11	Typo: Should this be "in the order of"? C
44070	SPM	9	12	9	14	Suggest deleting the phrase "but literature is just emerging" since it doesn't add anything to the sentence. Or, if the point is that the relative lack of literature is what increases uncertainties in attributing emissions to final consumption, then rephrase the sentence. Suggest "As literature is just emerging attributing emissions to the country of final consumption, uncertainties are larger for this approach than for production-based emission attribution". Alternatively, this sentence referring to country of consumption emissions could be deleted here, because the concept is properly described and introduced on pg 10, ln 29 - pg 11, ln 2.

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43468	SPM	9	12	9	12	<p>When considering the steady increase on global GHG emissions, despite current policies, or the global 2007/2008 economic crisis, the Report affirm that economy and population are the two main drivers (pag. 9, line 12).</p> <p>If we take in a simple way it means that by reducing this two factor, GHG will diminish.</p> <p>Is that enough to explain why are being so ineffective the current international, regional and national policies?.</p> <p>It is not the same to talk of economic growth for a developed than for a least developing country. For many countries economic growth is an imperative. The impact of economic growth on GHG depends of the quality of such growth, and of the levels and patterns of consumption.</p> <p>The same with population, the impact is not in the form of 1 new person = to 1 new person, because the impact depend of the consumption per capita.</p> <p>The analysis of the impact of economy requires considerations regarding the different models development can take.</p>
43647	SPM	9	12	9	13	<p>This sentence on the attribution of emissions relates more directly to the paragraph on page 10, line 29 to page 11, line 5. Suggest deleting here and incorporating into the paragraph on pages 10-11.</p>
47011	SPM	9	12	9	13	<p>"Attributing emissions...". This sentence is out of place here and should be moved/combined with the later paragraph on page 10, line 29. The paragraph concerns global totals and not regional emisions. Also, the text should read: "Attributing emissions to the country of final consumption raises methodological difficulties and equity questions and increases uncertainties." Problems associated with attributing emissions to the end-consumer go beyond uncertainties in the measurement of required data. They also have to do with:</p> <p>(i) the lack of harmonised methodologies for life-cycle analyses of internationally traded products, as elaborated in Chapter 5.2.3.7 and in Box 5.2 of Chapter 5.3.3.2. In absence of harmonised methodologies, national GHG emission estimates can hardly be made coherent and consistent.</p> <p>(ii) the lack of effective control of the consuming country over the emissions associated with the production processes in another country.</p>
44803	SPM	9	12	9	13	<p>The sentence on "Attributing emissions..." does not fit in this passage on global emissions. Delete? This issue is very complicated. Should countries with clean production be credited for nega-emissions caused by their export (which means avoided emissions in the importing country)? Also, the meaning of "but literature is just emerging" is unclear. If it stays, could this be expressed in terms of what the literature suggests or be contained in uncertainty language (not the "high confidence" at the beginning of the paragraph, which may be at odds with the "but" here).</p>
44876	SPM	9	12	9	13	<p>The phrase "literature is just emerging" may be interpreted as a negative evaluation of a promising line of study. Consider rephrasing to "...final consumption increases uncertainties, but there is an increasing body of literature on this issue."</p>
44748	SPM	9	12	9	12	<p>The sentence: "Attributing ..." generates confusion: 1) Can emissions be attributed to countries within the current uncertainties? 2) Why mention only "consumption"?</p>
44969	SPM	9	12	9	13	<p>Please rephrase or specify which type of literature is just emerging (the one concerning allocation of emission to the country of final consumption?). Is this paragraph and/or figure SPM.2 involving some attribution of emissions to the country of final consumption? If so, please clarify; if not, please consider moving this sentence on consumption-related allocation to the relevant paragraph (possibly page 10 lines 29 on), and clarify the confidence level.</p>
46818	SPM	9	12	9	13	<p>The statement of attribution of emission to consumptions is out of context. Please delete or explain the concept of territorial/consumption-based attribution when it is first used. The explanation comes only on page 10, lines 30-33.</p>
45268	SPM	9	12			<p>Is this line beginning "attributing emissions..." necessary? The last phrase of the sentence is redundant.</p>
45423	SPM	9	13	9	13	<p>Can you provide a short explanation why "GHG emission estimates in the AR4 were 5-10% higher than the estimates reported here" ?</p>
45503	SPM	9	13	9	14	<p>It should be explained why the GHG emission estimates are higher in AR4. Is this because of a more conservative approach in this report or does it reflect a correction of the AR4 numbers?</p>
44804	SPM	9	13	9	14	<p>This is perhaps too briefly expressed. Which GHG emissions does this refer to? Is this related to consumption-based emissions?</p>
45934	SPM	9	13	9	14	<p>GHG emission estimates in the AR4 were 5-10% higher than the estimates reported here, but lie well within the uncertainty range. [5.2] ~ This will not be understood for the SPM-readers (why and for which period ..).</p>

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43932	SPM	9	13	9	14	Please clarify the last sentence's point on uncertainties
44482	SPM	9	13	9	14	AR4 estimates were 5-10% higher than those reported here, but well within the uncertainty range. But that range is "of order 10%," so how is that "well within?" It seems about the same. The authors should clarify what they mean.
45134	SPM	9	13	9	14	"GHG emissions estimates in the AR4 were 5 - 10% higher..." Which estimates? It is unclear what is being referred to here. This has the potential to be misused: reduction in AR5 from AR4 emission estimates could be used to suggest we don't need to do as much - this of course is not supported by proper reading of the whole SPM
46819	SPM	9	13	9	14	Please explain to which estimates in AR4 this statement refers: "GHG emission estimates in the AR4 were 5-10% higher than the estimates reported here, but lie well within the uncertainty range."
45505	SPM	9	14	9	15	Figure SPM. 2. Please provide reference to Annex II.2 where the different geographical and economical regions are defined. It is unclear whether some nations are reported in the economic or geographic category (e.g. is Japan in OECD and/or Asia), as well as if they are "counted" twice, i.e. in both economic and geographic category, or just once.
45504	SPM	9	14	9	22	Figure SPM.2. We think that this figure contains too much information and is difficult to read. We question whether all the bars in the right hand panels are necessary to convey this message. We suggest that only 3 bars are used, namely the cumulative emissions from 1751-1970, 1751-1990, and 1751-2010. This would also make it more consistent with the years selected in Figure SPM.1.
44071	SPM	9	14	9	14	We assume this says that the AR4 estimates lie within the uncertainty range of the AR5 estimates, and not the other way around. The interpretation should be clarified.
46820	SPM	9	14			Colour specification is given both in the caption and the figure, hence can be deleted from the caption.
43733	SPM	9	14	9	22	Figure SPM.2's (c), (d), (e) and (f) are directly referenced from Figure 5.3 of the underlying report where (a) and (b) are not presented. (a) and (b) are results of direct add-up of (c), (e), (d) and (f) respectively. This processing method has the following concerns: (1) The uncertainty of CO2 emission estimates from FOLU is huge according to the description in Ch5, P16, L44-45 of underlying report "In contrast to fossil-fuel emissions, uncertainties in global land-use change emissions are sufficiently high to make trends uncertain in direction and magnitude." Under this circumstance, this simple add-up is infeasible and misleading. (2) The current figure fails to provide the uncertainty range and regional uncertainty after the add-up and further weakens the confidence level of the result. Therefore, it is suggested to delete (a) and (b) in SPM.2.
44072	SPM	9	15	9	15	Figure SPM.2: It would be helpful if individual figure panels could be given titles (presently, the title is essentially in the y-axis label, which makes it hard to read. Also, it seems logical to change the order of the panels within columns so that the combined total emissions panel is shown at bottom of the column (corresponding to the way in which arithmetic is done).
47012	SPM	9	15			Figure SPM.2 provides lots of important information which is not adequately discussed in the SPM. We suggest that information is added describing the key features shown in SPM.2.
44483	SPM	9	15	9	15	What is meant by "economies in transition"? If not in the accompanying Glossary, it should be and if it is, a footnote directing the reader to the Glossary is warranted.
44485	SPM	9	15	9	15	Figure SPM.2b should have uncertainty whiskers like panels (d) and (f).
44484	SPM	9	15	9	19	Figure SPM.2: An additional set of graphs should be added to reflect cumulative emissions since 1990 along the lines of panels b, d, and f. In order to conserve space, this may replace certain of the bars in the existing panels b, d, f (1751-1980, 1751-2000). Using 1990 as a start year for cumulative emissions analyses has a foundation in the literature, in part because it is largely recognized as the (approximate) year the world acknowledged the climate change problem.
44073	SPM	9	16	9	16	Figure SPM.2 caption: Per other comments, it needs to be clarified why this Figure refers to FOLU and not to AFOLU.
45135	SPM	9	16	9	18	It is not necessary to explain the colour coding; this is given in the key to the figure. All figure captions should be checked for consistency of style.
44074	SPM	9	17	9	17	Figure SPM.2 caption: Suggest changing to "OECD countries", and consider spelling out OECD since this is the first time it appears.
45935	SPM	9	18			Emissions are reported in GtCO2 per year. ~ Emissions are reported in GtCO2 (per year / per indicated period)
45500	SPM	9	2	9	5	This text contains a lot of numbers and reference years, which requires the reader to make significant calculations to deduce the main message. To enhance readability, we think that supporting text should be added (for example: .... This increase is mainly due to increased emissions from fossil fuels..... , while increases from FOLU have been more moderate..... "
44064	SPM	9	2	9	2	The WGI SPM reported that from 1750-2011 cumulative anthropogenic emissions were 555 [470 to 640] GtC (WGI SPM B.5 bullet 4). Why is WGIII not reporting data inclusive of 2011? Consistency across IPCC WGs is strongly recommended.



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43717	SPM	9	2			Definition of "mitigation" includes "... or enhance the sinks of greenhouse gases". This part of the definition covers everything related to "CDR" or "negative emission" (see 6.9). In the Report these terms are interpreted as "climate engineering options", not as mitigation.
44339	SPM	9	20			In the caption for Figure SPM.2 should "FOLU" be replaced by "AFOLU" ? This would be no problem if the acronym FOLU is explained at first use.
43648	SPM	9	22	9	22	Suggest using the term 'error bars' rather than 'whiskers' and identify their resolution/scope; these error bars are meaningless in their current form. The term 'whiskers' may also be confusing for policymakers.
45136	SPM	9	22			Why are uncertainty whiskers provided for (d) and (f) but not (b)?
45933	SPM	9	3	9	5	Apparently, the first cumulative figures (420 and 1300) are those from fossil fuel combustion and industrial processes (i.e. from non-FOLU activities); therefore, it should be clearly mentioned there: In 1970 the cumulative fossil CO2 emissions FROM FOSSIL FUEL COMBUSTION AND INDUSTRIAL PROCESSES since 1750 ..
45670	SPM	9	3	9	3	The unit 'GtCo2' may be added after the value '420+/-35'.
45133	SPM	9	3	9	3	should read "the cumulative fossil CO2 emitted since 1950 was..."
46815	SPM	9	3	9	3	Text says "420+-35" - please add unit.
44065	SPM	9	4	9	4	As also indentified in other comments, the use of FOLU vs. AFOLU is not clear to us. Suggest a footnote is required at the first introduction of these terms.
45371	SPM	9	4	9	4	It is noted that the figure of 1300 ± 110 GtCO2 for cumulative emissions until 2010 is probably inconsistent with the figure agreed by WGI (531 GtC) up to 2011. It is strongly recommended to use coherent figures and units. Another, second best option would be to explain in a footnote the relationship between the two figures.
47008	SPM	9	4	9	4	The meaning of +/- (presumably 1 standard deviation) can be included in the uncertainty footnote.
45264	SPM	9	4	9	8	Consider using term "biogenic CO2" rather than FOLU. Otherwise the use of FOLU, which is a subsector of AFOLU is confusing as gases and sectors are mixed.
45501	SPM	9	6	9	7	Please consider to rephrase this sentence to "The increasing global fossil fuels related CO2-emissions are undisputable. "
44066	SPM	9	6		14	Suggest that this paragraph could be more explicit that the level of uncertainty is much lower for CO2 from fossil fuels than from other sources and from other gases, and/or that the low uncertainty for CO2 from fossil fuels drives the total global GHG uncertainty estimate to be in the order of 10%.
45372	SPM	9	6	9	14	The information with respect to the uncertainties and the comparison with figures reported under AR4 are not very interesting for the policymakers. It would be more policy relevant to highlight the regions that are driving the further increase in GHG emissions since 1990 (1970).
44476	SPM	9	6	9	14	This paragraph includes several important and distinct points. The authors should consider breaking this paragraph into two or three paragraphs, such as (1) one that discusses the trend in global fossil fuel CO2 emissions and uncertainty; (2) one that highlights significant uncertainty in carbon estimates from the FOLU sector which require more concerted efforts to improve monitoring, measurement and modeling at various levels; and (3) one that discusses trends in emissions of non-carbon gases and the robustness of these estimates.
45267	SPM	9	6	9	14	Indicate trends in non-CO2 emissions as a separate paragraph as line 9 on uncertainty on CH4 and N2O emissions is lost in the section.

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Comment No	Chapter	From Page	From Line	To Page	To Line	Comment
43732	SPM	9	6	9	14	The description in terms of uncertainty is neither accurate nor comprehensive. It is suggested to make the following modifications: (1) only the confidence interval for fossil fuel CO2 emissions (90%) is provided. It is suggested to add information on confidence interval for CO2 from FOLU, CH4, N2O and the F-gases; (2) the uncertainty for global emissions of CH4, N2O and the F-gases has been estimated to be "±20%, ±60% and ±20%" instead of "20%, 60% and 20%" according to the underlying report (Ch5, P16, L7-8). It is suggested to revise the uncertainty range accordingly; (3) the description in L10-11 of the SPM "Combining these values yields an illustrative total global GHG uncertainty estimate of order 10%" ignores the uncertainties in assumptions and methodology in the calculation of "10%". According to the underlying report (Ch5, P16, L17-19), the precondition of such calculation is "assuming complete independence" and it has been pointed out that this processing method "may underestimate actual uncertainty". The current description ignores key information and is misleading for the policy makers. It is suggested to replace the current statement in L10-11 with the following descriptions from the underlying report (Ch5, P16, L17-19) : "An illustrative uncertainty estimate of around 10% for total GHG emissions can be obtained by combining the uncertainties for each gas assuming complete independence (which may underestimate actual uncertainty)." (4) This paragraph fails to present the difference of uncertainty of different time-scale. Historical emission data can be more uncertain as stated in the underlying report (Ch5, P16, L11-13). It is thus suggested to add "The uncertainty estimates quoted here are not time dependent and data for historical periods can be more uncertain" following "order 10%."
47009	SPM	9	7	9	7	It is not clear what is meant by "despite uncertainties". Perhaps the authors want to say that the uncertainties are not large enough to influence the statement of upward trend?
47010	SPM	9	8	9	8	There needs to be consistency within this paragraph regarding descriptions of uncertainties. It is unnecessary to describe the uncertainty attached to FOLU emissions as "very large" as the figure (50%) already speaks for itself and other uncertainty estimates in the paragraph do not have qualitative descriptions. The uncertainty on FOLU: (1) relates to the difference between gross emissions and gross removals (and therefore looks disproportionately large as a proportion of the net figure); and (2) applies in part to non-anthropogenic fluxes, which are inherently more uncertain than anthropogenic emissions and which are not regulated by the international agreements.
44802	SPM	9	8	9	9	Editorial. Change "very large uncertainties attached" to "uncertainties"
44477	SPM	9	8	9	8	Instead of "CO2 emissions from FOLU", the authors should consider using "carbon fluxes" to better capture the dynamic nature of carbon cycle.
44478	SPM	9	8	9	8	In the SOD, the text highlighted the stark nation-to-nation differences in emissions uncertainties. This is a very important finding and should be highlighted here.
46817	SPM	9	8	9	10	This sentence is not comprehensive for non-experts, please revise or explain in a footnote. ("Uncertainties are given in percentages of the mean of the total emission estimate" or something along those lines.)
44337	SPM	9	8			This is the first time the abbreviation FOLU has been used, so please also provide an expansion (Forestry and Other Land Use) for the benefit of the general reader. (The stand-alone printed version of the SPM does not generally include a copy of the Glossary).
44338	SPM	9	8			Should "FOLU" be replaced by "AFOLU" here? (Agriculture, Forestry and Other Land Use). AFOLU is the only term defined in the glossary, and the statement here looks as if it refers to agricultural emissions in addition to those from forestry. Please clarify if this is not the case.
45502	SPM	9	9	9	10	We think that this wording makes reading unnecessarily difficult since it forces the reader to jump back and forth in the text. We would propose that it is changed to: "Uncertainties for other gases have been estimated as 20% for CH4, 60% for N2O and 20% for F-gases."
44068	SPM	9	9		10	Suggest adding the word 'respectively' at the end of this sentence.
44067	SPM	9	9	9	9	Suggest defining F-gases here.
44479	SPM	9	9	9	14	Chapter 1, p. 21 lines 11-21 provides better detail, caution and caveats regarding emissions inventories uncertainties. The authors should select some of that text to be brought forward to the SPM because reinforcing the uncertainty is critical if one is to think about mitigation opportunities.
46816	SPM	9	4	9	4	Please explain the expression "FOLU". It seems that "Forest and Other Land" excludes the agriculture sector, in the text on pages 8 and 9, and in Figures SPM.1 and SPM.2. Please add information on agriculture.
45827	SPM	9				In order to facilitate clearer understanding on cumulative historical emissions, Figure in Page 30-(B) of Chapter 1 should be added with slight modification to aggregate EU27 as one.
45825	SPM	9	12	9	13	Wonder if the sentence beginning with "Attributing emissions..." would be better placed in the last paragraph on page 10, as it is about the consumption-based emission estimates.
43460	SPM	9	13	9	14	This sentence contradicts the statement provided in lines 1-2 of the same page. Consider rephrasing it.
45826	SPM	9	14	9	14	"lie" should be "lay" to be grammatically consistent with "were" on line 13.

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45820	SPM	9	2	9	2	Insertion of "about" before "2000" is necessary to be consistent with Figure SPM.2. Or, "2000" can be changed to "2009" but in that case, "about 900" should also be changed to "910".
45821	SPM	9	2	9	4	Each 1750 appearing 5 times should be 1751 to be consistent with Figure SPM.2.
45822	SPM	9	3	9	3	If "cumulative fossil CO2" is intended to represent "CO2 fossil, cement, and flaring", the latter expression should be used and also 420 should be 422, to be consistent with Figure SPM.2. Otherwise (if meaning only fossil CO2), there are no corresponding values in Figure SPM.2.
45823	SPM	9	4	9	4	1300 should be 1329 and to be consistent with Figure SPM.2.
45824	SPM	9	5	9	5	490 should be 488 to be consistent with Figure SPM.2.
44252	SPM	n/a				Comment on CHAPTER 13 of underlying report: Regarding the statement page 5, lines 45-47 of Chapter 13 ("Equity issues can be affected by domestic international property rights..."), we were unable to find sufficient evidence in sections 13.3 13.9 and 13.12 to explain and substantiate this statement. We recommend that the authors review this statement prior to finalization of the report.
45863	SPM	SPM	15	1	15	Appreciate if the difference between the scenarios without delay and the delay scenarios in decline rate should be added from the body text Ch.6 such as "pathways with emissions above 55 GtCO <sub>2</sub> -e in 2030 indicate decline rates between 2030 and 2050 of around 6% for scenarios in the range of 430-530 CO <sub>2</sub> -e in 2100." (Ch.6,p.63)
45864	SPM	SPM	15	1	15	<p>The note relating the difference of scenarios referred in AR4 and AR5 should be added in the notes of Table SPM.1 in order to ensure that policymakers clearly understand the difference of similar tables in AR4 and AR5.</p> <p>This table, Table SPM1, based on information of temperature and budget of each category of RCPs, has no categorization of scenarios based on CO<sub>2</sub> concentration target and its equilibrium temperature like AR4 similar table, Table SPM6 in SYR, has. To avoid confusion between similar table in AR4 and this table, the information, whether temperature stabilize (reaches peak, declines or maintains) or not in 2100, is important. This would help comprehensive understanding by all levels of policymakers to be explained carefully with making consistency with description in WG1 SPM, "Cumulative total emissions of CO<sub>2</sub> and global mean surface temperature response are approximately linearly related". (see. Box1.1, Figure 3, p.60, Chapter 1, WGI AR5).</p> <p>Propose the following text be used as reference for re-write:</p> <ul style="list-style-type: none"> <li>- Equilibrium values (as presented in Table 3.5, AR4) and 2100 concentration and temperature values (as presented in Table SPM1, AR5) cannot be easily compared given the wide range of possible post-2100 trajectories and the lags in the physical processes that govern both. In particular, equilibrium values assume that concentrations stay constant after 2100, while many scenarios in the literature since AR5 show increasing or decreasing concentrations in 2100. (See Ch.6, p. 21, line 14-19)</li> <li>- The stabilization of greenhouse gas concentrations at low levels requires a fundamental decline of GHGs emissions, in some cases, toward nearly zero in long term.</li> </ul>


























































































































































































































































































































































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